


ANALYSIS REPORT

WATER & SANITATION SERVICES IN URBAN GUJARAT (2014-15)

PERFORMANCE ASSESSMENT SYSTEM (PAS)

Prepared by Urban Management Centre

SEPTEMBER 2015

UMC URBAN MANAGEMENT CENTRE

pas performance assessment system

The Urban Management Centre (UMC) is a women promoted not-for-profit organization, that works towards professionalizing urban management in India and worldwide. UMC provides technical assistance and support to city governments and facilitates change through peer-to-peer learning processes. It enhances the capacity of city governments by providing expertise and ready access to innovations on good governance implemented in India and abroad. It facilitates city governments to design, implement and evaluate municipal development and management projects. UMC extensively works in the areas of urban water and sanitation, heritage management, urban planning, urban health, municipal finance, urban management, urban transportation and institutional restructuring.

PAS, a seven-year action research project, has been initiated by CEPT University with funding from the Bill and Melinda Gates Foundation. PAS aims to develop better information on water and sanitation performance at the local level to be used to improve the financial viability, quality and reliability of services. It will use performance indicators and benchmarks on water and sanitation services in all the 400-plus urban areas of Gujarat and Maharashtra. UMC and the All India Institute of Local Self Governance are CEPT's project partners in Gujarat and Maharashtra, respectively. More details are available on www.pas.org.in

ANNUAL PERFORMANCE ASSESSMENT REPORT

WATER & SANITATION IN URBAN GUJARAT
(PAS DATA 2014 –15)

For
Performance Assessment System
In Gujarat

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CEPT University, Ahmedabad

Submitted By

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ACKNOWLEDGEMENT

Since 2009, the Urban Management Centre (UMC) team has been intensively involved in data collection across all 167 urban local bodies of Gujarat as well as providing technical assistance for performance improvement planning. This data analysis report presents annual performance assessment of sixth round of data collected for the year 2014-15.

Our sincere thanks to the Government of Gujarat, especially, the Urban Development and Urban Housing Department, Gujarat Urban Development Mission (GUDM), Gujarat Municipal Finance Board (GMFB), Directorate of Municipality (DoM), Gujarat Urban Development Company (GUDC) for extending their support.. We also extend our sincere thanks to all chief officers, presidents, head of the departments and their team of 159 municipalities for their contribution in the data collection process and whole-hearted support to the PAS program.

UMC would like to acknowledge the Centre for Environmental Planning and Technology (CEPT) University for providing an opportunity to work jointly on Performance Assessment System (PAS) Project. Special thanks to PAS project team leaders – Dr. Meera Mehta and Dr. Dinesh Mehta for their continuous support and guidance on PAS project.

Lastly, we would like to appreciate the effort by the UMC- PAS team working hard on the data collection and finalization of this report.

Manvita Baradi

Director,
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List of Acronyms

BOD	Biological Oxygen Demand
CBO	Community Based Organisations
CEPT	Centre for Environmental Planning and Technology
COD	Chemical Oxygen Demand
CPHEEO	Central Public Health and Environmental Engineering Organisation
Cu.m	Cubic Metre
DoM	Directorate of Municipality
FC	Finance Commission
GIDC	Gujarat Industrial Development Corporation
GMARP	Gujarat Municipal Accounting Reforms Project
GMFB	Gujarat Municipal Finance Board
GoG	Government of Gujarat
GoI	Government of India
GUDM	Gujarat Urban Development Mission
GWIL	Gujarat Water Infrastructure Ltd.
GWSSB	Gujarat Water Supply and Sewerage Board
HH	Household
ICT	Information and Communication Technology
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
KPI	Key Performance Indicators
LAI	Local Action Indicators
LPCD	Litres Per Capita (Per) Day
MC	Municipal Corporation
MGSM	Mahatma Gandhi Swachhata Mission
MLD	Million Litres per Day
MSW	Municipal Solid Waste
NGO	Non-government Organisations
NGSY	Nirmal Gujarat Shauchalay Yojana
NRW	Non Revenue Water
O&M	Operation and Maintenance
P&C	Physical & Chemical
PAS	Performance Assessment Systems
RC	Residual Chlorine
SJMMSVY	Swarna Jayanti Mukhya Mantri Shaheri Vikas Yojana
SLB	Service Level Benchmark
SMS	Short Messaging Service
STP	Sewage Treatment Plant
SWD	Storm Water Drainage
SWM	Solid Waste Management
ULB	Urban Local Body
UMC	Urban Management Centre
USEPA	United States Environmental Protection Agency
WTP	Water Treatment Plant

Chapter 1: Performance Assessment System

1.1 Introduction

Performance Assessment System, seven year action research project, aims to measure, monitor, and improve the performance of municipal water supply and sanitation services in 400ULBs in the states of Gujarat and Maharashtra. This project is being implemented by the Urban Management Centre (UMC) in Gujarat since 2009. The project is assessing and monitoring the performance of all 167 cities over the last six years. UMC is working the ULBs on various performance improvement and information system improvement initiatives. The PAS indicator framework is aligned with the Government of India's Service level Benchmark (SLB) indicator framework.

The Service Level Benchmark (SLB) is one of the nine conditions as prescribed by the 13th Finance Commission to provide performance grant to ULBs. In order to avail this grant, it is mandatory for the State Government to notify the SLB status and target for each ULB for every fiscal year by 31st March. Also under the 14th FC the city governments have to meet the own source revenue and set up benchmarking PAS-SLB data becomes extremely important for such reporting.

Data collection under the PAS program has been an extensive exercise. During the last six years, the project team has collected the data and information on water and sanitation from all urban local bodies of Gujarat, understand ground realities, validate the data with ULB officials and engaged with them on various performance monitoring and improvement initiatives. UMC team also provided training and hand holding support to ULBs staff to collect, collate and upload the data on PAS portal and also use the data for better decision making.

1.2 Round Sixth PAS data collection for the year 2014-15

On request of GUDM, UMC organized centralized data collection workshop at the GUDM office, Gandhinagar from 10th February to 14th March 2015. A schedule to collect data from all 167 urban local bodies of the state was prepared and circulated to the cities. On an average, ten cities were scheduled for online data entry/collection every day (Annexure I&II). During the reporting period 135 municipalities have participated in workshop and filled the data and target for the next year on PAS portal with assistance from UMC PAS team. 14 ULBs, including Bhavnagar and Vadodara Municipal Corporations have filled the data online from their offices. UMC team, cross checked, corrected and submitted SLB data of 149 ULBs in government Gazette format to GUDM for Gazette notification in month of April 2015. GUDM requested all to fill the data online by 31st March 2015. However, 18 ULBs have not participated in workshop and not filled the data online.

Project team also reviewed the data obtained from 149 urban local bodies and cleaned the data elements pertaining to the Key Performance Indicators (KPIs) and Local Action Indicators (LAIs) across the sector.

1.3 Analysis of PAS data year 2014-15

The UMC team attempted to analyze the data collected in sixth round.
The analysis of all 32 Key Performance Indicators comprises (KPIs) a set of indicators for goals and reforms as indicated in indicators framework which is divided into five categories as mentioned in Table 1.1below:

KPIs	Water supply	Wastewater	Solid waste management (SWM)	Storm water drainage (SWD)
Indicators for goals				
Access and coverage	1. Coverage of water supply connections at household level	1. Coverage of households with access to individual toilets	1. Household level coverage of SWM services	1. Coverage of storm water drainage network
		2. Coverage of households with individual connections to sewerage network		
Service levels and quality	2. Per capita supply of water	3. Collection efficiency of wastewater network	2. Efficiency of collection of municipal solid waste	2. Incidence of water logging/flooding
	3. Continuity of water supply	4. Sewage treatment capacity	3. Extent of segregation of municipal solid waste	
	4. Quality of water supplied		4. Extent of municipal solid waste processed and recycled	
Financial management	5. Extent of cost recovery (O&M) in water supply services	5. Extent of cost recovery (O&M) in wastewater management	5. Extent of cost recovery (O&M) in SWM services	
Indicators for reform actions				
Efficiency in service operation	6. Extent of non-revenue water	6. Quality of wastewater treatment	6. Extent of scientific disposal of municipal solid waste	
	7. Efficiency in redressal of customer complaints	7. Extent of reuse and recycling of wastewater		
	8. Extent of functional metering of water connections	8. Efficiency in redressal of customer complaints	7. Efficiency in redressal of customer complaints	
	9. Efficiency in collection of water supply-related charges	9. Efficiency in collection of sewerage-related charges	8. Efficiency in collection of SWM-related user charges	
Equity	10. Coverage of water supply connections in 'slum settlements'	10. Coverage of toilets in 'slum settlements'	9.Household level coverage of SWM services in 'slum settlements'	
		11. Coverage of household connections to sewerage network in 'slum settlements'		

Table 1.1: Key Performance Indicators (KPIs)

Apart from KPIs as per the SLB framework, the PAS framework has also incorporated indicators pertaining to on-site sanitation disposal systems and service delivery to slums.
This report presents sector-wise and class wise analysis. Each sector has been analyzed across various indicators and a class-wise analysis has been made so that cities can look at their performance vis-a vis their peer cities.
In Gujarat there are 167 urban local bodies, and these have been divided into five categories as mentioned below:

Class of ULBs	Population range	Number of ULBs	Number of ULBs data analysed
Municipal Corporation	Above 3,00,000	8	0
Class A	Above 1,00,000	18	18
Class B	50,001 – 1,00,000	33	29
Class C	25001 – 50,000	45	42
Class D	15000 – 25,000	63	58
TOTAL		**167**	**147**

Table 1.2: Categories of cities of Gujarat

Eighteen ULBs, Ahmedabad (MC), Gandhinagar (MC), Jamnagar (MC), Junagadh (MC), Rajkot (MC), Surat (MC), Amreli (B), Dhrangedra (B), Palitana (B), Vadhwan (B), Karamsad (C), Sanand (C), Thangadh (C) Dakor (D), Maliya-miyana (D), Thara (D), Tharad (D) and Thasra (D) are excluded from the analysis due to non availability of data.

Due to non availability of data from six Municipal Corporations, this category has been excluded from the analysis. This report presents analysis of 147 municipalities of Gujarat is analysed in the sequence start from Class A, followed by Class B, Class C and Class D municipalities.

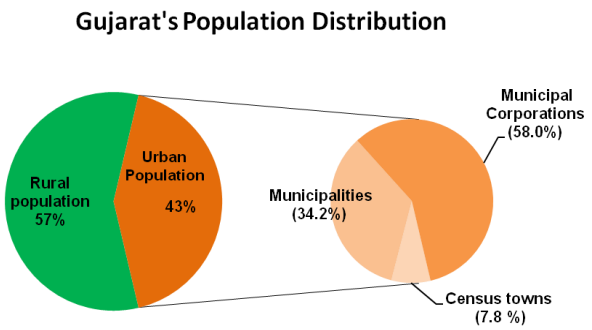
BOX-1

For data analysis, weighted averages have been used in place of simple average. Weighted average gives better perspective for a given indicator as it takes into consideration the importance of other related variables which would have been ignored in case of mean value. There is a huge variation between the least and most populated city at the state level as well as within a class of city. Hence, weighted averages have been calculated against population instead of simple average.

1.4 Urbanization in Gujarat

As per census 2011, Gujarat is the third most urbanized states in India with 43% of the state population living in urban areas which was 37% in 2001. Urbanization in Gujarat is the highest ever due to rapid growth in industrial and service sector over the last one decade. Only two states Tamil Nadu (46%) and Mahrashtra (45%) are more urbanized than Gujarat.

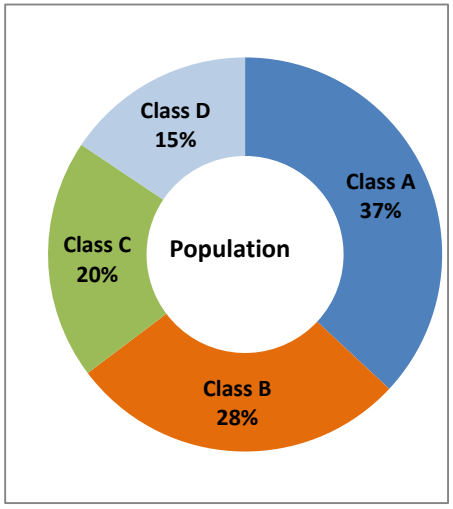
Graph 1.1: Urban population of Gujarat (census 2011)



Around 34% of urban population of Gujarat lives in 159 municipalities. Municipalities in Gujarat are classified as Class A,B,C and D municipalities based on population size as illustrated in table 1.2.

As per PAS 2014-15, total population residing in 147 municipalities of Gujarat is 84.89 lacs. Out of this 31.35 Lakh population lives in 18 Class A cities followed by Class B - 23.58 Lakh, Class C – 16.70 Lakh and Class D-13.24 Lakh.

Graph 1.2: Class wise population share



Gandhidham has maximum population of around 2.98 lakh followed by Mehsana and Nadiad have 2.23 lakh and 2.26 lakh respectively. Vanthali located in Junagadh district has lowest population 14,552 followed by Amod and Bantawa with population of 15,180 and 15,313 respectively.

Vapi a Class A municipality has shown the highest population growth rate of around 12.9% per annum followed by Mehsana 8.43 % growth. Vapi is a industrial city located on the golden corridor whereas Mehsana is known for agricultural and road equipment industries, located in North Gujarat.

Ten cities, VallabhVidyanagar, Vanthali, Billimora, Dabhoi, Khedbrahma, Kutiyana, Amod, Chalala, Damnagar and Rajpipla have shown declining trend of population with a negative growth rate between -0.06% to -1.90%. People from these municipalities are migrating to other major cities for search of better opportunity and education.

The subsequent chapters present analysis across the sectors of water supply, waste water, solid waste management and storm water drainage. The KPIs of all ULBs, class wise of all the four sectors are presented in Annexure-3.

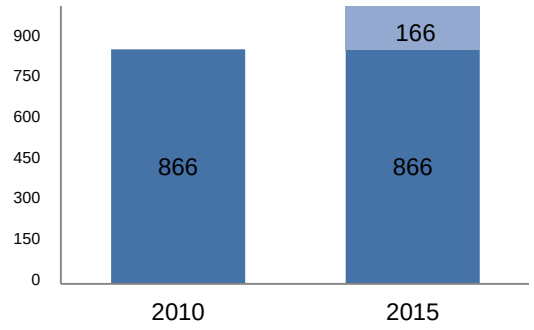
Apart from the Key Performance Indicators (KPIs), additional Local Action Indicators (LAIs) have also been identified and generated through PAS checklist for local government actions to improve performance on selected key reform areas such as equity, non revenue water, water quality and cost recovery. Local action indicators are more suitable for local monitoring and for performance improvement planning. The details of all LAIs have been tabulated sector-wise and attached along with KPIs.

Chapter- 2: Water Supply

2.1State Scenario

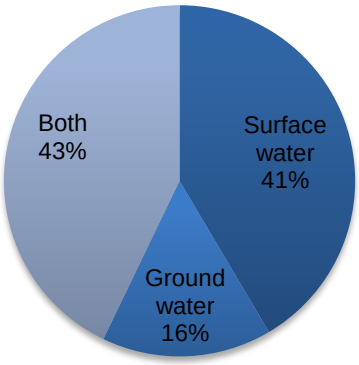
In year 2014-15 the total 1032 MLD of water produced by 147 municipalities, as compared to 866 MLD in year 2010. There is an overall 166 MLD increase of water production over last five years (Graph 1).

Graph 2.1: Increase in Water production (MLD)

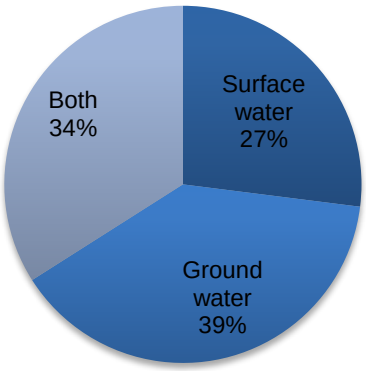


In year 2015, 63% of the total water produced from surface water sources which include water from Narmada canal, irrigation dams, ponds and lakes in form of Bulk raw and bulk treated water that is purchased by the municipalities from GWSSB and GWIL. The major source of water in Gujarat is surface water, accounting for 63% of total water production. The rest of the production is ground water. Looking at the dependency of cities on the source of water supply, it is evident that almost half of the cities are dependent on both sources of water, whereas 41% (61 cities) have sole dependency on surface water sources and only 23 cities dependent on ground water. (Graph 2.2) .

Graph 2.2: Source wise dependence for water supply in 2015

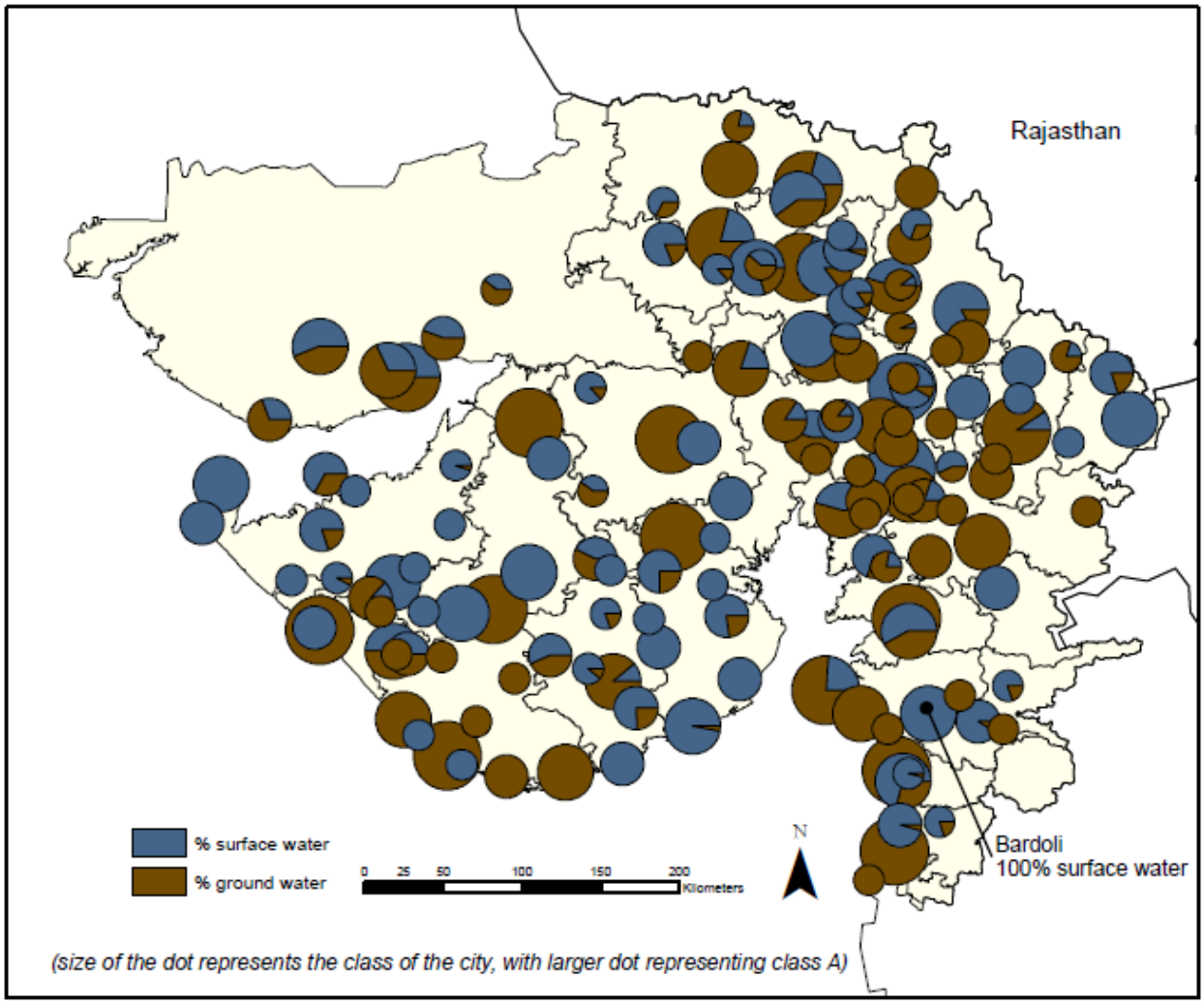


Graph 2.3: Source wise dependence for water supply in 2010



In 2010, there was high dependency on ground water sources, with 39% of cities (57 cities) solely dependent on ground water source. In the last 5 years, this number has been reduced and now more cities are dependent on surface water sources or to a mixed source of water.(Graph 2.3).Cities which shifted their dependence from ground water sources to surface water sources are Bardoli, Gariyadhar, Limbdi, Rajula, Wankaner, Bareja, Chotila, DevagadhBariya, Kalol, Kanjari, Kutiyana, Talaja and Vanthali.

Map 2.1: Source wise dependence for water supply



2.2 Water Treatment

Out of all 147 cities, 37 cities (25%) have their own water treatment plants (WTP) in year 2015. It is observe thatthe larger cities have WTPs. This could be attributed to their financial strength and the staff capacity to manage WTPs.Over the last five years; Patan (A), Godhara (B), Bardoli (B), Dwarka (C), Kapadvanj (C), Songadh (D) ,Dharampur (D), Kalavad (D) and Sikka (D) have constructed new WTPs.Whereas Veraval (A), Mahuva (B), Modasa (B), Upleta (B), Jafrabad (C), Mandavi -Kutch (C) and Talaja (C) have reported dysfunctionality of WTPs .

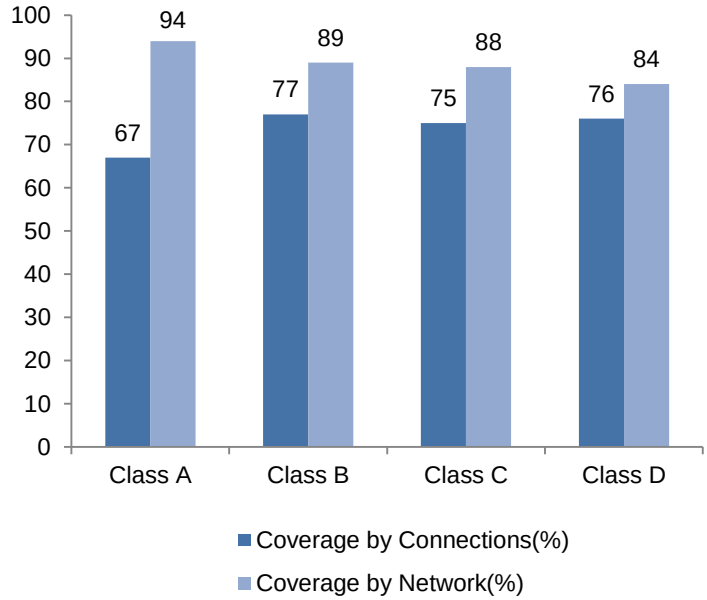
Class of ULB	Total Cities	Cities with WTP		% Of Cities With WTP	
Year		2010	2015	2010	2015
Class A	18	9	10	50	56
Class B	29	12	10	41	34
Class C	42	11	10	26	24
Class D	58	3	7	5	12
Total	147	35	37	24	25

Table 2.1: Cities with Water Treatment Plants

2.3 Access and Coverage

Access and coverage has been analyzed through coverage of individual water supply connections at the household level. It is defined as “total number of households in the service area that are connected to the water supply network with direct service connections, as a percentage of the total number of households in that service area”. Service area implies a specific jurisdiction in which service is required to be provided. The service level benchmark for this indicator is 100%.

Graph 2..4: Coverage of water supply network in 2015

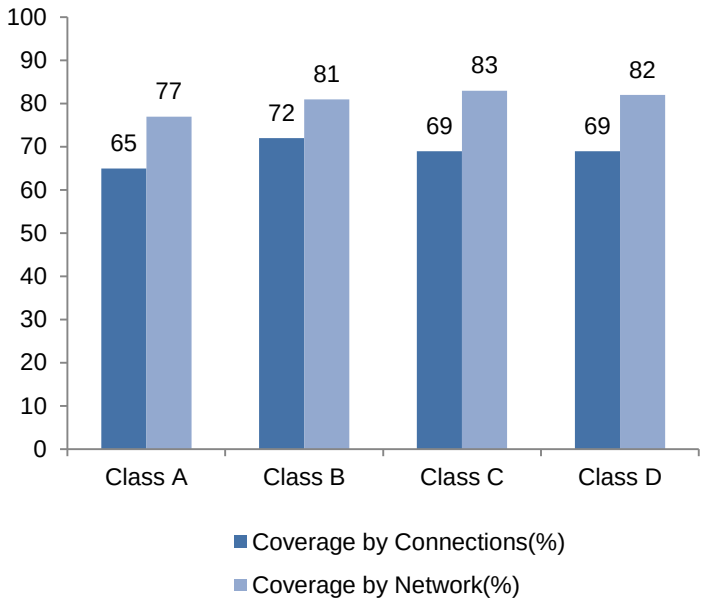


The number of water supply connections have gone up across all classes in 2015, compared to 2010. During the same period, the water supply network coverage has also been increased across all classes.

The possible reasons for low connection coverage against network could be

- Long process of giving connections due to inadequate staff
- Issues with land tenure and hence connections to slum dwellers or with unclear title, building permissions;
- Unwillingness of people to avail municipal connections- situations where they already have bore wells on their premises or townships

Graph 2.5: Coverage of water supply network in 2010

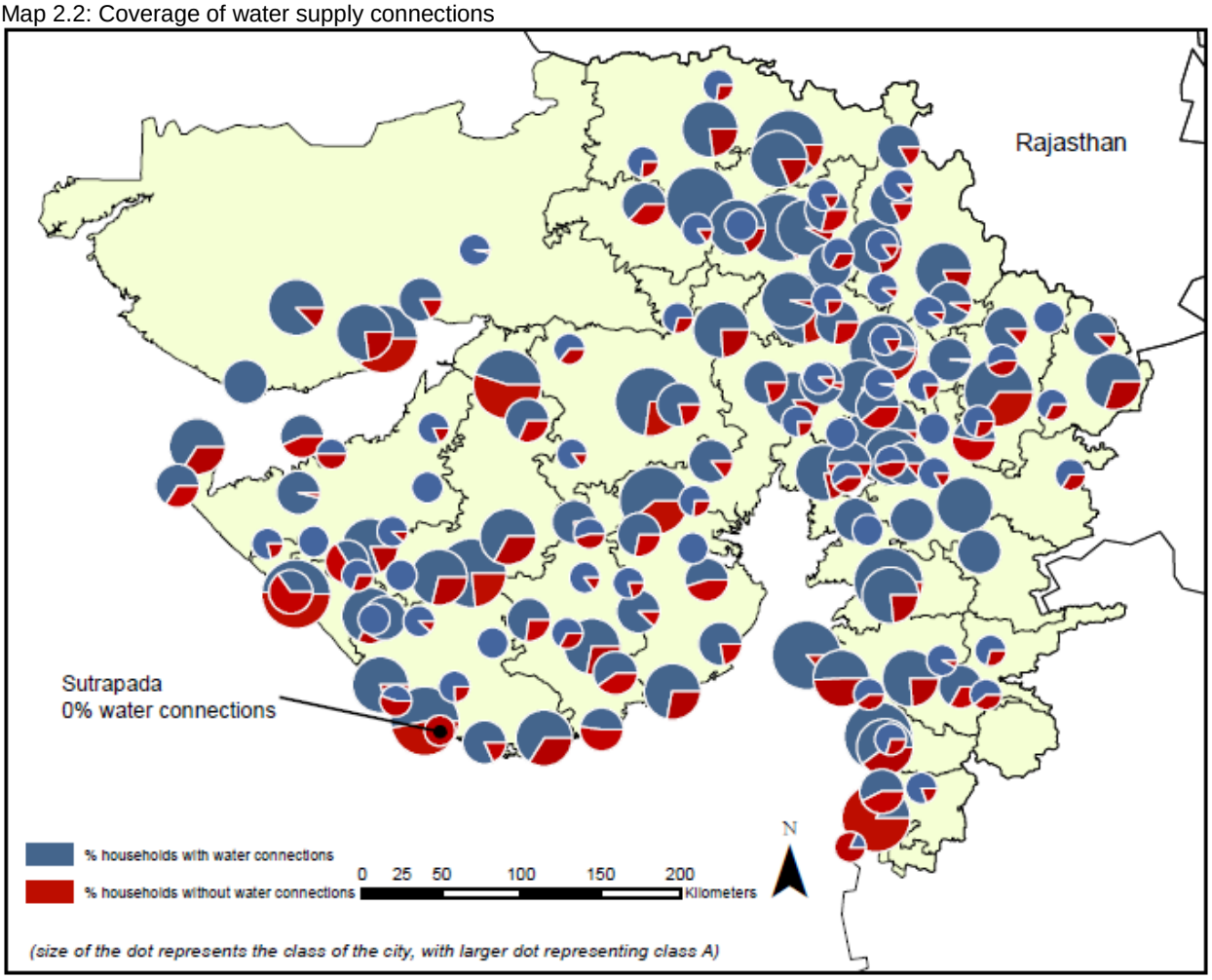


- **Class A cities:**

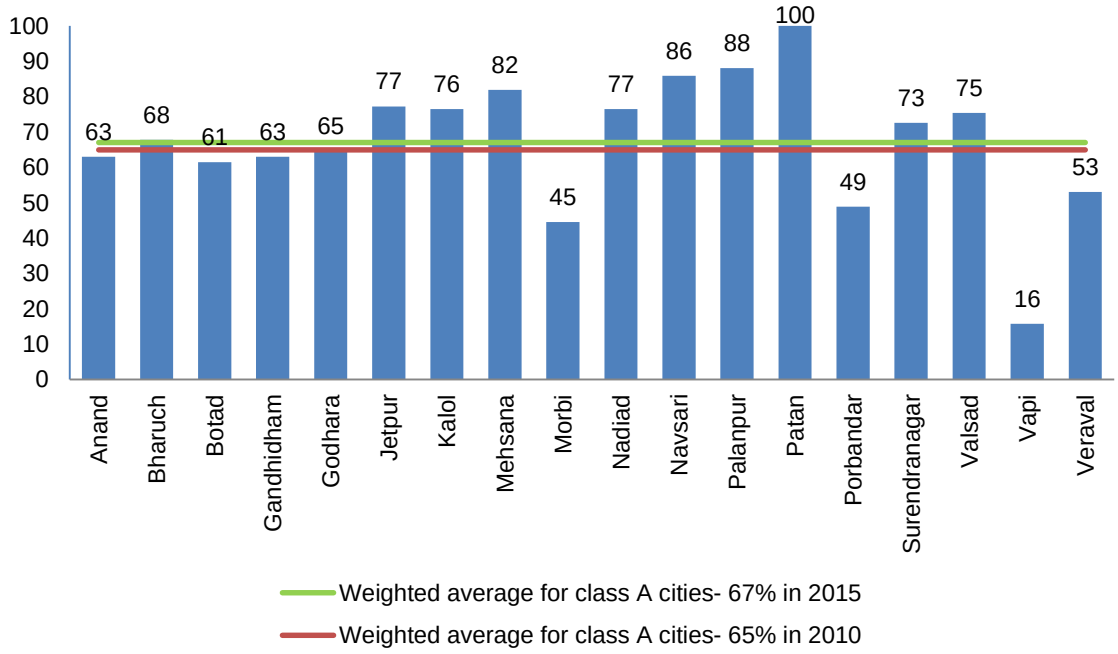
The weighted average of coverage of connections for Class A cities is 67% as compared to 65% in 2010; with the lowest coverage in Vapi (16%) and the highest in Patan (100%). In Vapi, only 4% increase in coverage over last five years,which was just 12% in 2010. This indicates that probably the reason for low connection coverage is the poor water network. There is need for improving its water network and making capital investments along with efforts towards providing more connections. GIDC is another source of water supply in GIDC area of Vapi that also needs to be considered as coverage.

Comparing the water supply network coverage with the connection coverage, it is seen that the cities of Godhra, Veraval and Gandhinagar have very high coverage of water supply network, while they have poor connection coverage. This again indicates the need for identifying the reasons for poor connection coverage and defining strategies for improving the same.

Map 2.2: Coverage of water supply connections



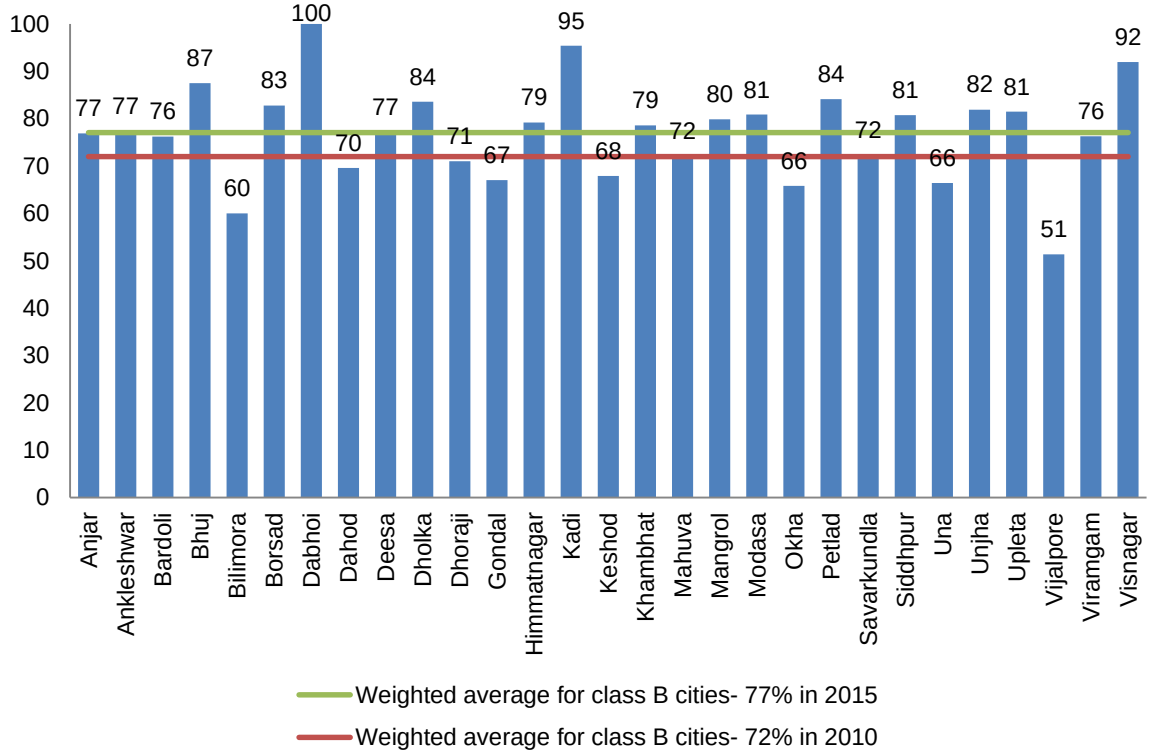
Graph 2.6: Coverage of water supply connections(%) in class A cities



- **Class B cities:**

The weighted average of coverage of water supply connections for Class B cities is 77% in 2015, compared to 72% in 2010. Graph2.7 highlights that there is low coverage in Vijalpore (51%), Bilimora(60%) and Okha (66%) as compared to other B class cities. These Cities also have less than 75% network coverage. Only Dabhoi has 100% coverage of water supply connections.

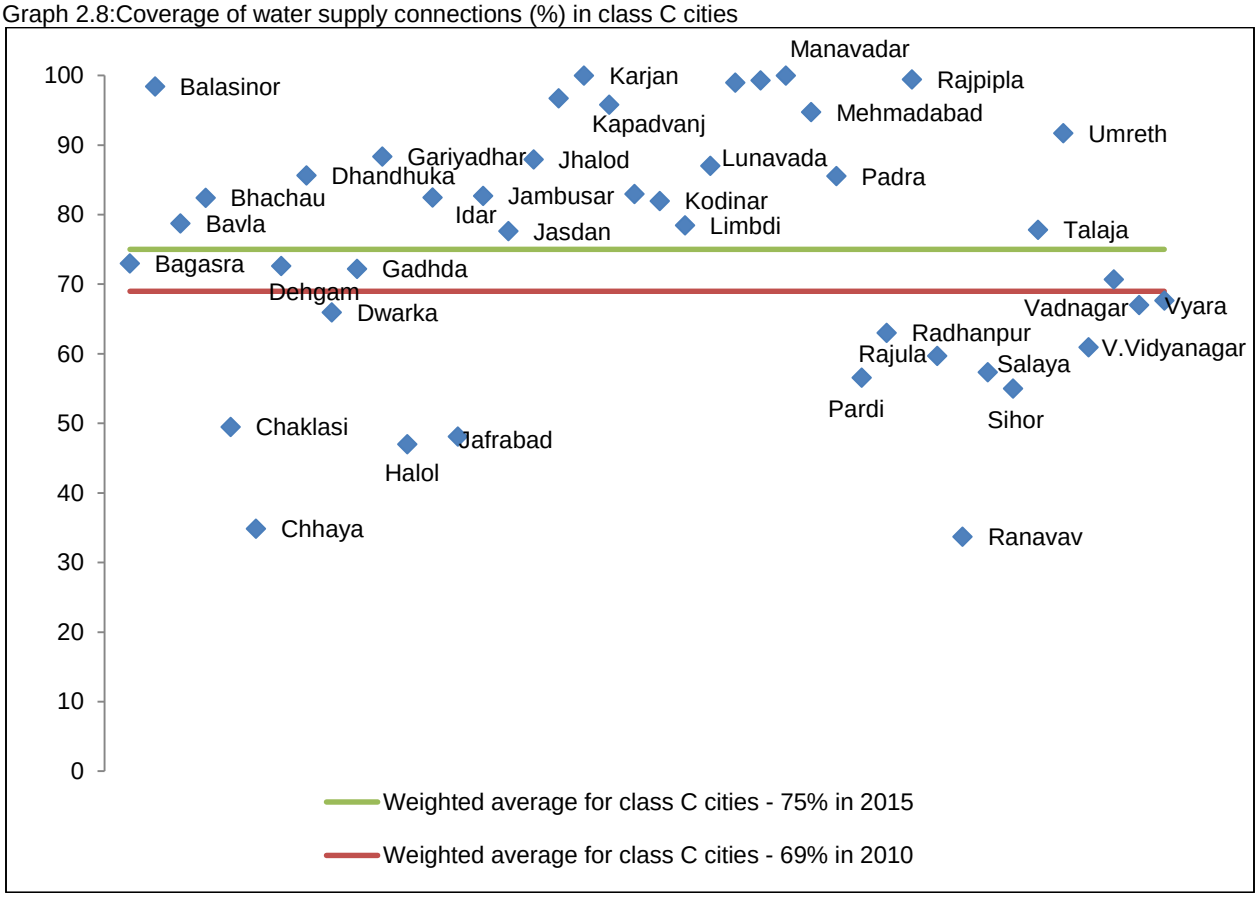
Graph 2.7: Coverage of water supply connections(%) in class B cities



- **Class C cities:**

The weighted average of coverage of water supply connections for Class C cities in 2015 is 75%; compared to 69% in 2010. Chhaya (35%), Halol (47%), Jafrabad (48%) and Ranavav (34%) have less than 50% connection coverage. There is vastneed to provide household connections by cities. Mansa and Karjan have 100% coverage of water supply connections. (Refer Graph 2.8)

Graph 2.8:Coverage of water supply connections (%) in class C cities

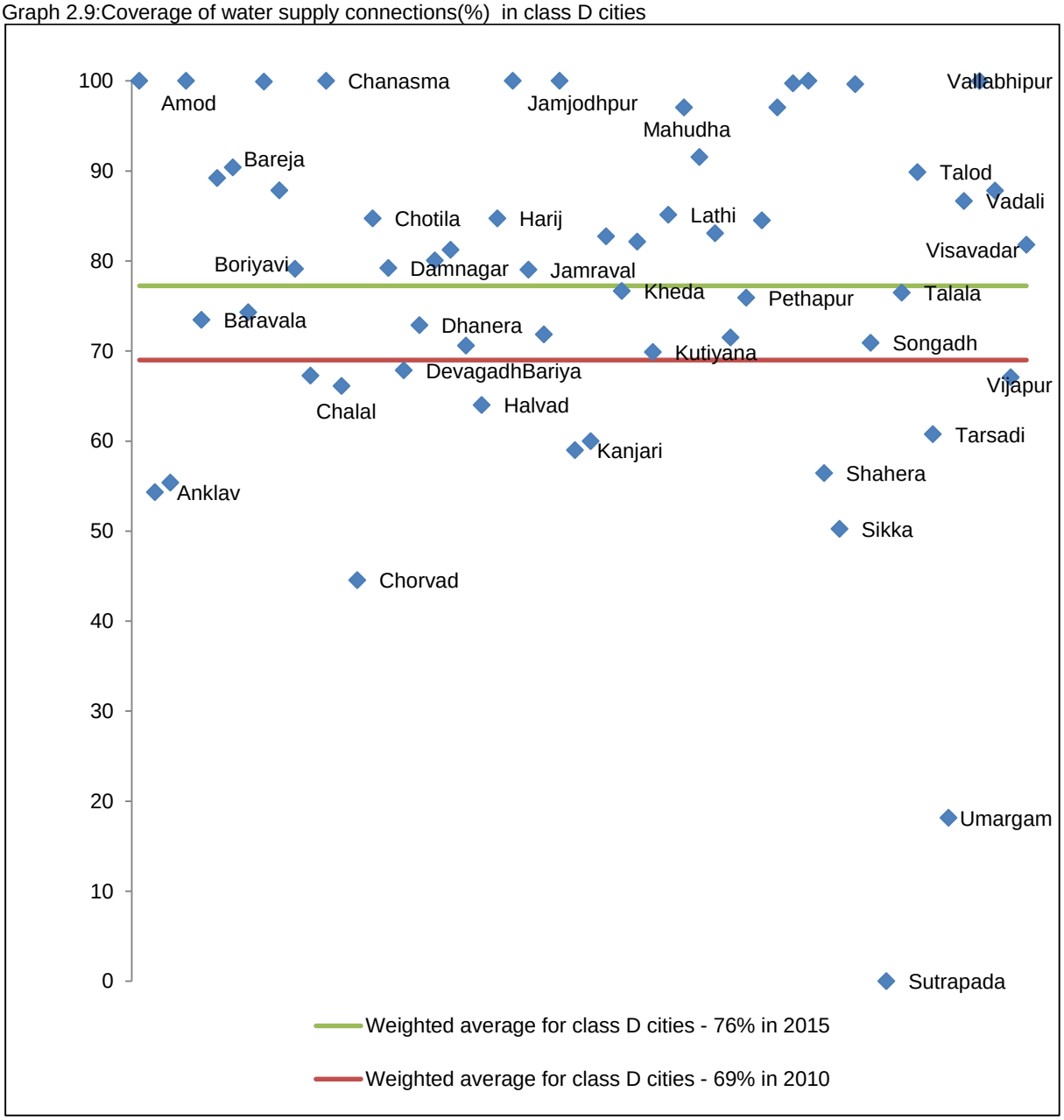


- **Class D cities:**

Weighted average of coverage of water supply connections for Class D cities is 76% in 2015, which was 69% in 2010. However, the distribution is more variable with 9 of the cities having less than 60% coverage and 28 cities enjoying more than 80% coverage.

Sutrapada municipality has not provided any water supply connections at the household level. The entire city is dependent on public stand posts for water supply. Similar to other class cities, there are many cities which have average or below average percentage of water connection but have nearly 100% coverage of network signifying the need for increasing HH connections. Bhanvad (100%), Rapar (97%) and Chanasma (100%) with coverage above97% can be considered exemplary for providing HH level connections for other Class D cities. (Graph 2.9)

Graph 2.9:Coverage of water supply connections(%) in class D cities



2.4 Service levels and quality

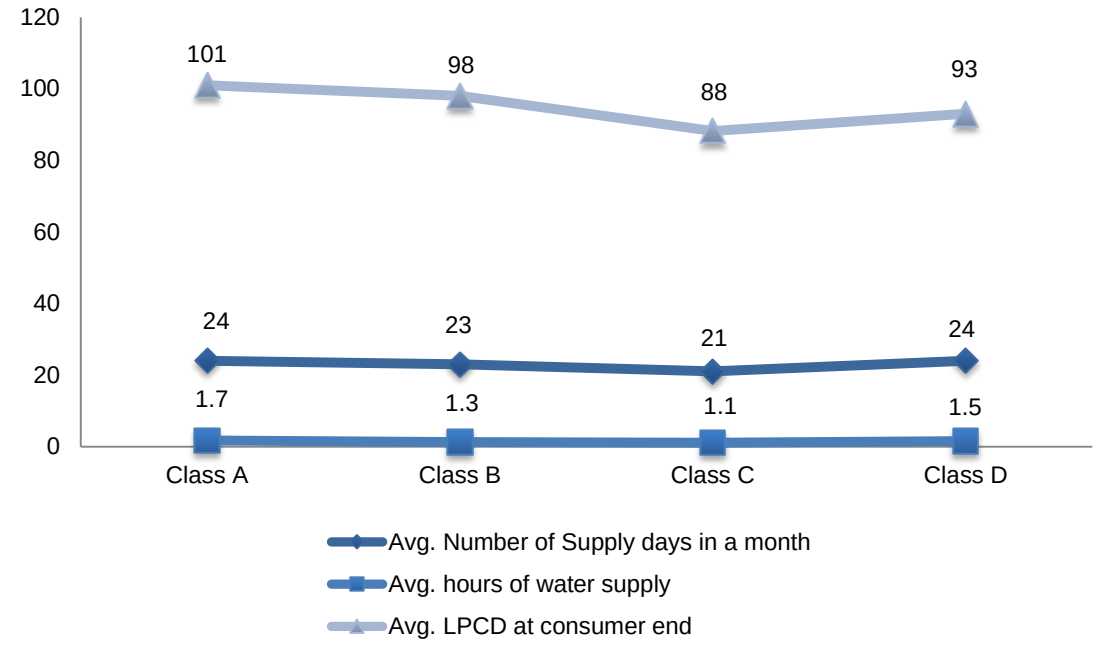
Service levels and quality includes indicators pertaining to per capita supply of water, continuity of the supply and quality of water supplied.

2.4.1. Per capita supply of water at consumer end and continuity

Per capita supply of water at consumer end is defined as “total water supplied to consumers expressed by population served per day”.

Continuity of water supply is defined as the weighted average of number of hours of pressurized water supply per day for a zone.

Graph 2.10: Service level indicators

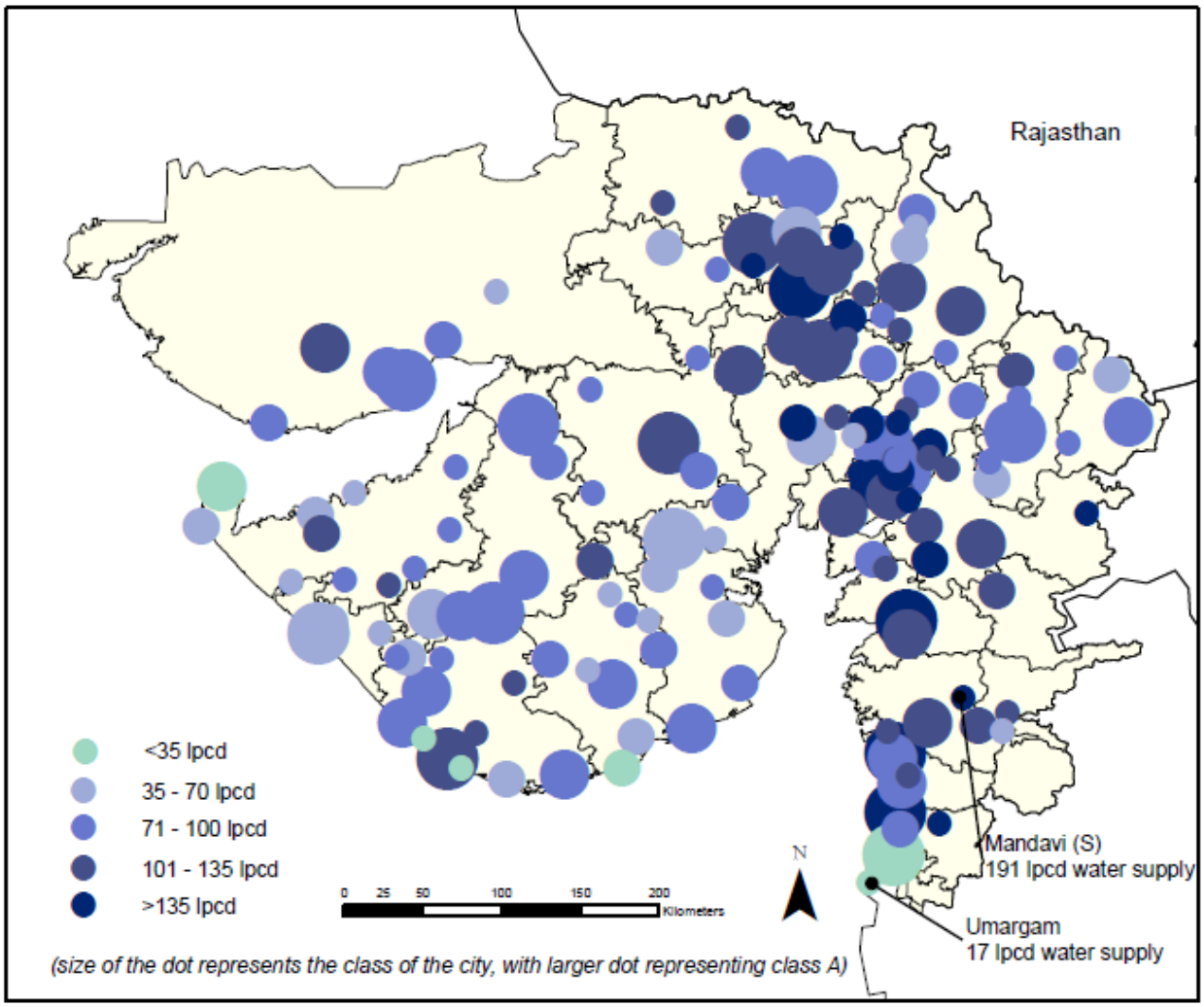


Per capita water supplied indicates the amount of water ULB supplies per person. The SLB benchmark stands at 135 lpcd.

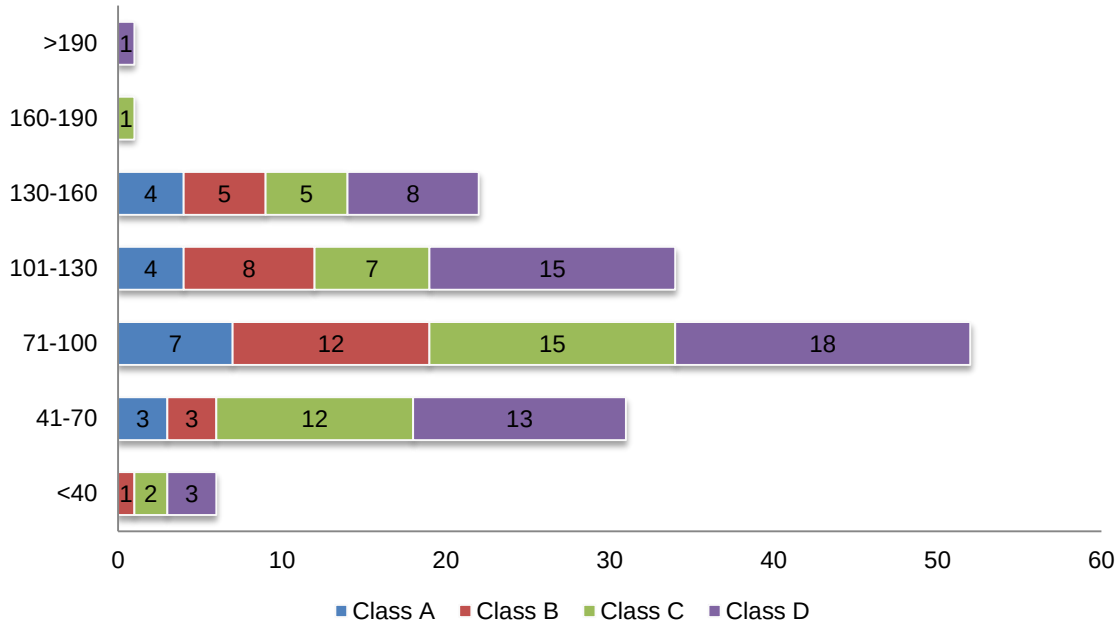
There are no significant variations in continuity and number of water supply days in a month across A, B, C, D classes of cities (Graph 2.10). The weighted average of per capita water supply for class A cities is highest with 101 lpcd which has significantly increased from 79 lpcd in 2010. Similar increment has been recorded for other class cities. However; all the classes have their weighted average below the national SLB of 135 lpcd.

Graph 2.11 illustrates the relative number of municipal corporations and classes across different lpcd ranges. There is a huge variation among cities in the lpcd provided, though it is not dependent on which class of ULB they belong to. It ranges from a minimum 17 lpcd in Umargam to 191 lpcd in Mandavi (Surat district). There are 6 Cities which provide the lowest lpcd in the range 11-40. 31 cities are in the range of 41-70. Only 19 Cities provide more than 135 lpcd.

Map 2.3: Per capita supply of water at consumer end



Graph 2.11: Per capita water supply in Gujarat state



- **Class A cities**

On an average, class A cities supply 101 lpcd over 1.7 hours of water supply and for 24 days in a month. Porbandar provides less than 53 lpcd water for 0.8 hours every alternate day. Gandhidham, Morbi and Veraval provide per capita water nearly as much or more than the benchmark but with less continuity (0.8-2hours) and frequency of water supply. Bharuch has the highest continuity of water supply (4 hours) most frequently, followed by Navasari (3.5 hours), Ananad and Nadiad (3 hours). The no. of days of water supply in a month is least in Botad among class A cities, which supplies water for only 8 days in a month.

Class A Cities	Per Capita Water Supply (lpcd)	Hours of Supply (Hr)	No. of days of supply in a month
Anand	81	3	30
Bharuch	151	4	30
Botad	63	0.5	8
Gandhidham	88	0.7	10
Godhara	90	2	30
Jetpur	94	0.2	12
Kalol	112	2	30
Mehsana	138	2	30
Morbi	93	0.8	30
Nadiad	96	3	30

Navsari	141	3.5	30
Palanpur	87	1	30
Patan	127	1	30
Porbandar	53	0.4	15
Surendranagar	103	0.5	15
Valsad	138	2.5	30
Vapi	50	2	30
Veraval	123	0.8	15

Table 2.2: Service levels for class A cities

- **Class B cities**

The average per capita supply of water for Class B cities is 98 lpcd. Kadi, Dabhoi, Petlad and ViramgamCities have values close to the SLB of 135 lpcd. Okha supply less than 40 lpcd water for less than an hour daily.
Bardoli, Khambhat and Petlad supply water for 4 hours a day.

Class B Cities	Per Capita Water Supply (lpcd)	Hours of Supply (Hr)	No. Of days of supply in a month
Anjar	85	0.37	15
Ankleshwar	128	2.50	30
Bardoli	111	4.00	30
Bhuj	135	0.50	15
Bilimora	92	1.50	30
Borsad	111	3.00	30
Dabhoi	131	1.50	30
Dahod	87	0.75	15
Deesa	97	2.00	30
Dholka	66	1.25	30
Dhoraji	82	0.77	10
Gondal	71	0.33	10
Himmatnagar	109	1.50	30
Kadi	135	1.00	30
Keshod	87	0.67	10
Khambhat	125	4.00	30
Mahuva	74	1.00	10

Mangrol	78	0.33	10
Modasa	124	1.00	30
Okha	38	0.30	12
Petlad	140	4.00	30
Savarkundla	97	0.50	15
Siddhpur	50	0.75	30
Una	76	0.75	15
Unjha	112	1.00	30
Upleta	62	0.42	10
Vijalpore	87	2.00	30
Viramgam	134	1.00	30
Visnagar	114	0.65	26

Table 2.3: Service levels for class B cities

- **Class C cities**

Average lpcd for Class C cities is 88. Water is supplied for 1.1 hours daily and 21 days in month (Refer Table). ranavav and Jafrabad supply less than 40 lpcd. Bavla, Karjan, Mansa, Mehmadabad, Umreth and VallabhVidyanagar supply more than 135 lpcd water. Chaklasi, Pardi and VallabhVidyanagar supply water for more than 3.5 hours.

Class C Cities	Per Capita Water Supply (lpcd)	Hours of Supply (Hr)	No. Of days of supply in a month
Bagasra	84	1.0	15
Balasinor	90	2.0	30
Bavla	145	1.5	30
Bhachau	82	0.8	15
Chaklasi	97	4.0	30
Chhaya	56	0.5	30
Dehgam	96	1.5	30
Dhandhuka	76	0.3	10
Dwarka	47	0.3	15
Gadhda	66	1.0	15
Gariyadhar	82	0.2	10
Halol	61	1.0	30
Idar	69	0.5	15
Jafrabad	22	0.4	7
Jambusar	100	1.0	29
Jasdan	104	0.4	15

Jhalod	67	0.4	15
Kapadvanj	84	0.4	15
Karjan	148	2.0	30
Khambhaliya	102	0.5	15
Khed Brahma	96	0.5	30
Kodinar	55	0.2	15
Limbdi	76	0.8	10
Lunavada	104	0.8	15
Manavadar	66	0.2	10
Mandavi	93	0.5	15
Mansa	139	1.3	30
Mehmadabad	140	2.5	30
Padra	129	2.0	30
Pardi	79	4.0	30
Radhanpur	61	1.0	15
Rajpipla	113	1.5	30
Rajula	61	1.5	15
Ranavav	40	0.5	15
Salaya	63	1.0	30
Sihor	69	0.2	7
Talaja	84	0.8	30
Umreth	168	2.0	30
V.Vidyanagar	144	3.5	30
Vadnagar	102	1.0	30
Vyara	125	2.0	30
Wankaner	97	0.2	15

Table 2.4: Service levels for class C cities

- **Class D cities**

The average water supply for Class D cities is 93 lpcd. These Cities provide water for 1.5 hours on an average and for 24 days in a month. Chorvad, Sutrapada and Umargam supply less than 40 lpcd of water. Sojitra supplies 155 lpcd of water with 9 hours of supply for all 30 days. Amod, Anklav, Boriyavi, Dharampur, Gandevi and Mandavi also supply water for more than 4 hours everyday.

Class D Cities	Per Capita Water Supply (lpcd)	Hours of Supply (Hr)	No. Of days of supply in a month
Amod	106	3.0	30
Anklav	138	3.0	30
Babra	70	0.4	15
Bantawa	79	0.3	15

Baravala	62	2.0	15
Bareja	122	2.0	30
Bayad	80	1.0	30
Bhabhar	107	1.0	30
Bhanvad	77	0.2	10
Bhayvadar	72	0.2	15
Boriyavi	84	4.0	30
Chalal	66	1.1	30
Chanasma	151	1.0	30
ChhotaUdaipur	152	1.5	30
Chorvad	31	0.5	15
Chotila	76	0.5	30
Damnagar	67	0.2	15
DevagadhBariya	78	0.8	30
Dhanera	113	1.5	30
Dharampur	144	4.0	30
Dhrol	100	0.4	15
Gandevi	109	4.0	30
Halvad	82	1.0	30
Harij	85	1.0	30
Jamjodhpur	111	0.4	15
Jamraval	69	0.4	15
Kaalol	75	2.0	30
Kalavad	86	0.2	7
Kanjari	107	2.0	30
Kansad	112	3.0	30
Kathlal	109	2.0	30
Kheda	46	2.0	30
Kheralu	143	0.5	15
Kutiyana	64	0.3	10
Lathi	92	0.4	15
Mahudha	140	2.5	30
Mandavi_S	191	6.0	30
Oad	126	2.5	30
Patdi	89	3.0	30
Pethapur	107	1.5	30
Prantij	80	1.5	30
Rapar	62	0.5	15

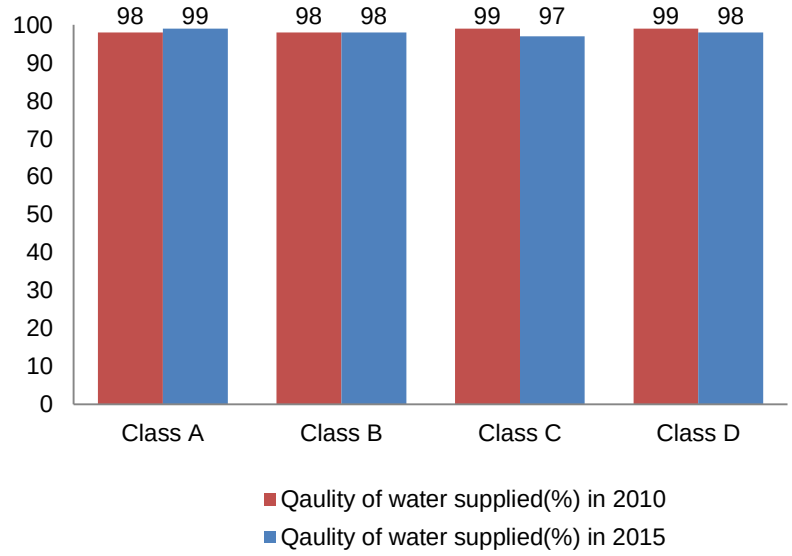
Santrampur	89	1.2	30
Savri	115	1.0	30
Shahera	79	1.0	30
Sikka	68	0.7	7
Sojitra	155	9.0	30
Songadh	131	1.3	30
Sutrapada	24	2.0	30
Talala	102	1.0	30
Talod	131	1.5	30
Tarsadi	52	2.0	30
Umargam	17	1.0	30
Vadali	45	0.3	10
Vallabhipur	78	0.5	15
Vanthali	92	1.0	15
Vijapur	111	2.0	15
Visavadar	115	0.4	15

Table 2.5: Service levels for class D cities

2.4.2 Water quality

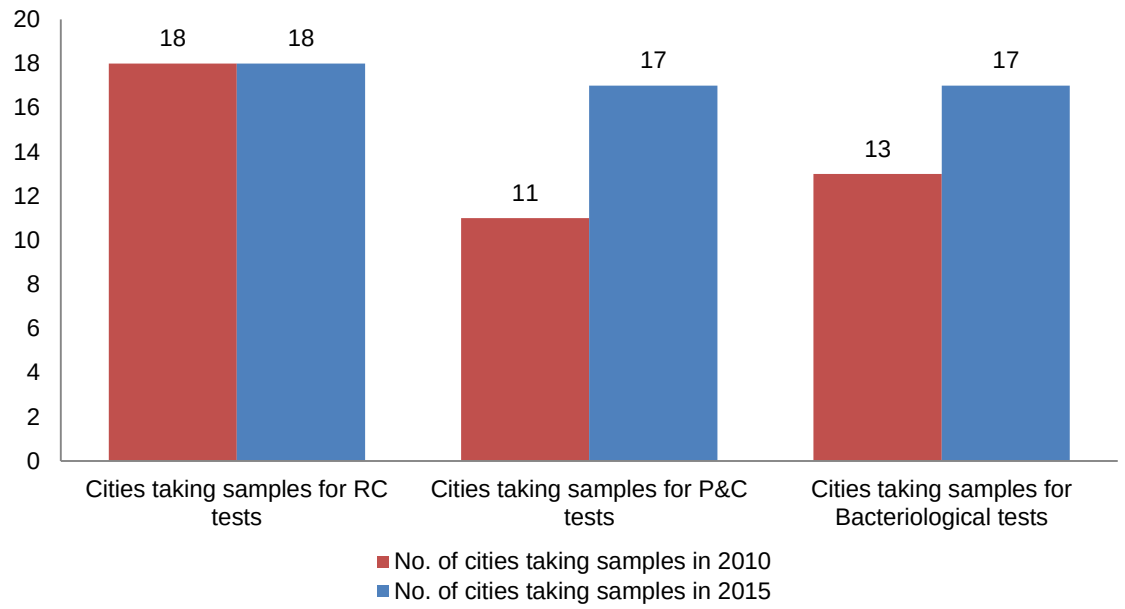
Quality of water supplied is defined as percentage of water samples that meet or exceed the specified potable water standards and sampling regime, as defined by CPHEEO.
As shown in graph 2.12; across different classes of Cities, the quality of water supplied is reported to be good and is close to SLB value of 100%.

Graph 2.12: Quality of water supply



- **Class A cities**

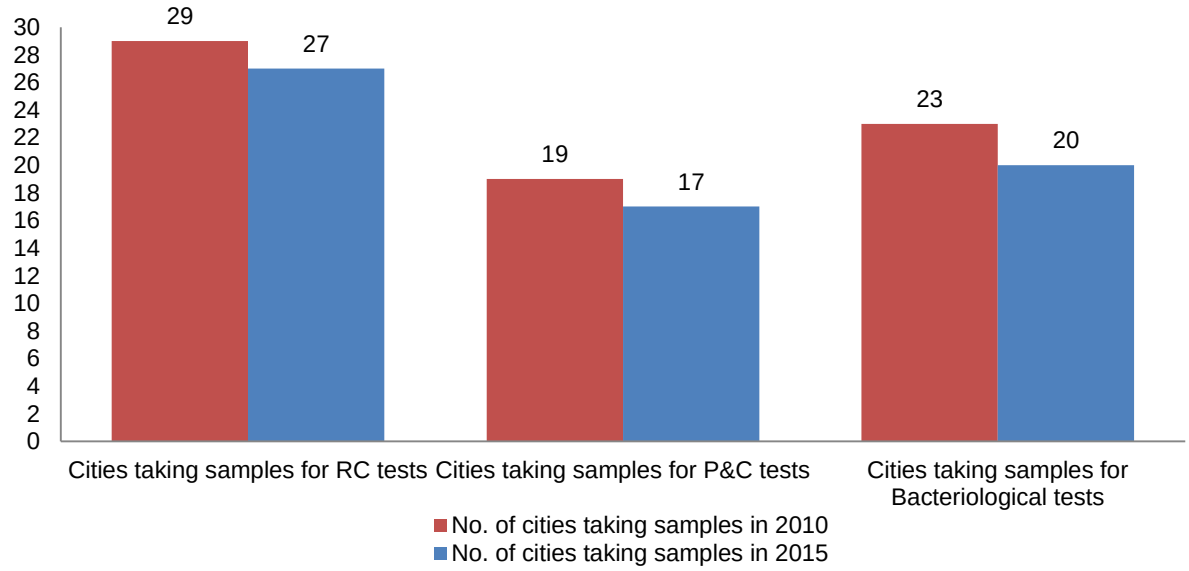
Graph 2.13: Water quality tests conducted by class A cities



18 class A cities have been considered for this analysis. As shown in graph 2.13; all cities have been taking samples for RC tests. Only Veraval is not taking any samples for physical and chemical tests, while Anand is not taking samples for bacteriological tests. However; it is quite evident that more cities are taking all three kinds of tests in 2015 compared to 2010.

- **Class B cities**

Graph 2.14: Water quality tests conducted by class B cities

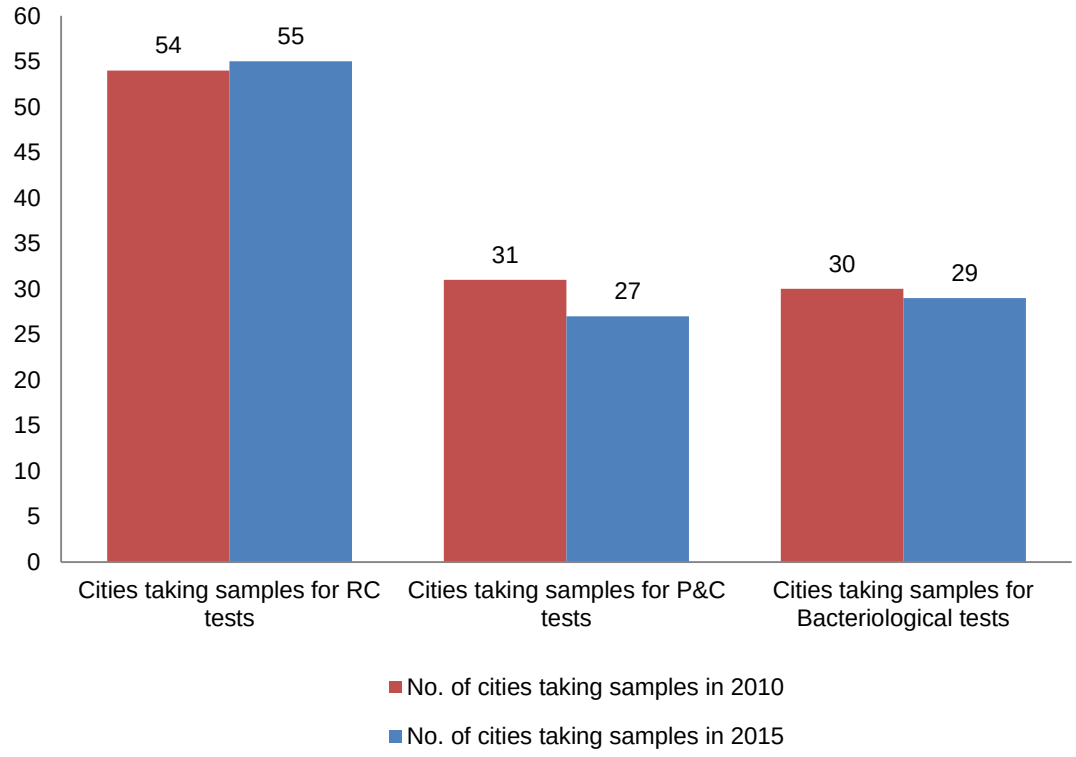


29 class B cities have been considered for this analysis. As shown in graph 2.14; all cities were taking samples for RC tests in 2010 but Anjar and Upleta did not provide any data for the same in 2015. Similarly; no. of cities taking other two types of tests has also gone down in 2015 compared to 2010.

- **Class C cities**

42 class C cities have been considered for this analysis. As shown in graph 2.15; only Ranavav did not provide any data on samples taken for RC tests in 2015 and Rajpipla did not take any samples. No. of cities taking other two types of tests has also gone up in 2015 compared to 2010. However; these numbers are far from 100% which is an ideal scenario.

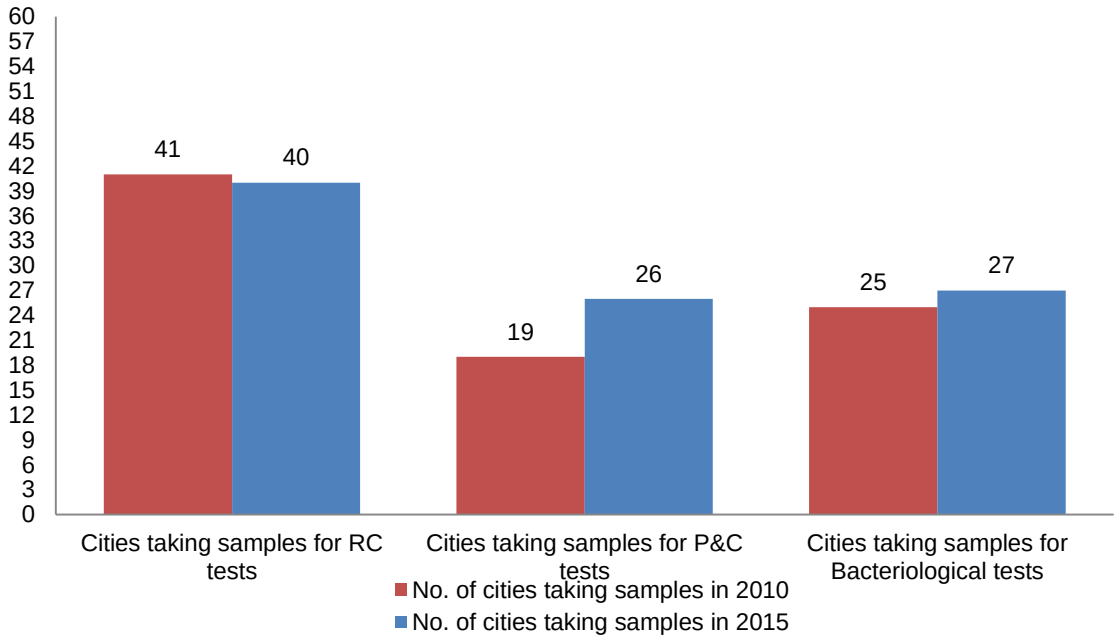
Graph 2.15: Water quality tests conducted by class C cities



- **Class D cities**

48 class D cities have been considered for this analysis. As shown in graph 2.16; only Boriyavi, Damnagar and Vanthali did not provide any data on samples taken for RC tests in 2015. No. of cities taking other two types of tests has gone down in 2015 compared to 2010. It is important to notice that less than 50% of cities are taking samples for P&C and bacteriological tests.

Graph 2.16: Water quality tests conducted by class D cities



2.5 Financial management:

Financial sustainability of water supply system is measured based on the extent of cost recovery through local charges and taxes. It helps to understand the deficit or surplus of financial resources that the ULB has for operating and managing its water supply system. The extent of cost recovery (Operation & Maintenance) is defined as the total operating revenues expressed as a percentage of the total operating expenses incurred in the corresponding time period. Only income and expenditure of the revenue account must be considered, and income and expenditure from the capital account should be excluded. Even at the national level, one of the mandatory reforms to be undertaken by ULB under the JnNURM program prescribes “the levy of reasonable user charges by Cities and parastatalswith the objective that the full cost of Operation and Maintenance (O&M) or recurring cost is collected within the next seven years.” It is suggested that the same can be achieved through:

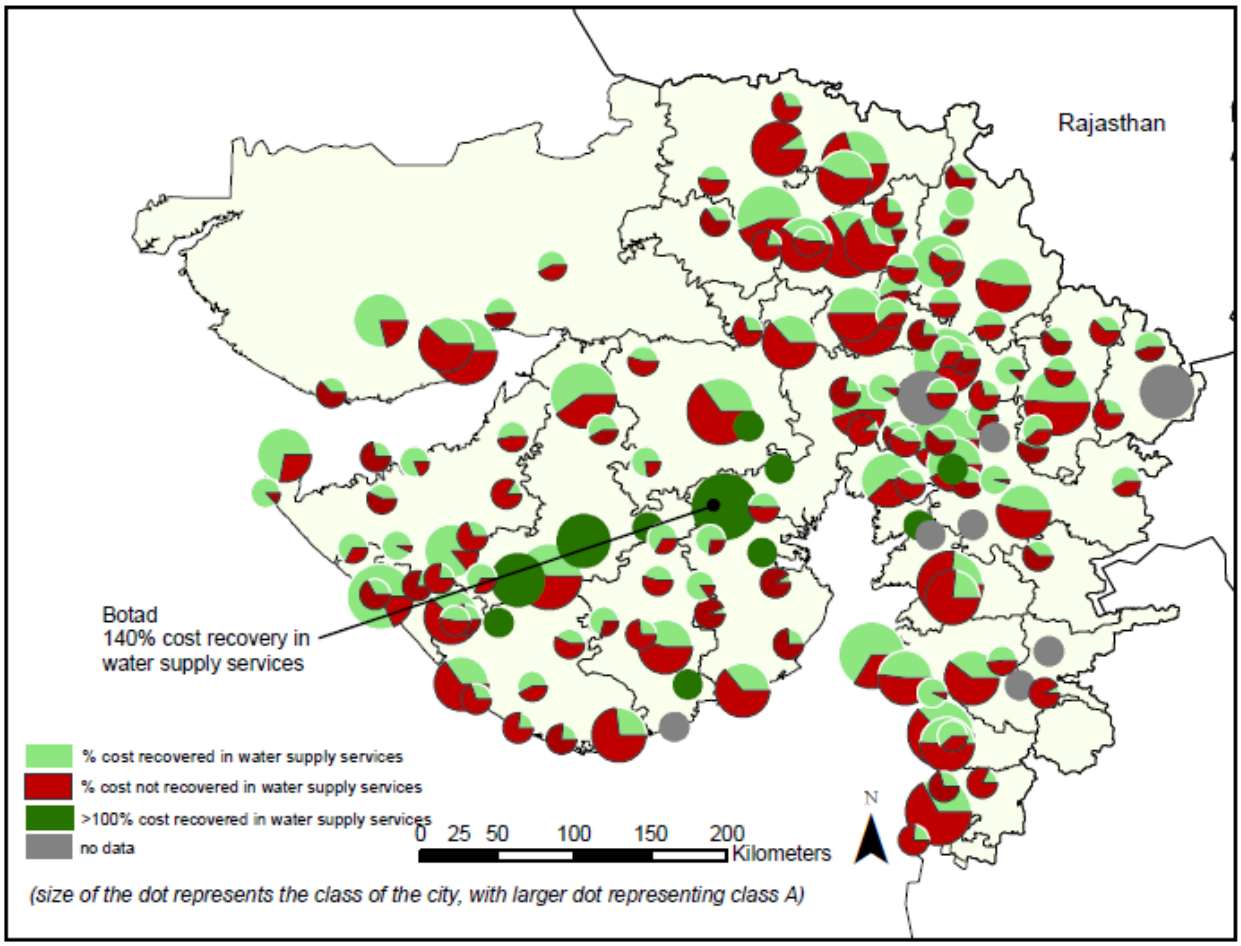
- Increase in coverage (base) of users
- Reduction in losses (commercial and physical losses)
- Improvement in method of measurement of service
- Improvement in billing and collection efficiency
- Rationalizing user charges

2.5.1 State scenario

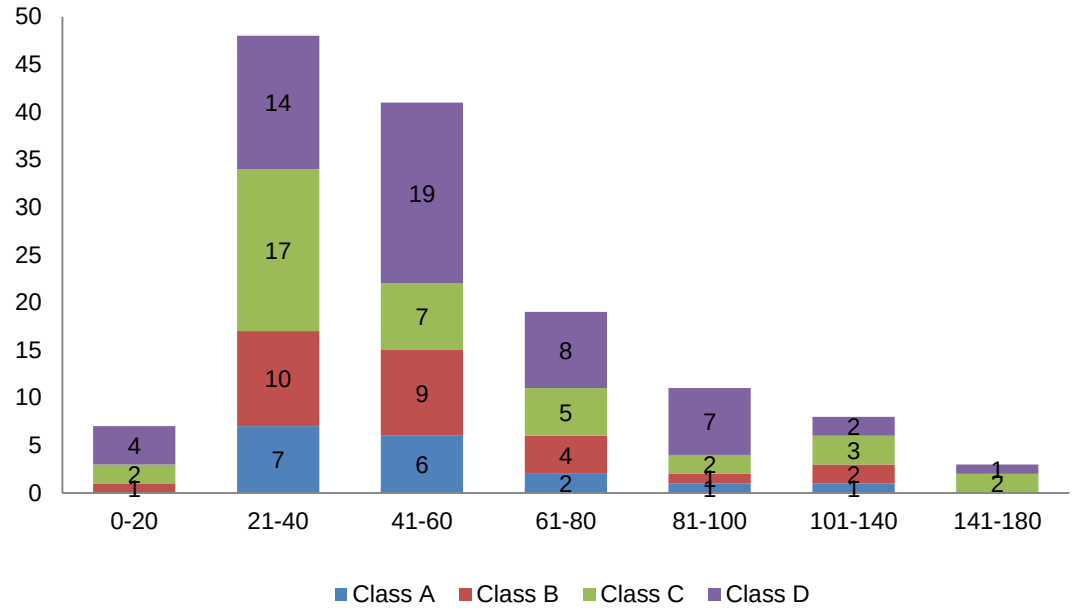
At the state level, under the Gujarat Municipal Accounting Reforms Project (GMARP), all municipalities have computerized accounting systems with accrual-based double entry system. This has facilitated ease of obtaining financial data from the cities in Tally Software. All cities levy a fixed yearly tariff, with most of these charging Rs 600 annually as user charge. Dahegam

is charging Rs 1200 annually as water user charges. Sutrapada charge Rs 20 every year as user charges, which is very low.

Map 2.4: Extent of cost recovery in water supply services



Graph 2.17: Cost recovery (O&M)-Ranges of % of cost recovery



Out of the 147 cities, 137 have been considered for this analysis; data for 10 Cities are not available. 7 cities (Deesa (10%), Gariyadhar (7%), Sihor (9%), Dharampur (18%), Kalavad (16%), Kheda (11%), Tarsadi (8%)) cannot recover more than 20% of the costs and this affects the sustainability of the service as well as means that water supply is being subsidized by other services. 48 cities fall under the range between 21-40% of cost recovery, only 11 cities (Botad (140%), Dhoraji (135%), Gondal (109%),dhandhuka (173%), Jambusar (156%), Jasdan (107%), Limbdi (101%), Rajpipla (112%), Anklav (180%), Vallabhipur (120%), Vanthali (119%)) have more revenue income than expenditure.

Class of cities	Average % of Cost Recovery
Class A	53
Class B	55
Class C	54
Class D	53

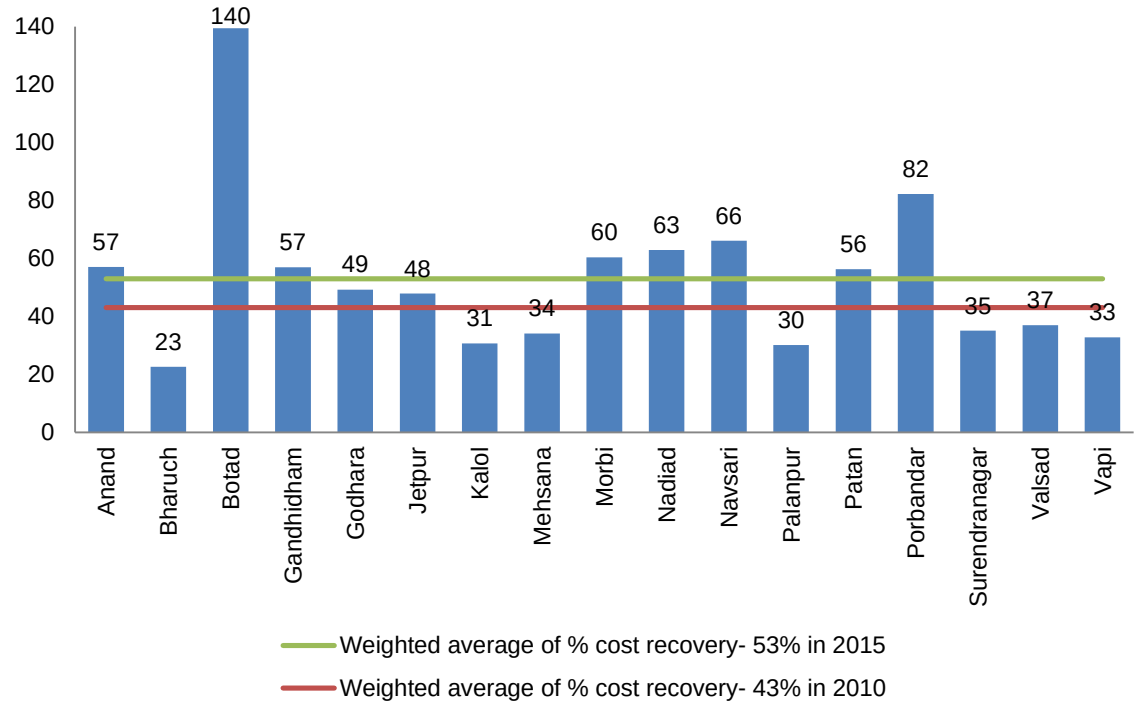
Table 2.6: % cost recovery for all classes

The cost recovery in all cities across classes are low except for a few cities which report greater than 100%.These exceptionally high values skew the mean. Low cost recovery ratios also signify that the cities give low priority to operation and maintenance of existing networks. O&M budgets would be the first to be affected, with consequent deterioration of pipes, machinery, and service. To be sustainable, an operation must be financially viable.

- **Class A cities**

The weighted average of cost recovery for Class A cities is 53% in 2015 as compared to only 43% in 2010. The distribution of data for cost recovery is slightly varied with the average difference from the mean being 18%. Botad is the only city with over 100% cost recovery. The cost recovery for water services in Bharuch has decreased due to bulk water purchase cost and electricity cost increased in 2015. The indicator value is only 23%.

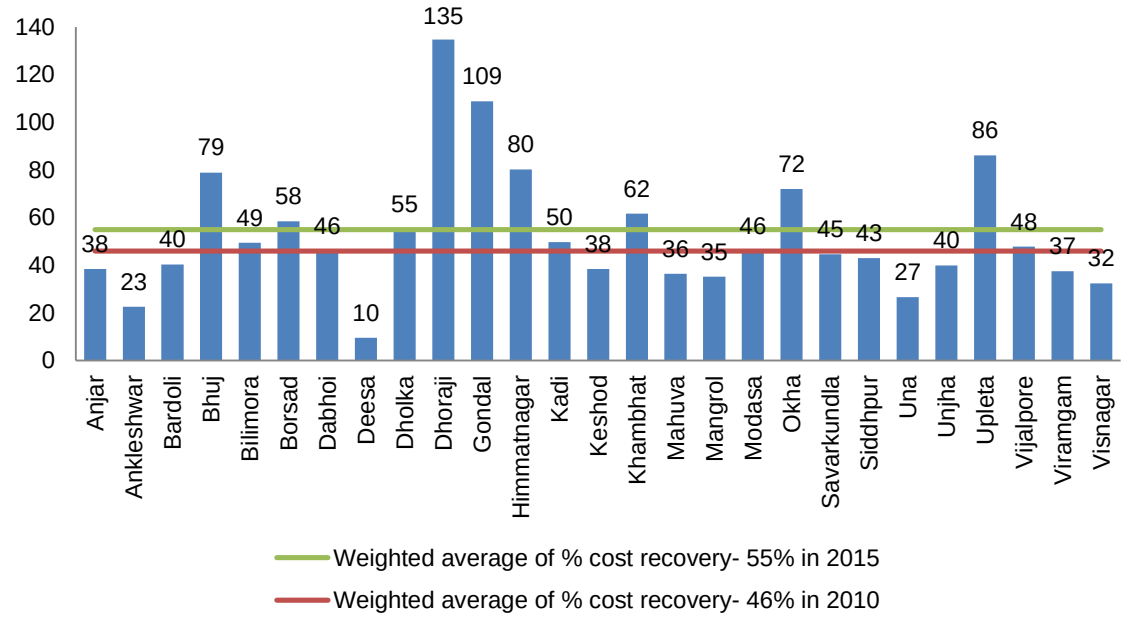
Graph 2.18: % Cost recovery (O&M)- Class A cities



- **Class B cities**

The weighted average for cost recovery for Class B cities is 55% in 2015, which was 46% in 2010. Gondal and Dhoraji are doing exceptionally well with more than 100% cost recovery. But when we look at the efficiency of collection of water supply related charges, it is only 30% for Dhoraji and 47% for Gondal. This indicates that these Cities might not be incurring enough money for O&M of their existing systems which could have negative impacts in long run.
Deesa has below 10% cost recovery in water supply related services, which indicates the need to increase their collection efficiency and thoughtful use of the resources. The low cost recovery of Deesa is due to very high expenditure in O&M of water supply services.

Graph 2.19: % Cost recovery (O&M)- Class B cities

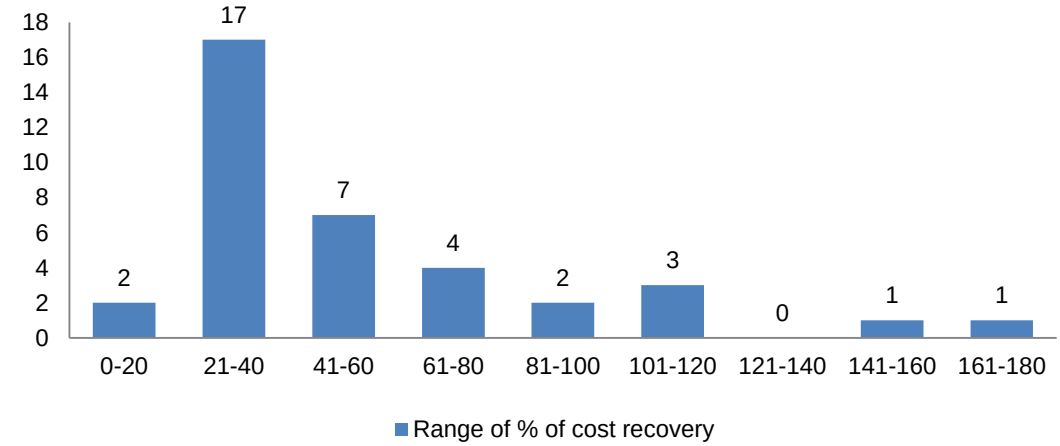


- **Class C cities**

Only 37 cities out of 42 have been considered for this analysis because 5 cities could not provide any data. The weighted average of cost recovery for class C cities increased from 38% in 2010 to 54% in 2015. Gariyadhar (7%) and Sihor (9%) are worst performing and falls under 0-20% range. Refer Graph 2.20. In Sihor, tariff charges are only Rs. 150 per annum which is very low and new connection charges are also very low at only Rs. 150 which is the cause of low revenue generation.Gariyadhar has major expenditure on salaries, electricity and maintenance compared to low revenue income.

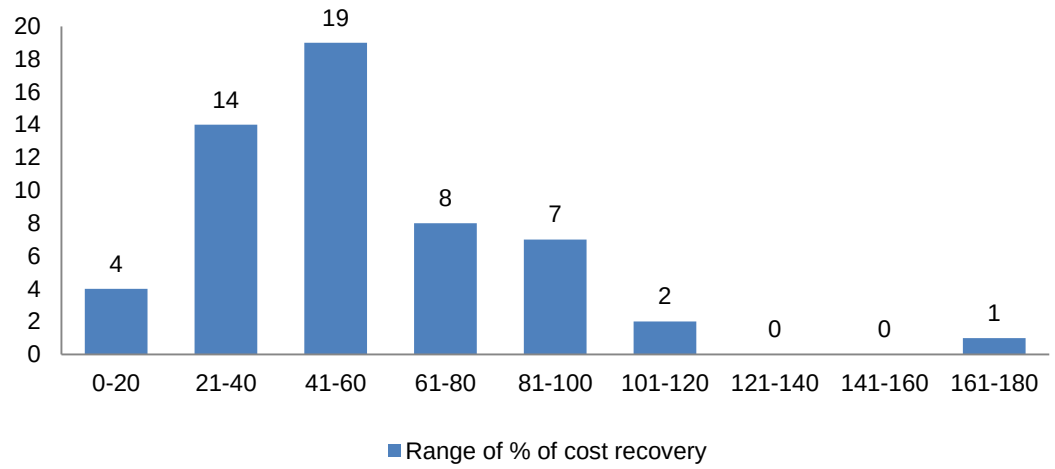
Only Dhandhuka (173%), Jambusar (156%), Jasdan (107%), Limbdi (101%) and Rajpipla (1112%) have more than 100% cost recovery in water supply services.

Graph 2.20: % Cost recovery (O&M) - Class C cities



- **Class D cities**

Graph 2.21: Cost recovery (O&M) - Class C cities



In terms of cost recovery, Class D weighted average has been calculated from available data of 55 cities. The indicator value is 53%. 3citiesAnklav 9180%), Vanthali (119%) and Vallabhipur (120%) have reported more than 100% of cost recovery. 4 cities (Dharampur (18%), Kalavad (16%), Kheda (11%) and Tarsadi (8%)) have less than 20% of cost recovery while the majority of the class D cities have their cost recovery in the range of 20-60%.

2.6 Efficiency in service operation

2.6.1 Extent of Non Revenue Water (NRW)

Non Revenue Water is an important indicator for assessing the efficiency in service operation of water supply system. This indicator highlights the extent of water produced which does not earn the utility any revenue. This is computed as the difference between the total water produced (ex-treatment plant) and the total water sold expressed as a percentage of the total water produced. NRW also refers to water that has been produced but is "lost" before it reaches the customer. It refers to the amount of water produced that does not earn any revenues for the ULB. This "lost" water could be due to real losses (through leakages, also referred to as physical losses) or apparent losses (theft, illegal connections, free water etc.). High levels of NRW seriously affect the financial viability of water supply provision due to lost revenues, increased operational costs impacting the quality of the service provided.

2.6.2 NRW reduction strategies

Reduction of NRW needs a comprehensive strategy and includes, but is not limited to:

- Undertaking a rapid water audit to prepare a water balance to understand the real magnitude of the problem, and to estimate how much water is being lost, where and why
- Designing a strategy that includes a combination of technical and financial measures along with governance reforms
- Controlling apparent losses by interventions such as updating customer databases, improving billing and collection procedures

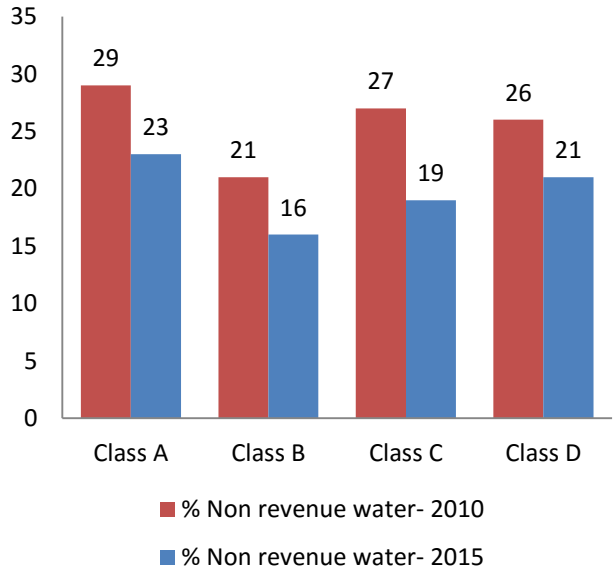
- Technical interventions for controlling real losses such as pipelines and assets management, selection, operation and maintenance; pressure management; leakage control
- Initiating metering at all water utilities (water treatment plant, water distribution stations) as well as at consumer end

System Input Volume	Authorized Consumption	Billed Consumption (Metered and Non-metered)	Non- metered Consumption
			Metered Consumption
		Unbilled Consumption	Free to departments and consumers
			Fire Hydrants
	Water Losses	Apparent or Commercial Losses	Theft by Consumers
			Theft by Water Sellers
			Inaccurate Meters
			Data Handling Errors
		Real, Physical or Technical Losses	Leakages from Transmission or Distribution Mains
			Leakages and overflows from storage tanks
			Leakages on service points to customer meter

Table 2.7: Water balance (as per the International Water Association)

The average NRW across all class size of cities ranges between 16-25% indicating marginal differences across classes in 2015. NRW has decreased over all classes compared to 2010.
(refer Graph 2.22).

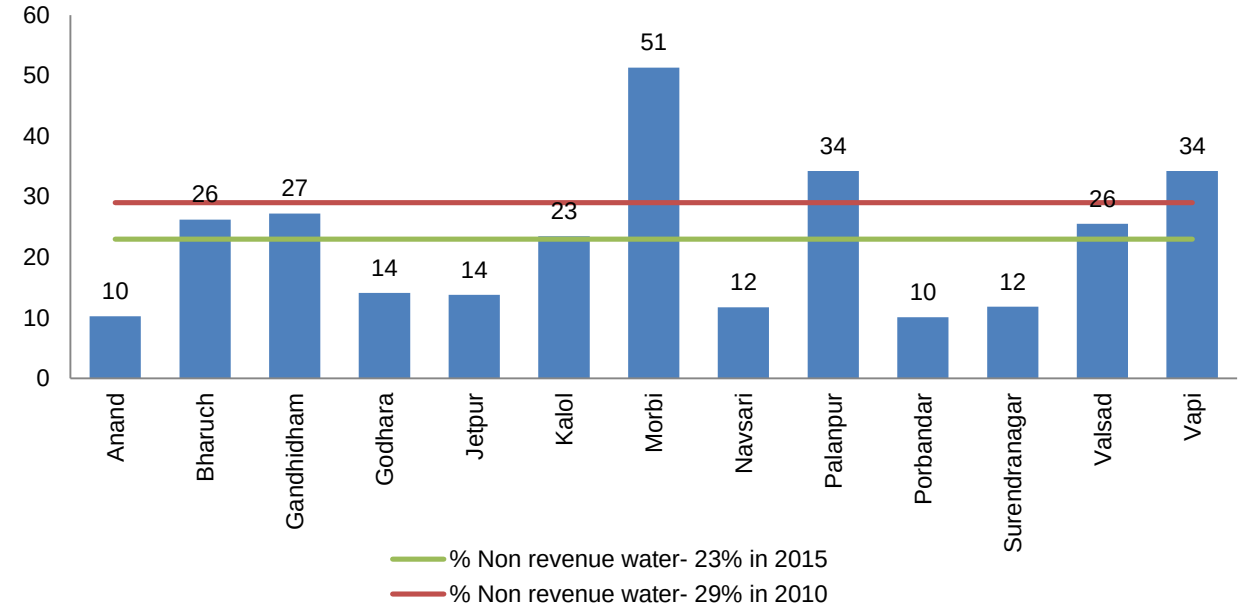
Graph 2.22: Extent of NRW in 2010 and 2015



- **Class A cities**

Among 18 class A cities, 13 have been considered for analysis of NRW. The other 5 did not have data on NRW. 23% of water produced in 13 cities of class A is NRW. Anand, Godhara, Jetpur, Navasari, Porbandar and Surendranagar show NRW values lesser than the SLB of 20%. Morbi, Palanpur and Vapi have notably higher values than that of class A cities' weighted average. These cities need to work towards a comprehensive NRW reduction strategy. Data provided by cities are without any documentary evidence and have a poor reliability.

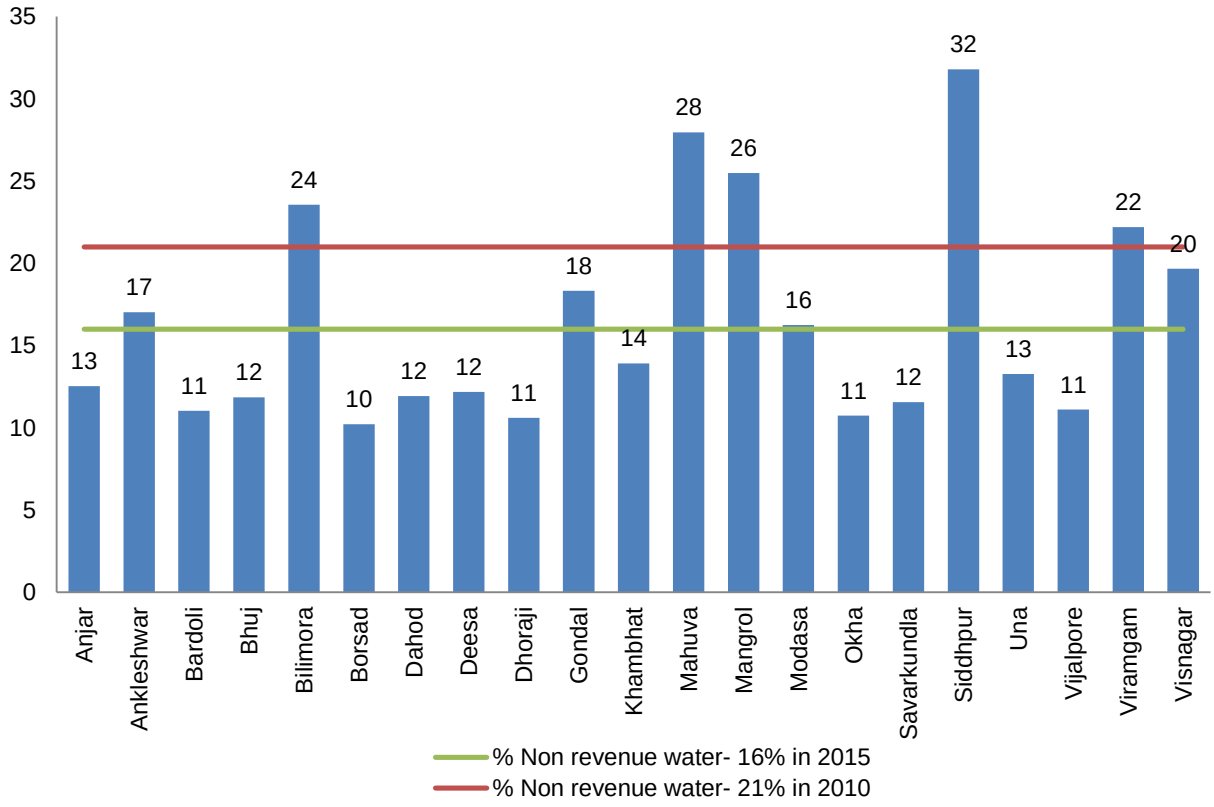
Graph 2.23: % Non Revenue Water- Class A cities



- **Class B cities**

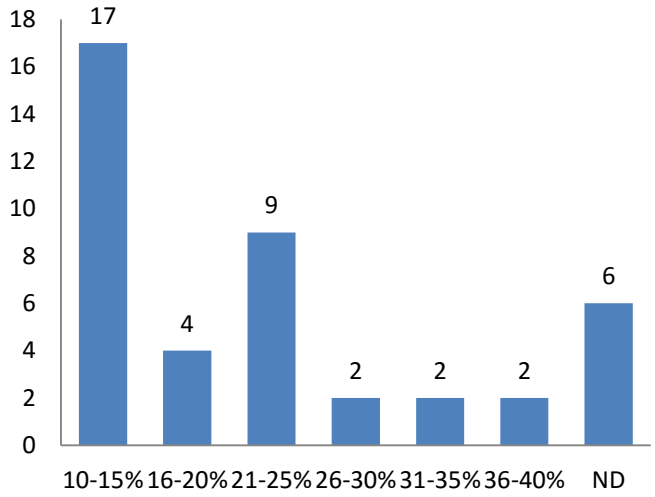
The weighted average for NRW among class B cities is 16% in 2015. 16Cities have NRW values below the national service level benchmark. For 8 cities, data is not available. Siddhapur has highest NRW at 32%. Other 4 cities having more than 20% NRW are Bilimora, Mahuva, Mangrol and Viramgam.

Graph 2.24: Non Revenue Water- Class B cities



- **Class C cities**

Graph 2.25: % Non Revenue Water- Class C cities



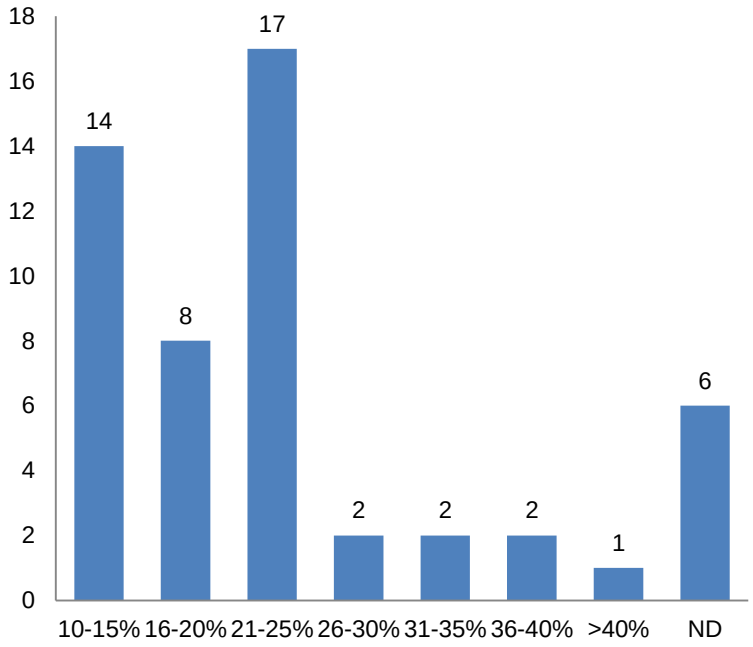
The values for NRW of Class C Cities are in range between 10 to 40%. 6 Cities do not have relevant data pertaining to the NRW indicator and hence are not included for the analysis. The weighted average percentage for NRW in Class C Cities is 19.

Bavla has highest NRW at 40%, followed by Chhaya (34%), Pardi (35%) and Vyara (36%).21 out of total 42 class C cities recorded less than 20% NRW, which is national SLB. Jafrabad, Jambusar and Wankaner have only 10% NRW.

- **Class D cities**

The weighted average of NRW for class D cities is 21%. 12 Cities could not provide any estimate on the extent of NRW. 22 cities could manage to keep their NRW below national SLB of 20%. Patdi has minimum NRW among all class D ctiesswith only 10% NRW, while Chhota-Udaipur has as high as 41% NRW. 24 Cities have greater than 20% NRW and these should work on reducing their NRW by various adaptive measures as mentioned in 2.6.2

Graph 2.26: Non Revenue Water- Class D cities



2.6.3 Efficiency in redressal of customer complaints

Complaint redressal system is an important function of an efficient, responsive and transparent city. The basic purpose behind a grievance redressal mechanism is to provide a platform to citizens to lodge their complaints related to municipal services, voice their opinions and provide feedback.

Most of the Cities in the state have attempted to establish a system to register complaints and to redress them within a stipulated time, as mentioned in the citizens' charters of cities. After the GOI initiative to prepare citizens‟ charter, various initiatives have been undertaken in Gujarat to formulate and operationalize such charters.

These grievance redressal systems range from manual system, where the citizen needs to approach the city to register a complaint in a paper form, to ICT application-based, where they can register the complaint through a telephone, SMS or the city website.

The total number of water supply-related complaints redressed within 24 hours of receipt of complaint, as a percentage of the total number of water supply related complaints received in the given time period. The SLB for this indicator is 90%.

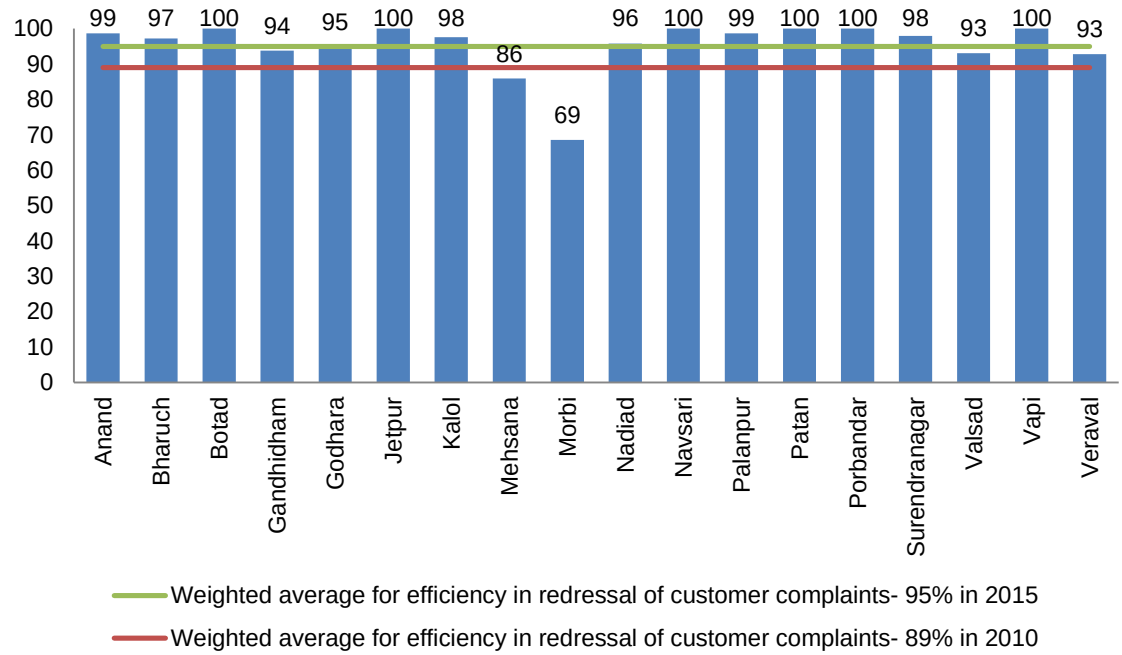
Redressal Of Customer Complaint (Range in %)	Number Of Urban Local Bodies
51-60	3
61-70	2
71-80	4
81-90	21
91-100	116
NA	1
Total	147

Table 2.8: Redressal of customer complaints(%) in 2015

- **Class A cities**

The weighted average of efficiency in redressal of customer complaints among Class A cities is 95%, which was around 89% in 2010. 6cities have reported 100% efficiency, whereas only 2 cities have reported less than 90% efficiency. These cities are Morbi (69%) and Mehsana (86%).

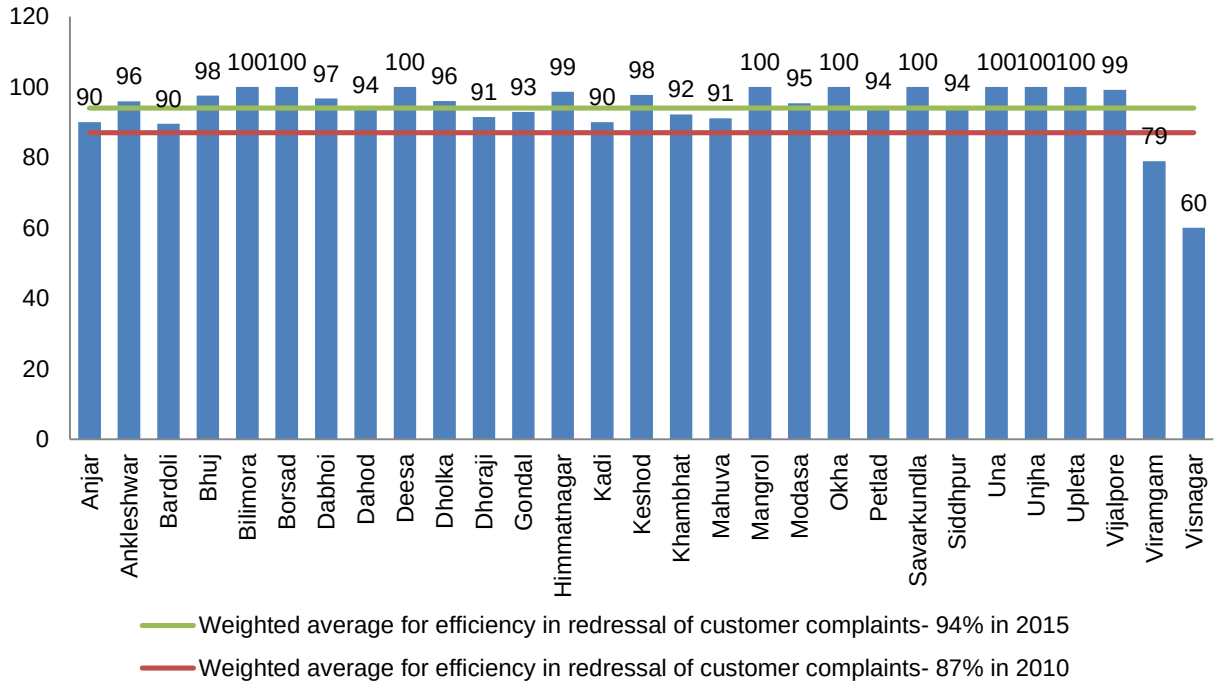
Graph 2.27: Complaints redressal (%) - Class A cities



- **Class B cities**

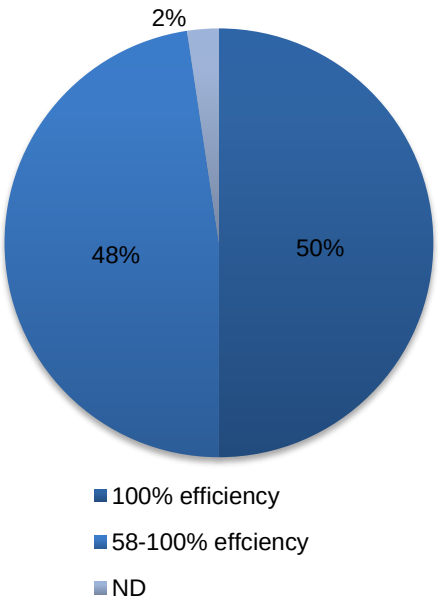
Among Class B ULBs, the weighted average in redressal of customer complaints is 94%. 9 cities have reported 100% efficiency in redressal of customer complaints as shown in Graph 2.28.Visnagar has reported 60% efficiency which is lowest among class B cities.

Graph 2.28: Complaints redressal (%) - Class B cities



- **Class C cities**

Graph 2.29: Complaints redressal (%) - Class C cities

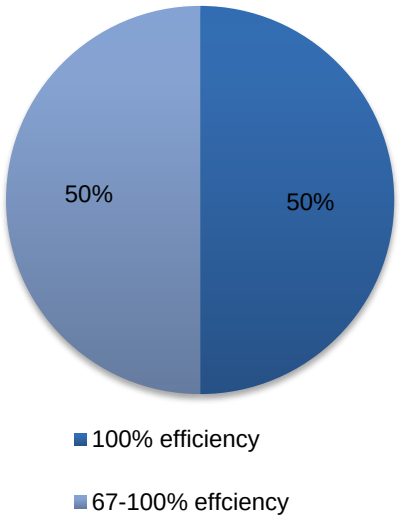


Among Class C cities, half of the cities have reported 100% efficiency in redressal of customer complaints. The weighted average for class C increased from 93% in 2010 to 95% in 2015. Ranavav has no data for the efficiency in redressal of customer complaints for water supply services.

- **Class D cities**

Graph 2.30 shows the efficiency in redressal of customer complaints among class D cities. The weighted average of efficiency in redressal of customer complaints among Class D is 95%. Out of 58 cities, half have reported 100% efficiency in redressal of customer complaints whereas in other half of the cities, Sikka has reported lowest efficiency at 67%

Graph 2.30: Complaints redressal (%) - Class D cities

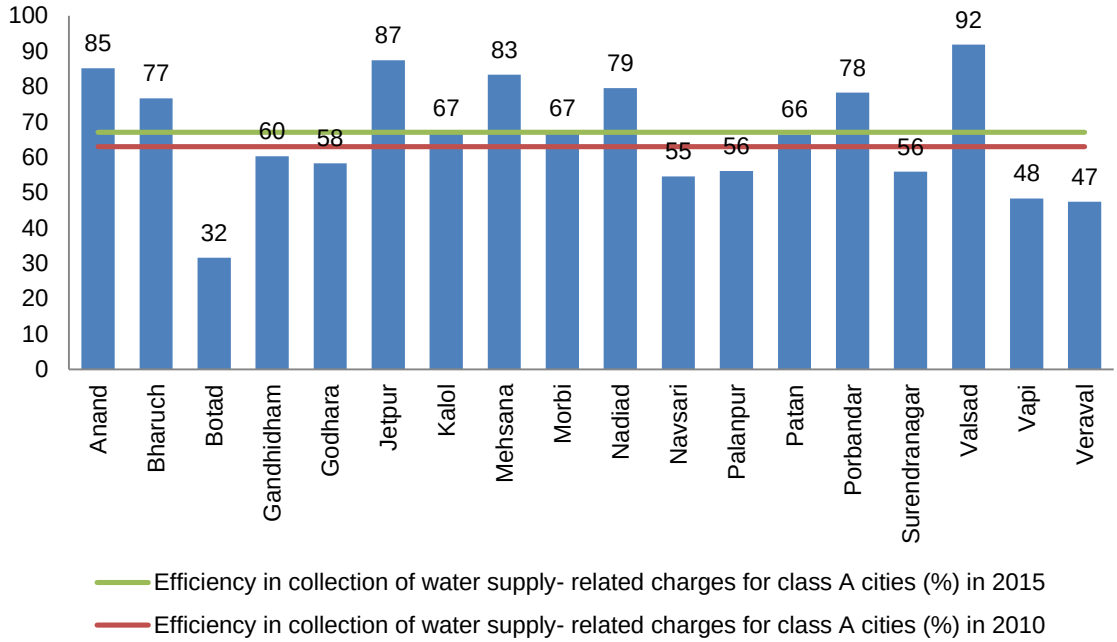


2.6.4 Efficiency in collection of water supply- related charges

This indicator captures the extent of collection of revenues that are billed by the ULB. It denotes the revenues that are due to the ULB, and hence an important factor in its cost recovery efforts.

- **Class A cities**

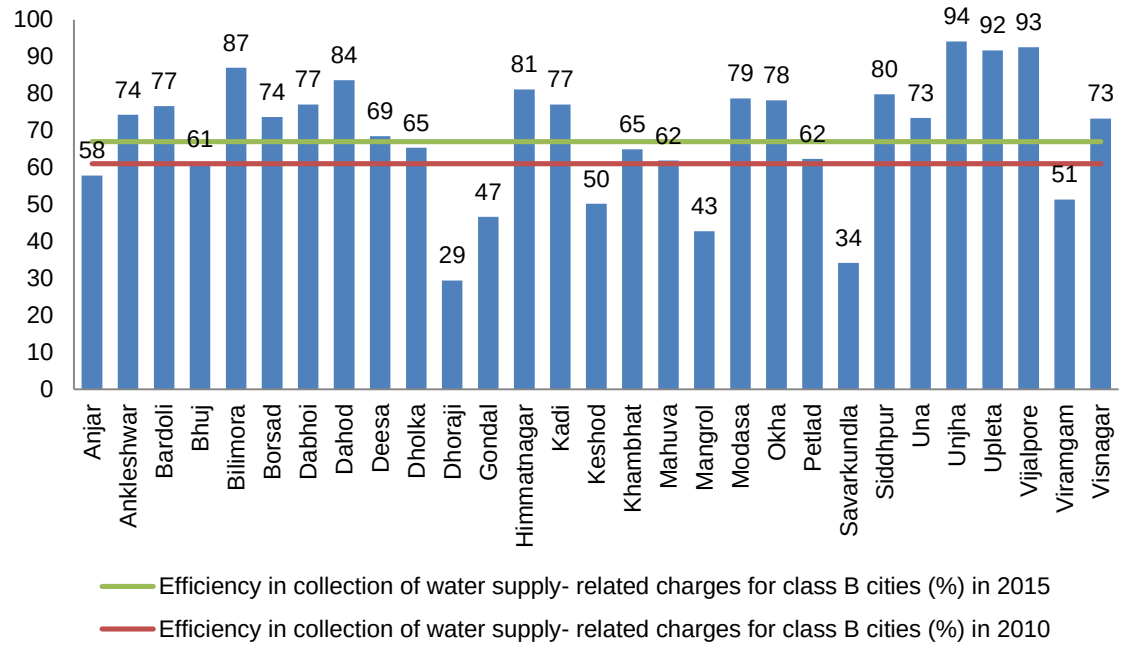
Graph 2.31: Efficiency in collection of water supply related charges for class A cities(%)



The weighted average of efficiency in collection of water supply- related charges for class A cities increased from 63% in 2010 to 67% in 2015. This is very low than national benchmark of 90%. Valsad is the only class A city to have its indicator value greater than the benchmark value, while Veraval has the least efficiency (47%).

- **Class B cities**

Graph 2.32: Efficiency in collection of water supply related charges for class B cities(%)

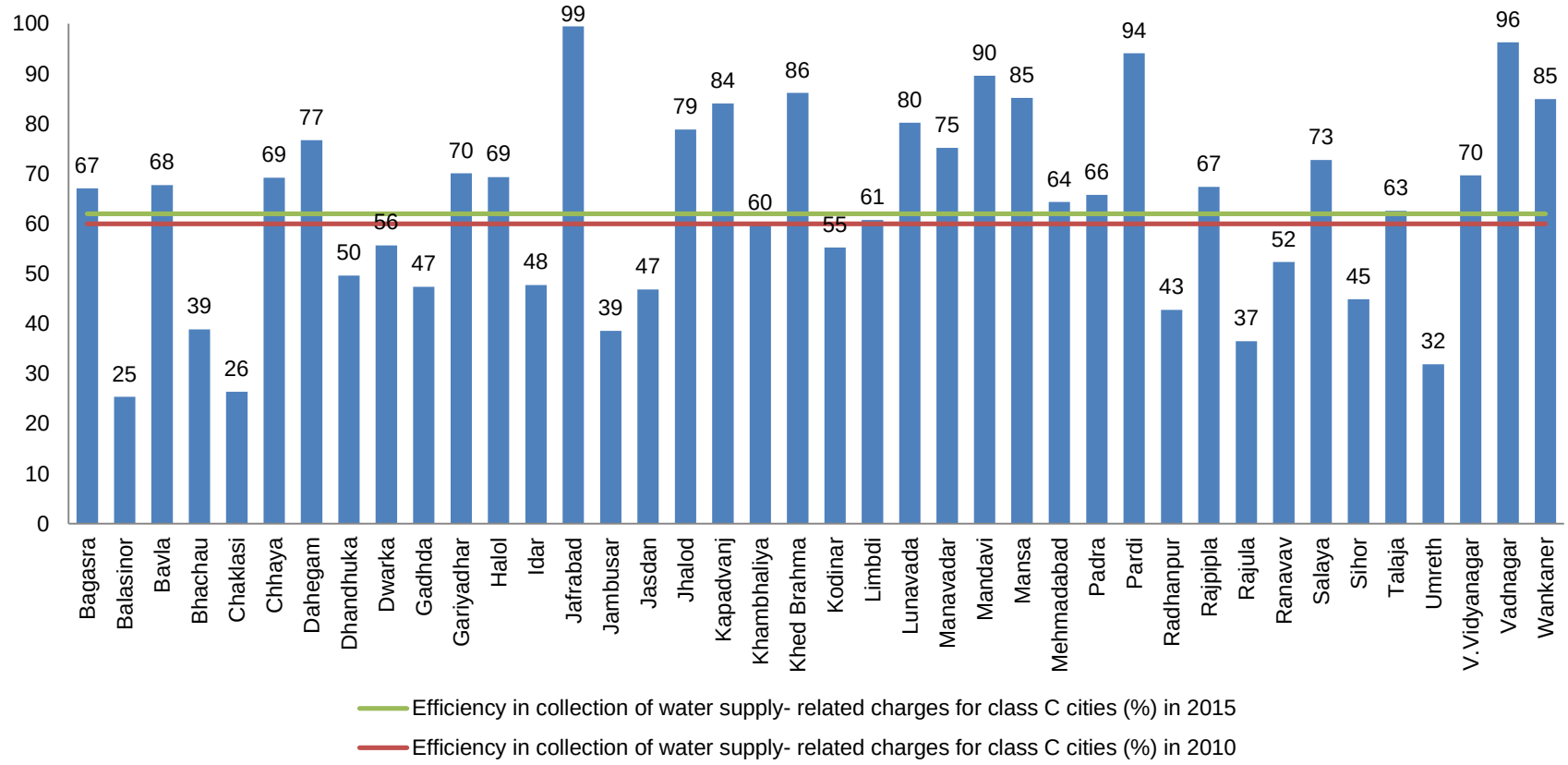


The weighted average of efficiency in collection of water supply- related charges for class B cities increased from 61% in 2010 to 67% in 2015. Unjha (94%), Upleta (92%) and Vijalpore (93%) have higher collection efficiency than benchmark of 90%. Dhoraji (29%), Gondal (47%), Mangrol (43%) and Savarkundla (34%) have below 50% collection efficiency which is very poor.

- **Class C cities**

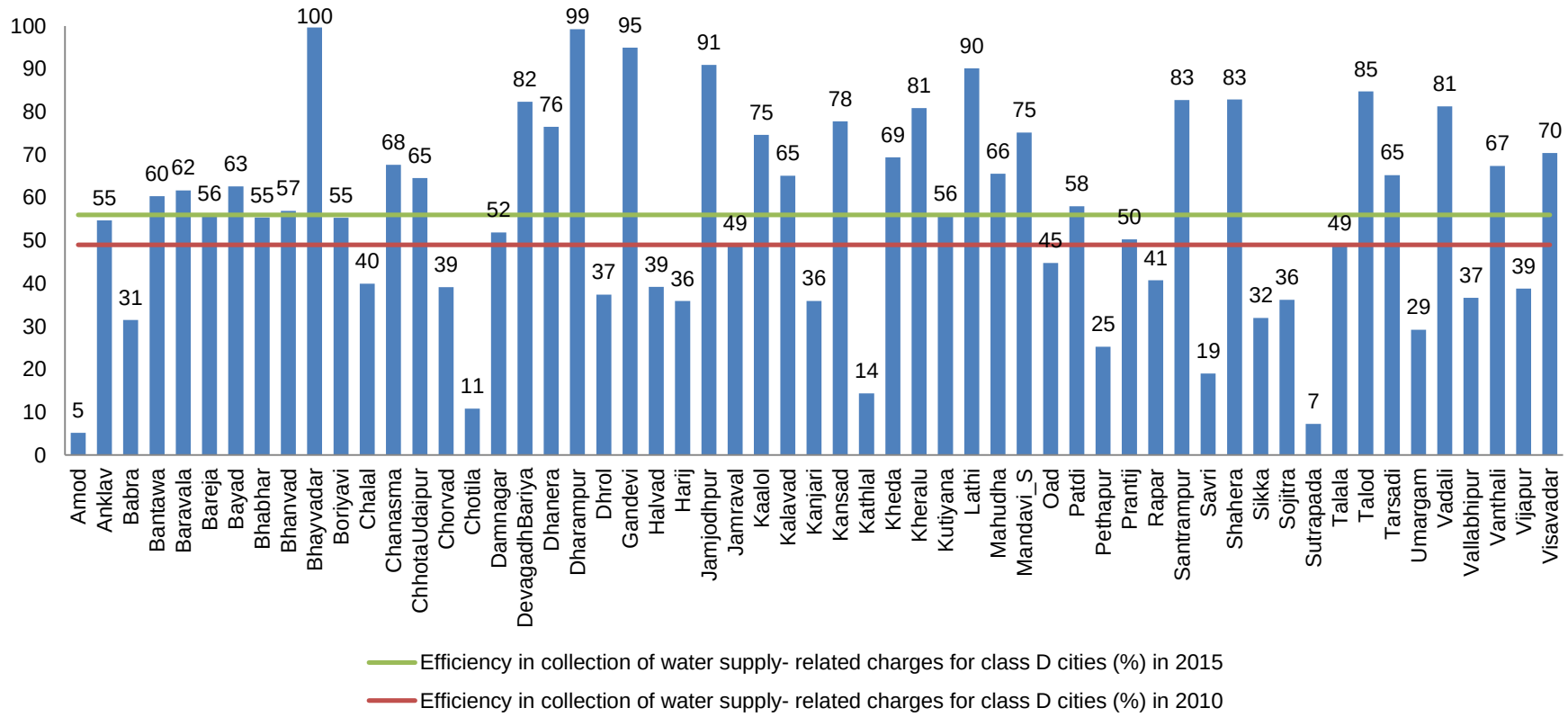
40 class C cities have been included in this analysis. Data for Karjan and Vyara is not available. The weighted average of efficiency in collection of water supply- related charges for class C cities increased from 60% in 2010 to 62% in 2015. Jafrabad (99%), Mandavi (90%), Pardi (94%) and Vadnagar (96%)comply with the benchmark of 90%. 9 cities have below 50% collection efficiency.

Graph 2.33: Efficiency in collection of water supply related charges for class C cities(%)



- **Class D cities**

Graph 2.34: Efficiency in collection of water supply related charges for class D cities(%)



58 class D cities have been included in this analysis. Songadh does not have data for this indicator. The weighted average of efficiency in collection of water supply- related charges for class C cities increased from 49% in 2010 to 56% in 2015. Bhanvad is the only city to have 100% efficiency in collection of water supply- related charges. Amod (5%), Chotila (11%), Kathlal (14%) and Sutrapada (7%) have extremely low collection efficiency which could cause great losses to their revenue account.

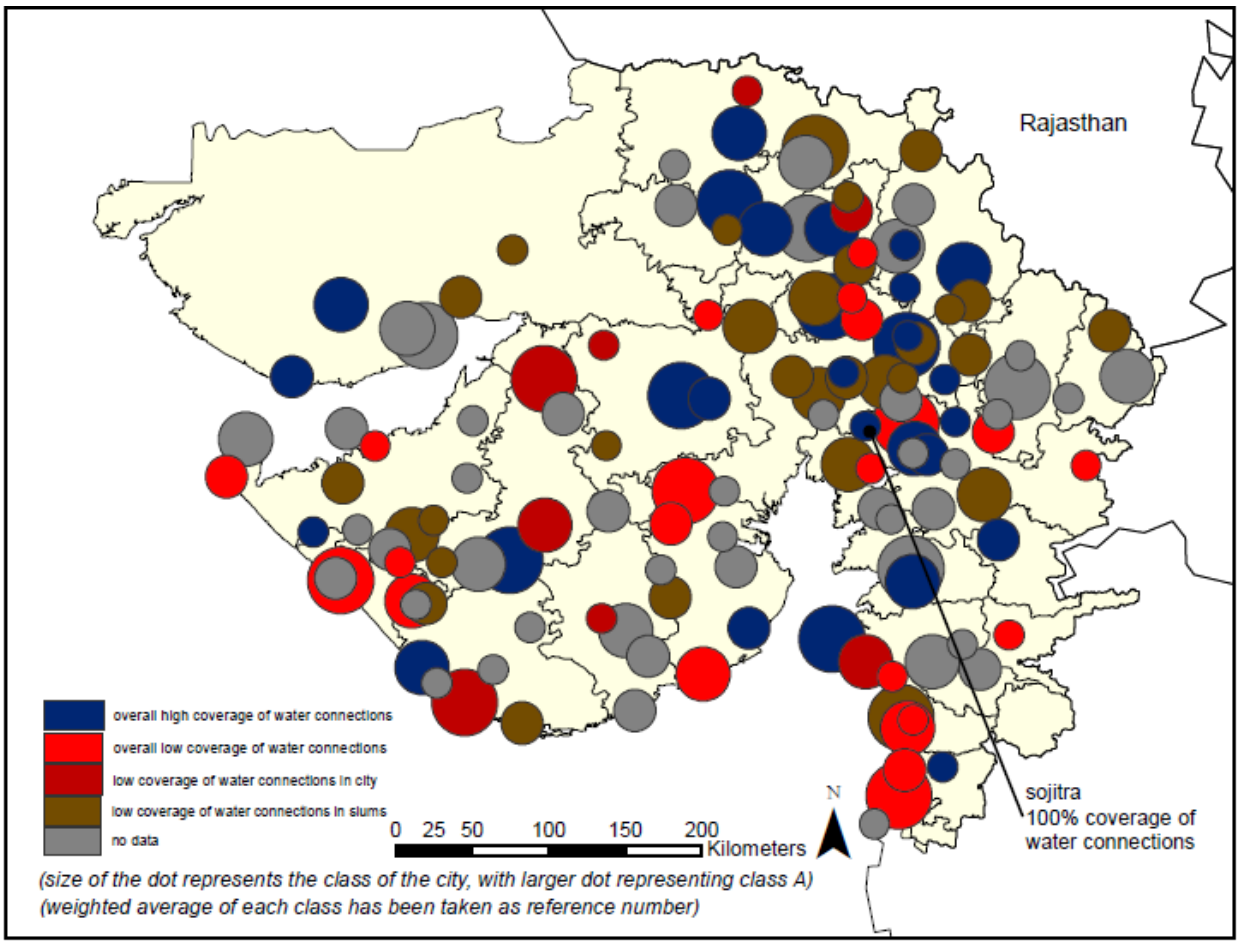
2.6 Equity

2.7.1 Spatial variations in coverage of water supply connections

The coverage of water supply connections in slum settlements is defined as total households with individual tap connections as percentage of the total households in slum settlements in the city. 100% coverage in a city could be achieved only by covering all the slum households though there are technical difficulties as well as land tenure issues leading to provision of water networks in slum settlements. At the national level, mandatory reforms have been undertaken by cities for provision of basic services to the urban poor:

- Internal earmarking, within local bodies, budgets for basic services to the urban poor
- Provision of basic services to the urban poor, including security of tenure at affordable prices, improved housing, water supply and sanitation

Map 2.5: Equity in water supply services

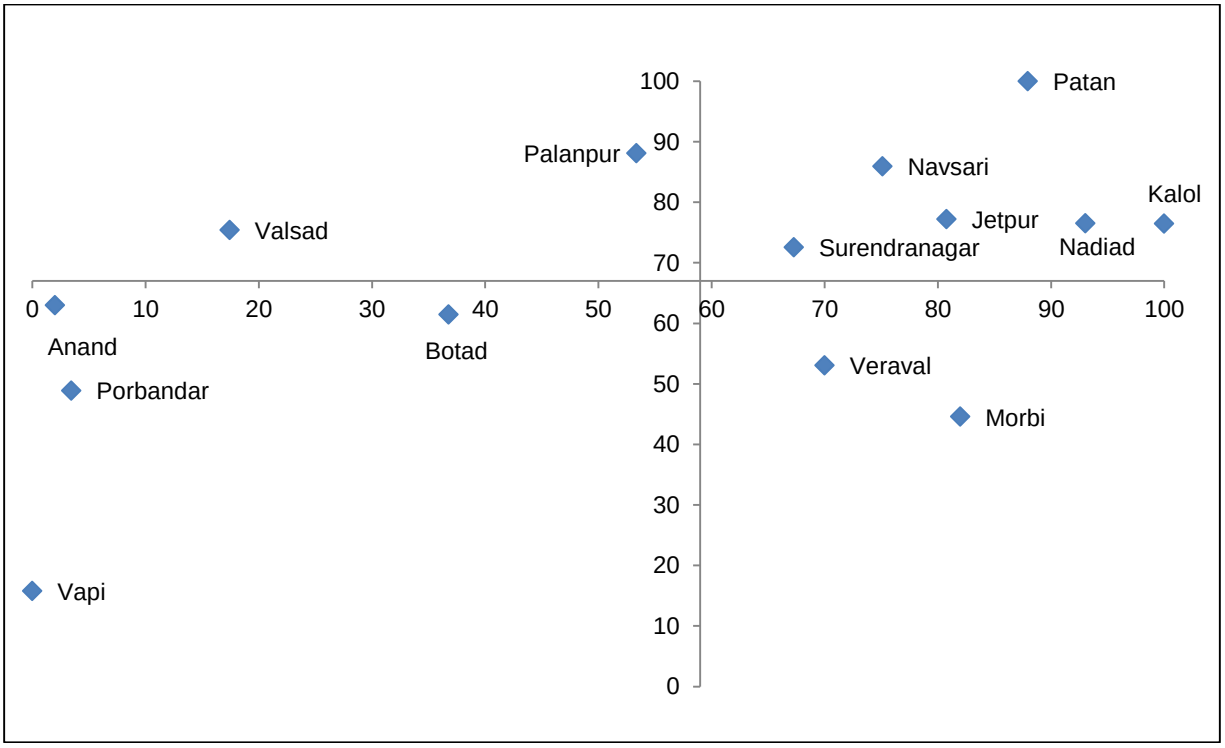


- **Class A cities**

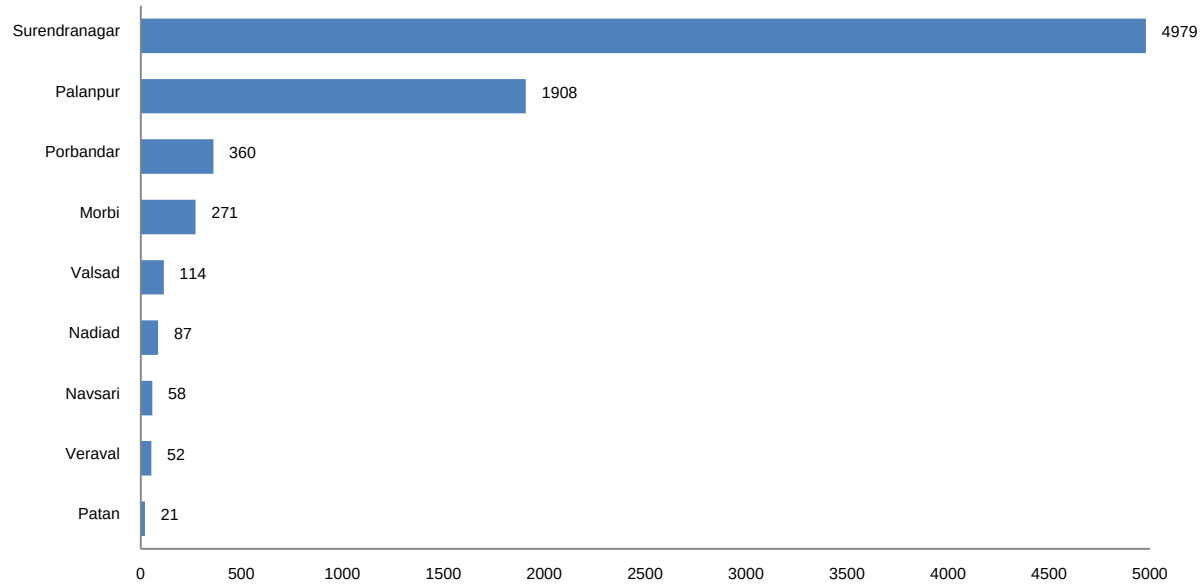
14 out of 18 class A cities have been considered for this analysis, other 4 do not have data. 59% of slum households in class A cities have individual water connections vis-à-vis 67% of households at the city level. The coverage of water supply connections in slums has gone down compared to 63% in 2010. 5 Cities have reported higher coverage in slum compared to city-wide coverage. The reliability of data is low as scale D. Morbi has 82% water supply connections in slums compared to city's 45% coverage.

Surendranagar municipality has slum connection coverage of 33%. At the same time, there is high dependency of slum population on stand posts for drinking water.

Graph 2.35: Coverage of water supply connection in slum and city-Class A cities



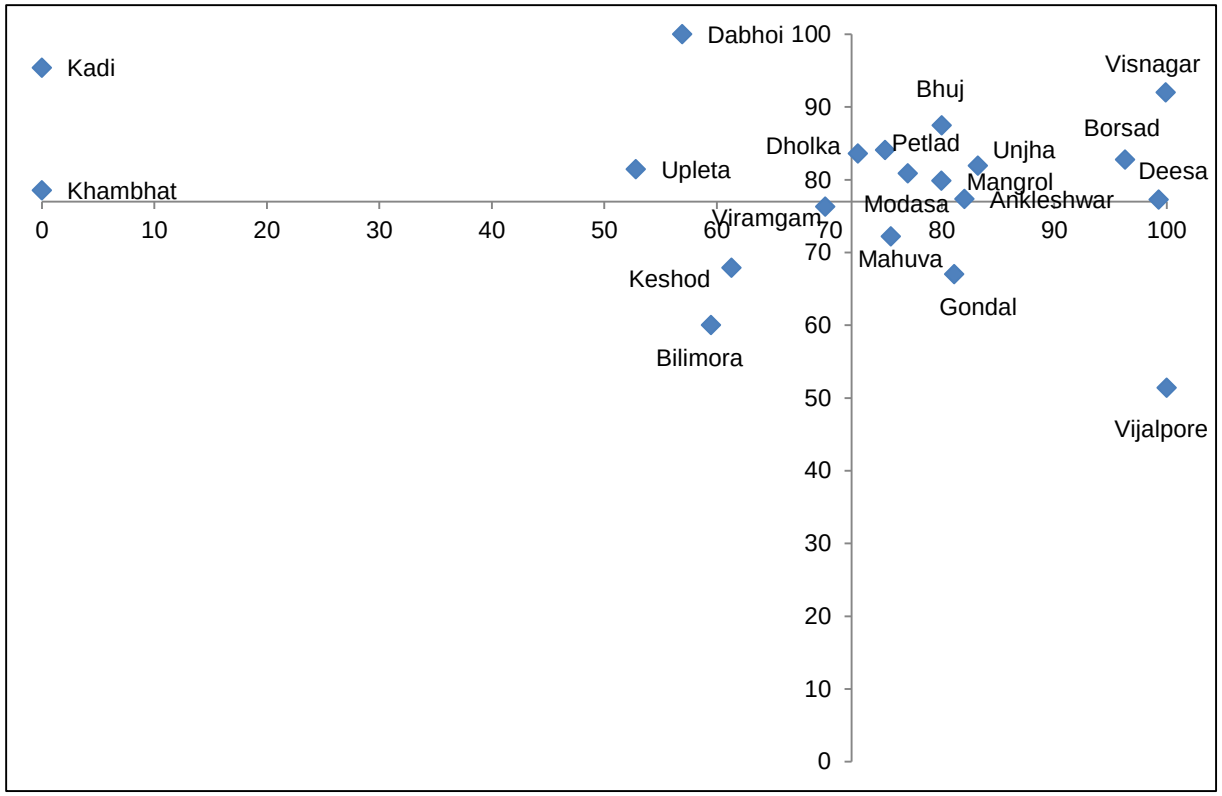
Graph 2.36: Slum population per stand post-Class A cities



- **Class B Cities**

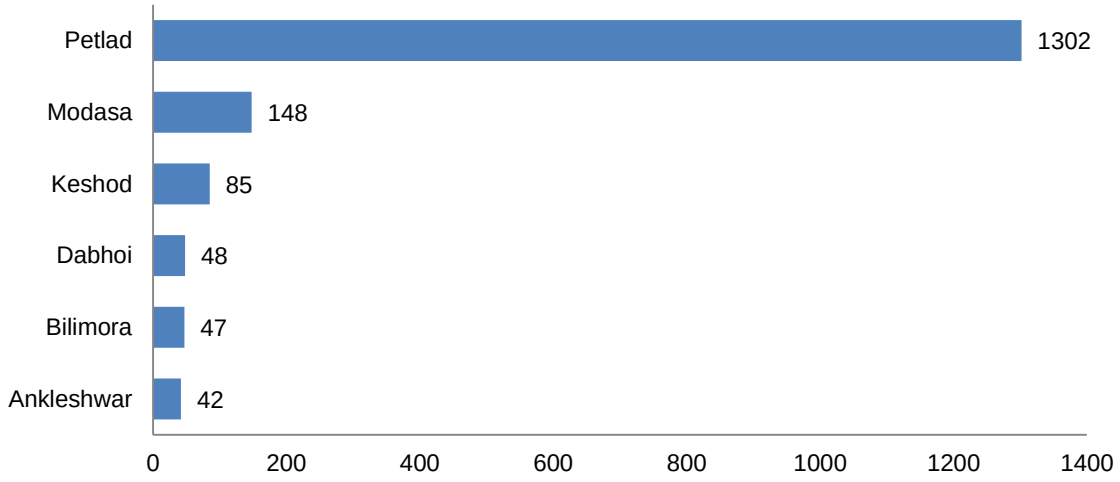
Among 33 Class B cities, 13 have not been considered for analysis due to lack of information on slum coverage in the rest. The weighted average of coverage of water supply connections in slums in Class B Cities is 72%. This is lower than the average city wide coverage 77%. The coverage of water supply connections in slums has gone up from 66% in 2010. Ankleshwar, Bhuj, Borsad, Modasa, Mangrol, Petlad and Unjha municipalities are most equitable, with a high city-wide coverage as well as high connection coverage in slums. Kadi and Khambhat have 0% of water supply connections in slums. Kadi had 100% coverage of water supply connections in slums in 2010.Vijalpore and Visnagar have 100% coverage of water supply in slums.

Graph 2.37: Coverage of water supply connection in slum and city-Class B cities



Anjar, Borsad, Deesa, Dholka, Kadi, Khambhat, Mangrol and unjha do not have any functional stand posts. Borsad, Deesa, Dholka and Unjha have high coverage of water supply connections in slums. It is important to note that Petlad has high (75%) coverage of water supply connections in slum and hence only 25% of slum population is dependent on the stand posts for water supply.

Graph 2.38: Slum population per stand post-Class B cities

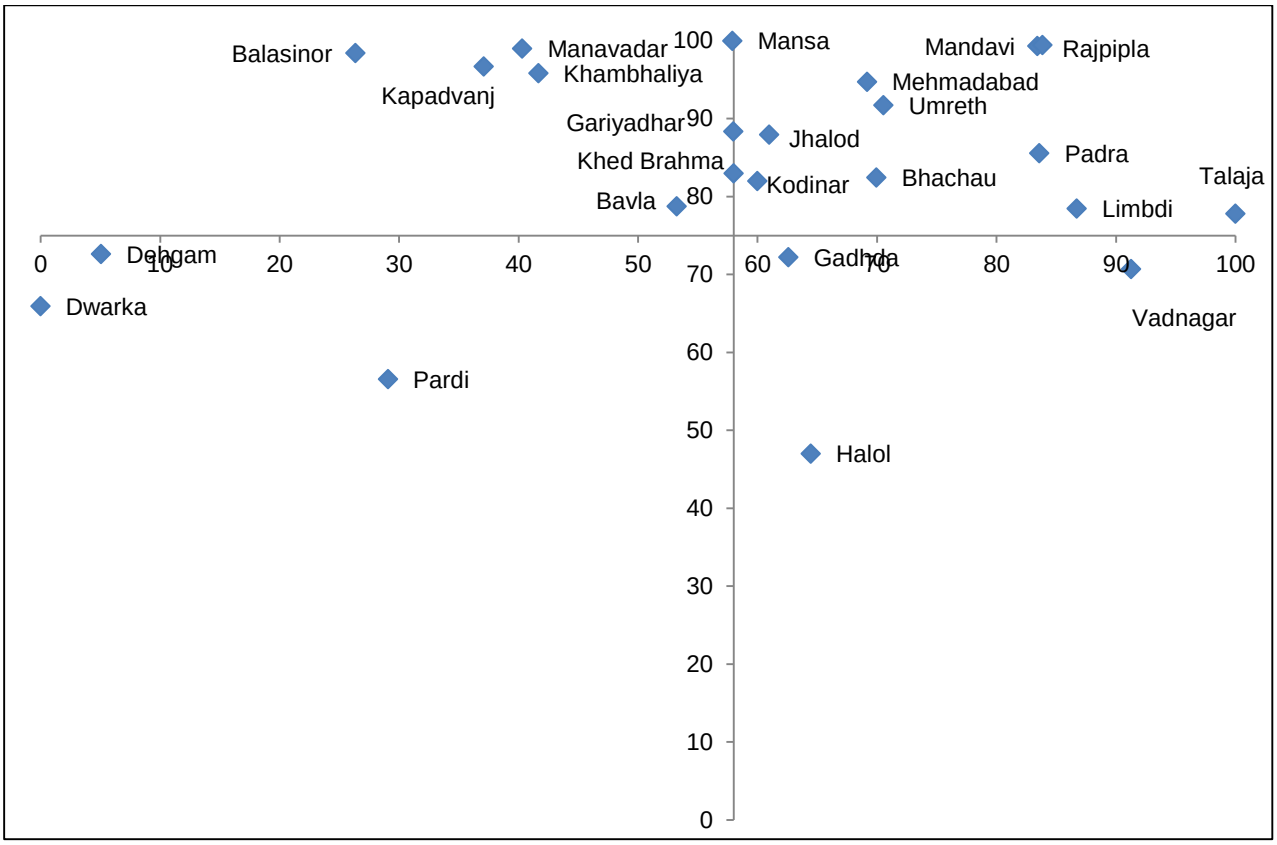


- **Class C Cities**

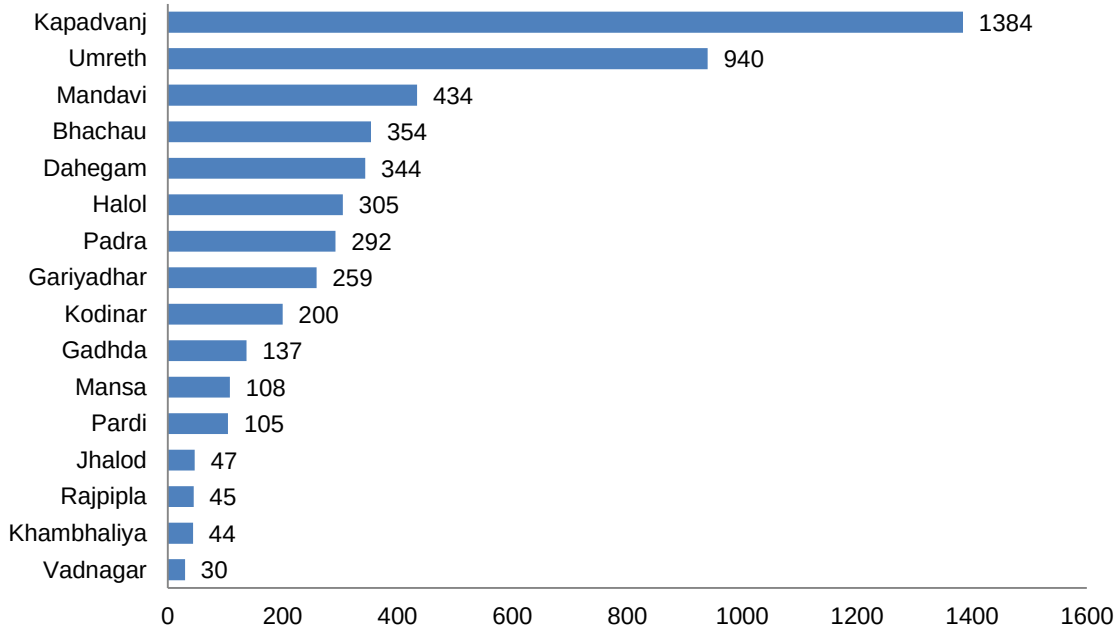
58% of slum households in class A cities have individual water connections vis-à-vis 75% of households at the city level.

Talaja has reported 100% coverage in slums while Dwarka has "0" coverage in slums against city-wide coverage of 66%. Limbdi, Mandavi, Padra, Rajpipla and Talaja show good coverage at the city level as well as in slums. Balasinor, Dahegam, Dwarka, Kapadvanj, Khambhaliya and Manavadar municipalities have a good coverage at the city level but very low coverage in slums.

Graph 2.39: Coverage of water supply connection in slum and city-Class C cities



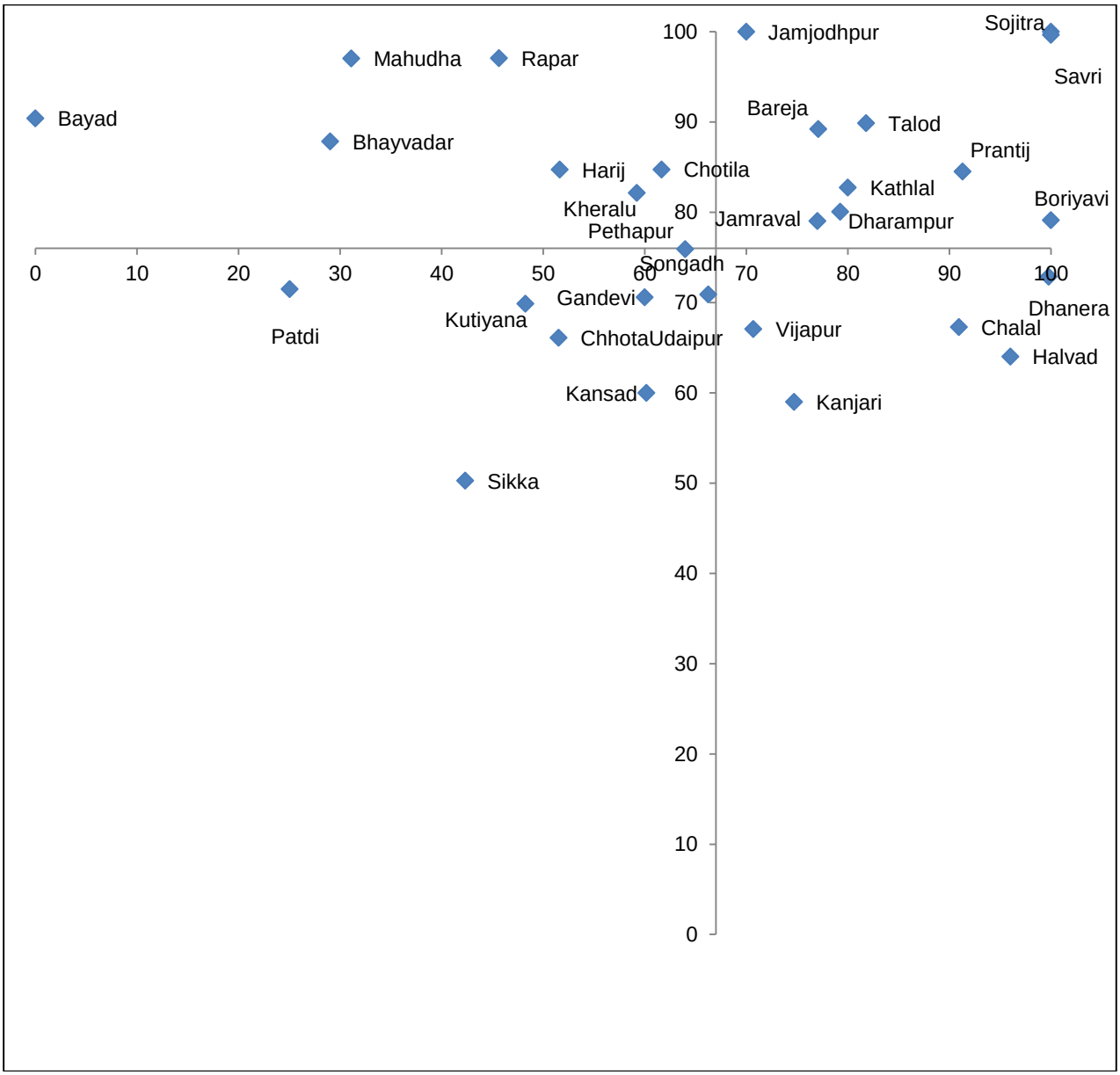
Graph 2.40: Slum population per stand post-Class C cities



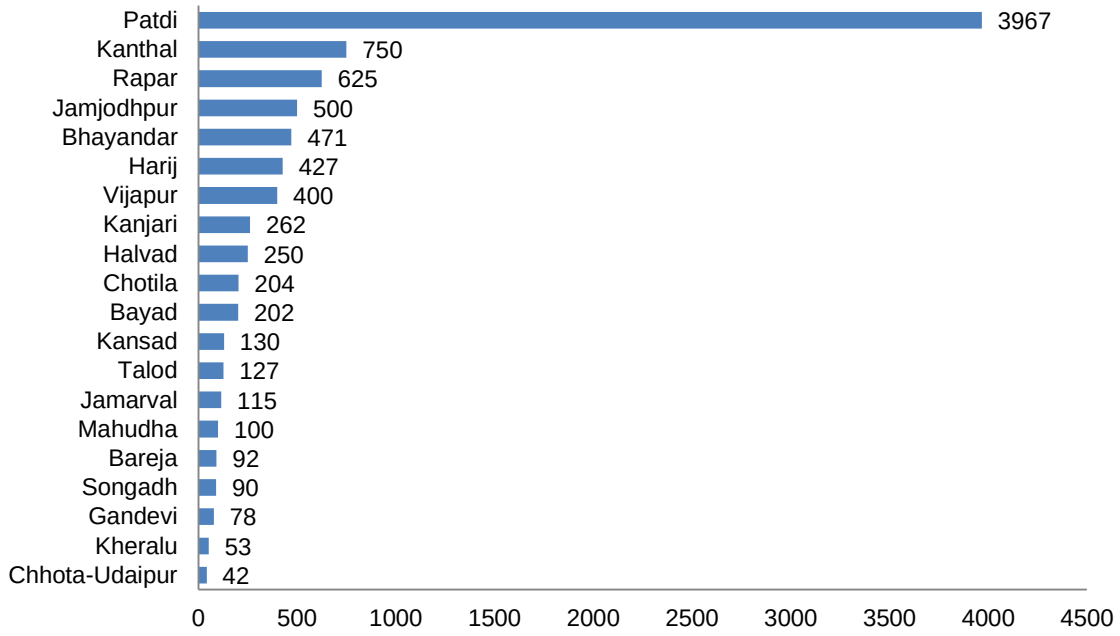
- **Class D Cities**

Among Class D Cities, the weighted average of coverage of water supply connections in slum settlements is 67%, which is lower than the city wide coverage of 76%. The coverage of water supply connections in 2010 was 61%. Bayad city has “0” coverage in slums against 90% coverage at city level, showing high inequity. Sutrapada has zero coverage in both city and slum. The municipality has not provided any water connections and provides water only through public stand posts. Among the Cities that have low water connection coverage in slums, there is a huge variance in the number of households with access to a community stand post. It ranges from Prantij municipality with 5 persons per stand post to Patdi with 3967 persons per stand post.This highlights the need to increase community stand posts so as to ease access to water for slum dwellers.

Graph 2.41: Coverage of water supply connection in slum and city-Class D cities



Graph 2.42: Slum population per stand post-Class D cities



Chapter- 3: Waste Water

3.1 Introduction

In 2010, 66% of properties had access to individual toilets. This has increased to 82.7% in the year 2015. Coverage of individual toilets has increased by 17percent over the last five years.Only one percent of households are dependent on community toilets and the remaining 17.3% households practice open defecation.As per Census 2011, 81.4% households of 147 municipalities had an individual toilet facility. Census 2011 data further shows that 3.5% of households of reported cities are dependent on public toilets and 15.1% urban households defecate in the open.

The Government of India has launched the Swachh Bharat Mission with a vision to dedicate Clean India on 2nd October 2014.The State Government of Gujarat has initiated Mahatma Gandhi Swachhata Mission on 26th February 2014, with a vision to make Gujarat open defecation free, Zero waste, dust free and green.MGSM realizing this laudable vision and primarily emphasizes to make adequate provision of clean individual and Pay & Use toilets.To achieve **"Open Defecation Free"** status, Government of Gujarat has scaled-up construction of individual household toilets and public toilets under "Mahatama Gandhi Swachhata Mission".

Government of Gujarat has initiated sewerage project in all cities under Swarnim Jayanti Mukhya Mantri Shaheri Vikas Yojana (**SJMMSVY**). GoG has made a provision of Rs 40,000 million in its initial budget in year 2009. As of March 2015, total 156 projects are approved and its estimated cost is Rs.68, 740 million. These all projects are implemented by Gujarat water supply and Sewerage board (GWSSB)andGujarat Urban Development company Ltd. (GUDC). As of March 2015, five projects are completed, 141 projects are in progress and rest are under tendering and approval stage.

Sewerage project Under SJMSVY for cities of Gujarat		% of work completed
1	Bavla	75
2	Botad	75
3	Dabhoi	60
4	Dhanera	50
5	Himmatnagar	90
6	Jamjodhpur	50
7	Jasdan	80
8	Kadi	75
9	Lathi	75
10	Nadiad	70
11	Patan	90

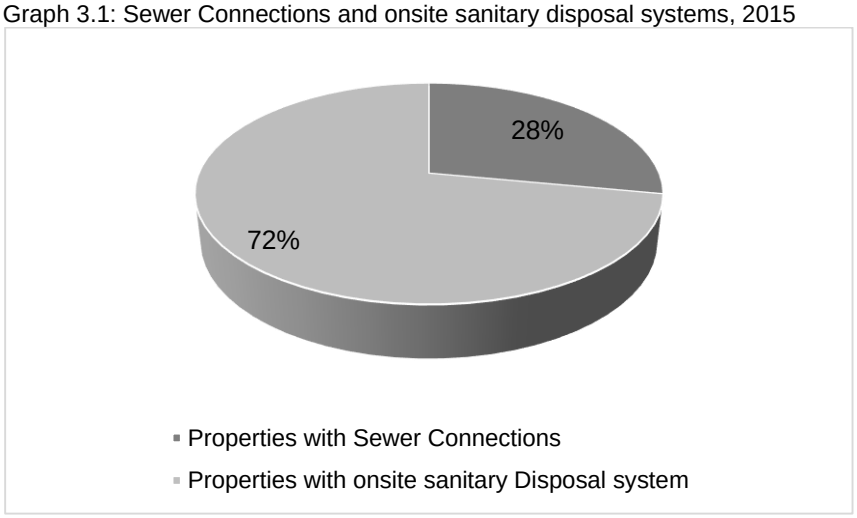
12	Sanand	65
13	Sidhpur	100
14	Songadh	65
15	Talod	75
16	Tarsadi	55
17	Viramgam	80
18	Visnagar	75

Table 3.1: Sewerage project under SJMSVY for cities of Gujarat

Out of 147 cities, 55 (37.4%) cities have some extent of underground sewerage network. This ranges from 1% (Bilimora) to 100% (V. Vidyanagar). In absence of a centralized sewerage system, cities have open drains for collection of grey water while individual households have single pits or septic tanks for disposal of black water.

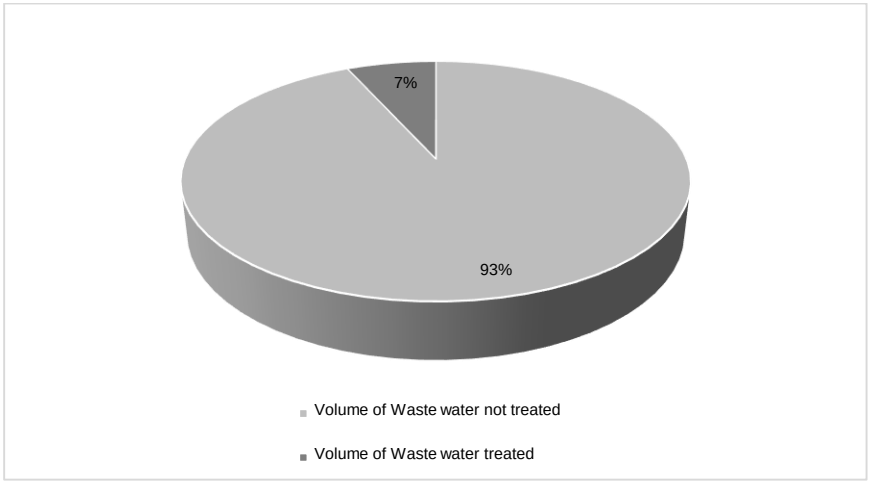
The total no of properties in 147 cities of Gujarat that have access to individual toilets are around 22 lacswhile6 Lacs properties have toilets connected to sewer networks.Around 15 Lacs properties depend on onsite sanitary disposal system.

Graph 3.1: Sewer Connections and onsite sanitary disposal systems, 2015



The total waste water generated by 147 Cities is about 799 MLD out of which only 7% (54 MLD) is collected and treated.

Graph 3.2: Waste water treatment, 2015



As per 2014-15 PAS SLB Data, out of 55 cities that have some extent of sewerage network, only Valsad (class A) and VallabhVidyanagar(Class C) have a sewerage treatment plant and 12 cities have functional oxidation ponds. The following table lists the details of these cities

Class of cities	Name of Municipality	Installed capacity of oxidation pond (in MLD)
Class-A	Morbi	16
	Patan	14
Class-B	Himmat Nagar	17
	Kadi	15
	Peltad	10
	Unjha	5
Class-C	Balasinor	6
	Mandavi	6
	Mansa	3
Class-D	Anklav	3
	Gandavi	2
	Mandavi S	3

Table 3.2: Number of cities with Oxidation Ponds, 2015

Out of 55 Cities with sewerage systems, 52 of them levied sewer related charges whereas Billimora, Karjan and Dhrol are providing service free of charge. Similarly 92 cities which has no

sewerage systems, three cities, namely Dholka, Songadh, and kheda levies a minimum charge of Rs.120, Rs.24 and Rs.96 per annum for non- sewered services.

124 citiesprovideseptage management services. These cities have in total of 190 septage sucking machines. Kalol and Bareja do not own septagesucking machines but they have licensed private contractors for the purpose. The coming sections will dwell into further details of each of the KPIs.

3.2 Access and coverage

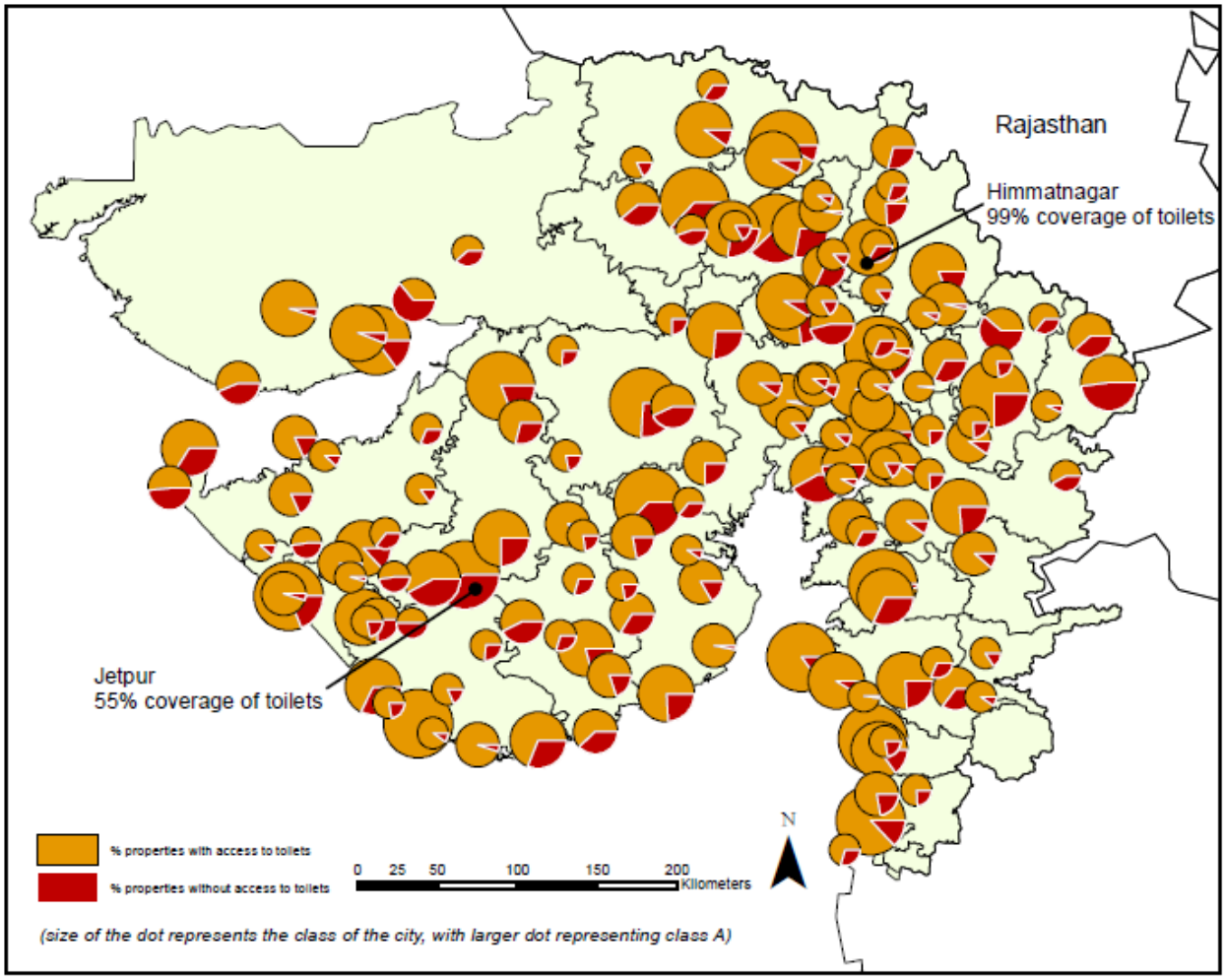
3.2.1 Coverage of properties with access to individual toilet

As per SLB, coverage of toilet is defined as total number of properties with access to individual or community toilets within walking distance. Properties include those in the categories of residential, commercial, industrial and institutional.

3.2.2 Coverage of Waste water Network services

This denotes the extent to which the underground sewage (or sewerage collection) network has reached out to individual properties across the service area. Properties include those in the categories of residential, commercial, industrial and institutional.

Map 3.1: Coverage of properties with access to individual toilet



- **Class A cities**

- **Coverage of properties with access to individual toilet**

Data for all 18 classAcitiesisincluded for the analysis.The average coverage of toilet for Class A cities is 82.4% in the year 2015 which was 65.1% in year 2010. This has increased to 17.3% over a span of last five years.Botad, Godhara, Mehsana, Patan, Porbandar, Surendrenagar and Valsad have coverage below the class average and Jetpur municipality has the least coverage of 54%. On the other hand Anand, Bharuch, Navsari,Palanpur have more than 90% coverage and Veravalhas 100% coverage.

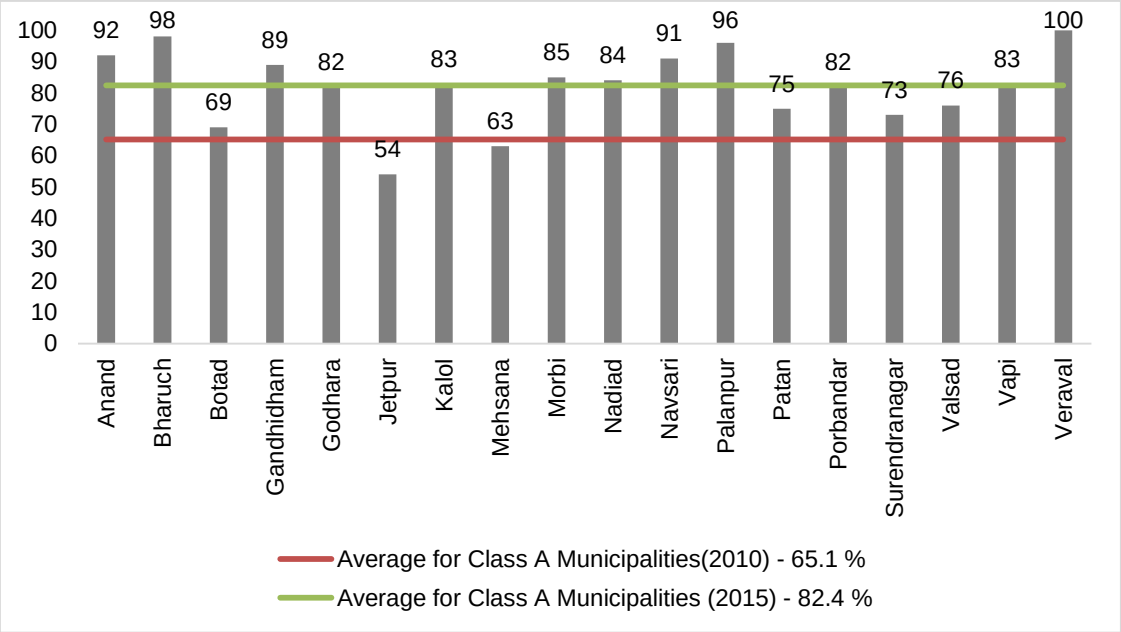
The 17.3% increase in coverage for individual toilet is attributed to the cities whose coverage has increased drastically from 2010 to 2015 and is listed in the table below.

S. No	Name of City	Coverage (2010)	Coverage (2015)
1	Veraval	62	100
2	Bharuch	47	98
3	Patan	45	75
4	Kalol	61	83
5	Nadiad	65	84
6	Morbi	55	85
7	Anand	68	92
8	Navsari	79	81

Table 3.3: Class A cities showing tremendous growth - Coverage of toilets (%)

Apart from these there is decrease of coverage of individual toilets in Botad from 77% in 2010 to 69% in 2015 whereas the coverage for Valsad(76%) remained the same for both the years.

Graph 3.3: Coverage of toilets (%) - Class A cities

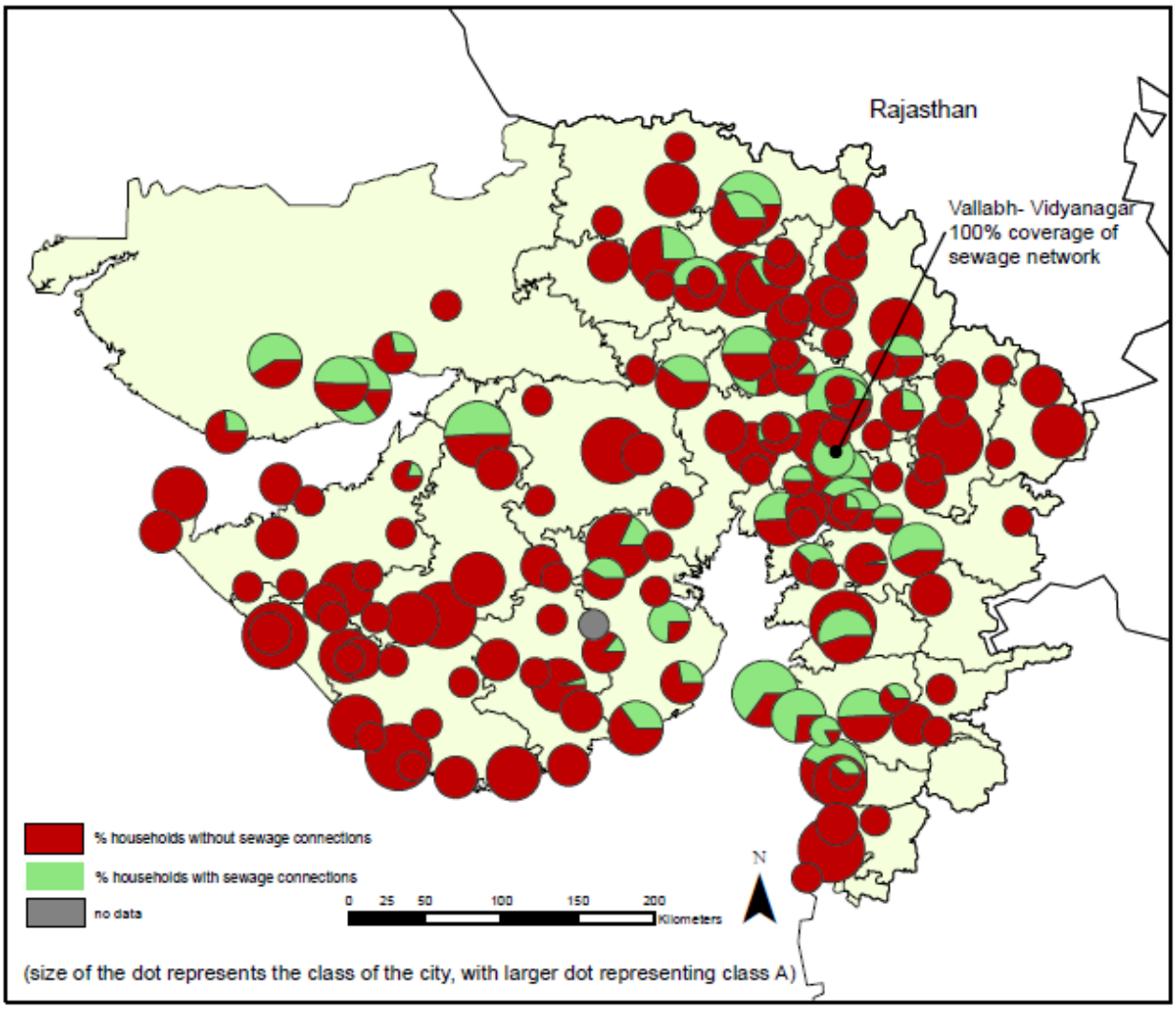


- **Coverage of Waste water Network services**

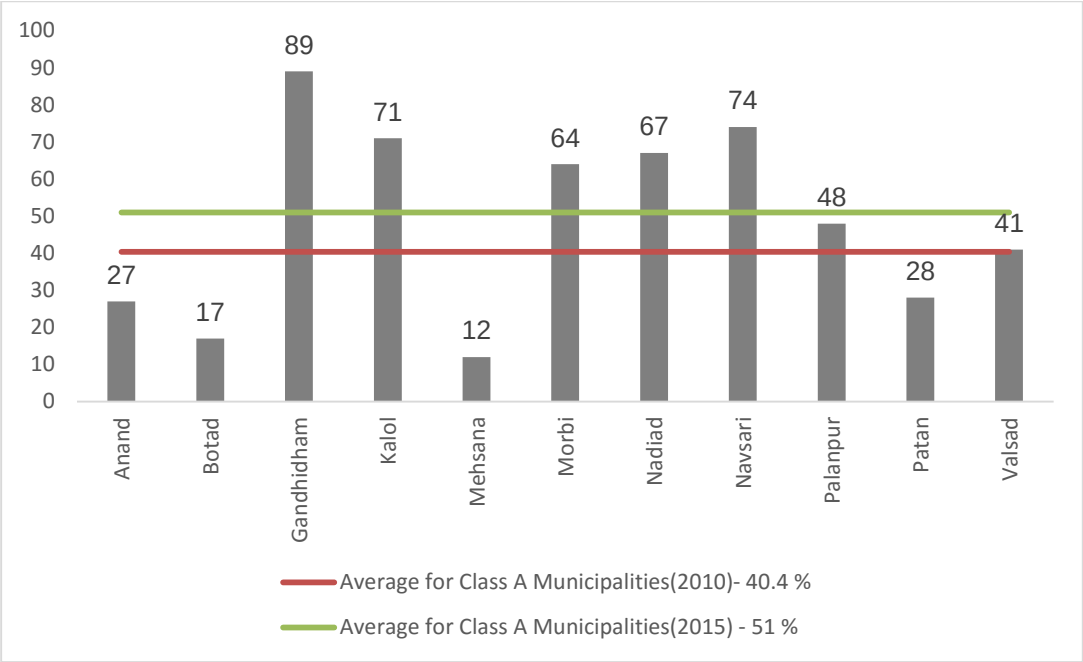
11 cities of class A have some extent of underground sewerage. The class average has increased from 40.4% to 51% from 2010 to 2015. There is a strong disparity between other citiesandGandhidhamwhich has the highest coverage at 89%, followed by Navsari, Nadiad and Morbiwith coverage of 74%, 67% and 64% respectively. Mehsana and Botad have less than 20% coverage for waste water network services.

Morbi has shown a drastic increase from 3% in 2010 to 64% in 2015. Similarly for Gandhidham(12%), Kalol(20%) and Nadiad (20%), there has been a moderate increase in coverage for waste water network services in last five years, hence marginalcontribution to the overall increase of 10.6%. On the other side, Anand municipality shows decrease in coverage from 48% in 2010 to 27% in 2015. It means that most of the toilets constructed in last five years are connected with on-site disposal system rather than sewerage network.

Map 3.2: Coverage of Waste water Network services



Graph 3.4: Coverage of sewerage network (%) - Class A cities



- **Class B cities**

- **Coverage of properties with access to individual toilet**

For Class B cities there has been an increase of 12.2% coverage of properties with access to individual toilets over the last five years, which was 71.7% in 2010 and has increased to 83.9% in 2015.

Bardoli, Borsad, Dahod, Dhoraji, Gondal, Khambhat, Mangrol, Modasa, Okha, Savarkunda, Una, Unjha, Upleta, Viramgam and Visnagarhas values less than the class average. Dhoraji and Khambhatshows the least coverage 57% and 58% respectively. On the other hand, Himmatnagar has achieved100% toiletcoverage.

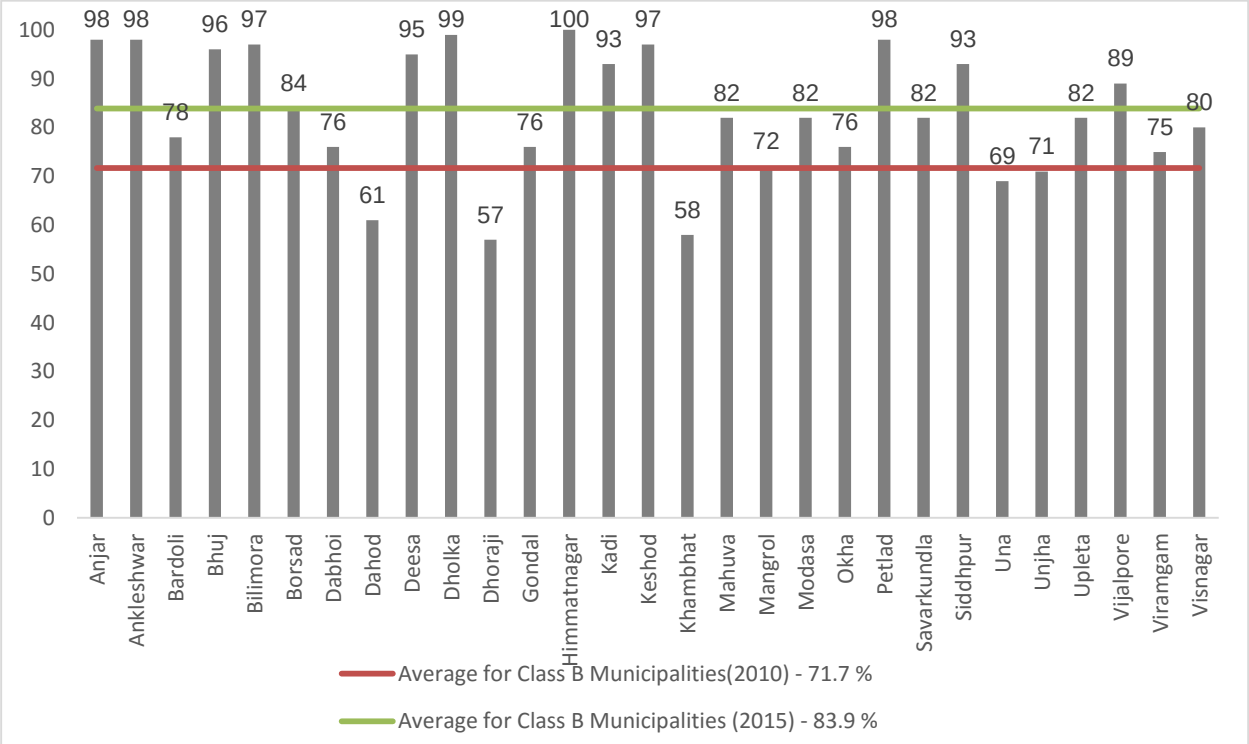
Only eight cities have shown tremendous increase in coverage of individual toilets are listed in table below.

S. No	Name of City	Coverage (2010)	Coverage (2015)
1	Himmat Nagar	91	100
2	Dholka	71	99
3	Ankleshwar	76	98
4	Keshod	33	97
5	Deesa	70	95
6	Bilimora	86	97
7	Anjar	82	98

Table 3.4: Class B cities showing tremendous growth - Coverage of toilets (%)

On the other hand, 21 cities have shown marginal increase leading to overall 12.2% increase. Borsad shows a decrease in coverage from 90% in 2010 to 84% in 2015. It may be due to increase in number of properties proportionate to the number of toilet constructed.

Graph 3.5: Coverage of toilets (%) - Class B cities



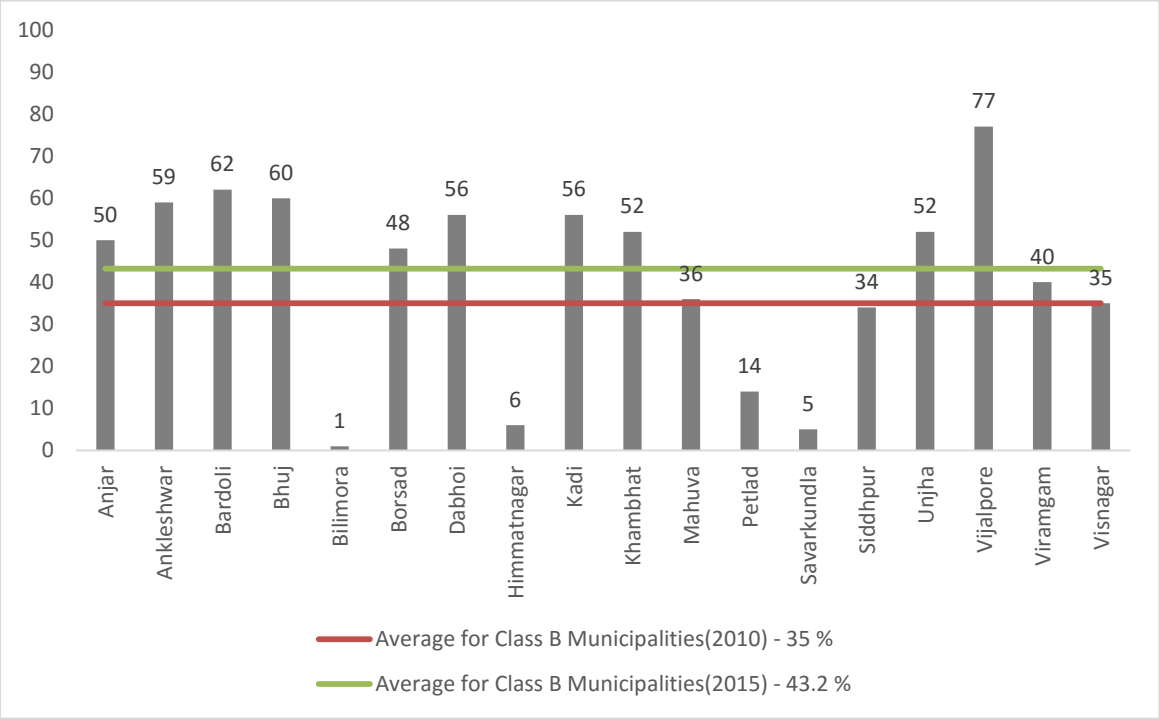
- **Coverage of Waste water Network services**

Regarding coverage of sewerage connections in Class B cities, data from only 18 Citieshas been included in the analysis as they only have the provision of underground sewerage networks. Data for Class B Citiesare extremely variablewith the coverage ranging from 1% (Bilimora) to 77% (Vijalpore). The class average for Coverage of waste water network services in the 2015 is 43.2 % and has increased by 8.2% since 2010. This is attributed to the increase in coverage of waste water network for the cities listed in the table below.

S. No	Name of City	Coverage (2010)	Coverage (2015)
1	Ankleshwar	32	59
2	Kadi	27	56
3	Bhuj	47	60
4	Bardoli	46	62

Table 3.5: Class B cities showing tremendous growth - Coverage of sewerage network (%)

Graph 3.6: Coverage of sewerage network (%) - Class B cities



- **Class C cities**

- **Coverage of toilet**

The average coverage of toilet in Class C cities in 2015 is 81.1%, which is similar to other class averages and has increased by 20% since 2010. 32 cities have achieved above 70% coverage, only 10 cities namely, Lunavada (41%), Bhachau (54%), Chaklasi (55%), Dwarka (57%), Dehgam(60%), Limbdi (63%), Bagasra (64%), Vyara(67%), Mansa(68%) and Radhanpur(68%) have values below 70%. More than a quarter of the Citieshave above 90% coverage, VallabhVidyanagar ranks the highest with 100 % coverage followed by Rajpipla (99%).

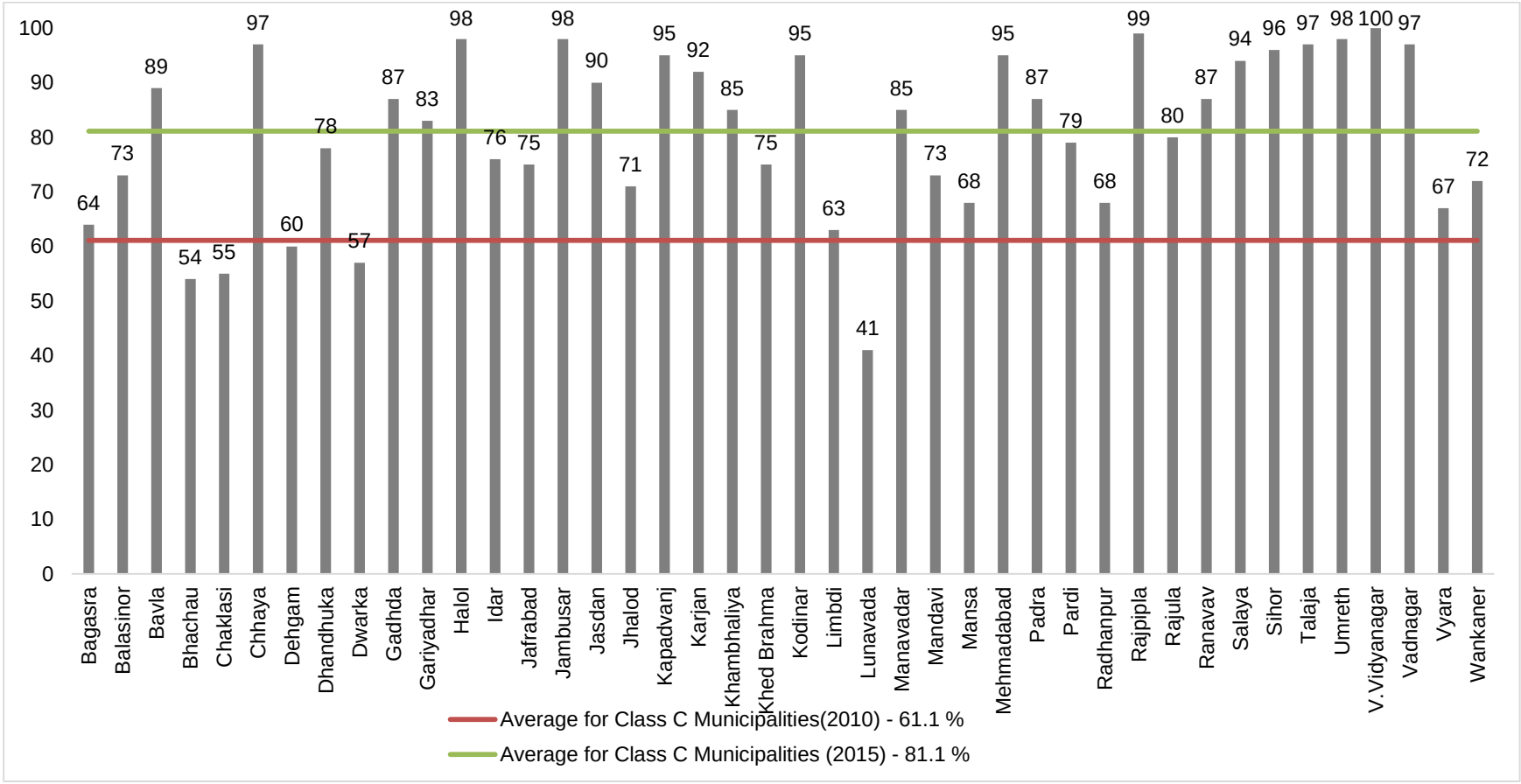
The increase in class average is due to the appreciation in coverage for toilets for the cities listed in the table.

S. No	Name of City	Coverage (2010)	Coverage (2015)
1	V. Vidyanagar	76	100
2	Raipipla	76	99
3	Halol	57	98
4	Talaja	70	97
5	Sihor	80	96
6	Kodimar	62	95
7	Salaya	65	94

8	Padra	49	87
9	Ranavav	41	87
10	Gariyadhar	30	83
11	Manavadar	54	85
11	Khambaia	30	85

Table 3.6: Class C cities showing tremendous growth - Coverage of toilets (%)

Graph 3.7: Coverage of toilets (%) - Class C cities



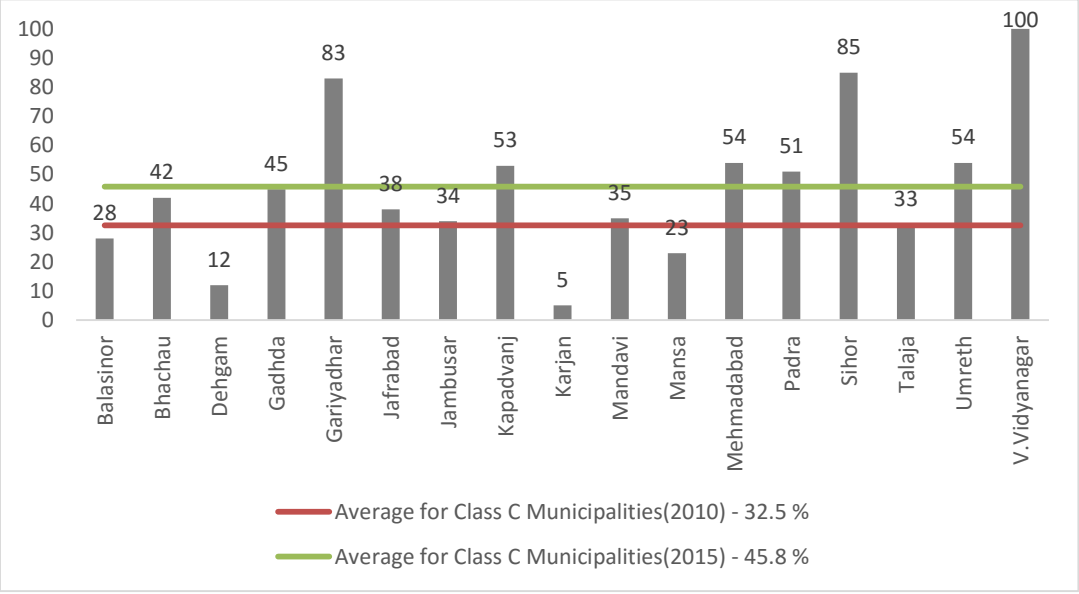
- **Coverage of Waste water Network services**

Data of 17 cities is included in the analysis due to non-existence of sewerage system in the rest of the cities. Similar to the scenario from other classes, the coverage of sewerage connections across Class C cities is also variable, ranging from 5% in Karjan to 100% in VallabhVidyanagar as illustrated in Graph. Most of the cities have a notably higher coverage of individual toilets than sewerage connections, which implies increasing dependence on soak pits/septic tanks. On an average, more than 50% of the households do not have a sewerage connection in Class C cities. Overall there has been an increase of 13.3 % in coverage of waste water networks for Class C cities from the year 2010 to 2015 and this is basically due to improvement in coverage for certain cities. It has also been observed that some cities where sewerage network was nonexistent in 2010 but has services established by 2015. This is illustrated the following table.

S. No	Name of City	Coverage (2010)	Coverage (2015)
1	Kapadganj	0	53
2	Jafrabad	0	38
3	Bhachau	0	42
4	Karjan	0	5
5	Mansa	0	23

Table 3.7: Class C cities showing tremendous growth - Coverage of sewerage network (%)

Graph 3.8: Coverage of sewerage network (%) - Class C cities



- **Class D cities**

- **Coverage of properties with access to individual toilet**

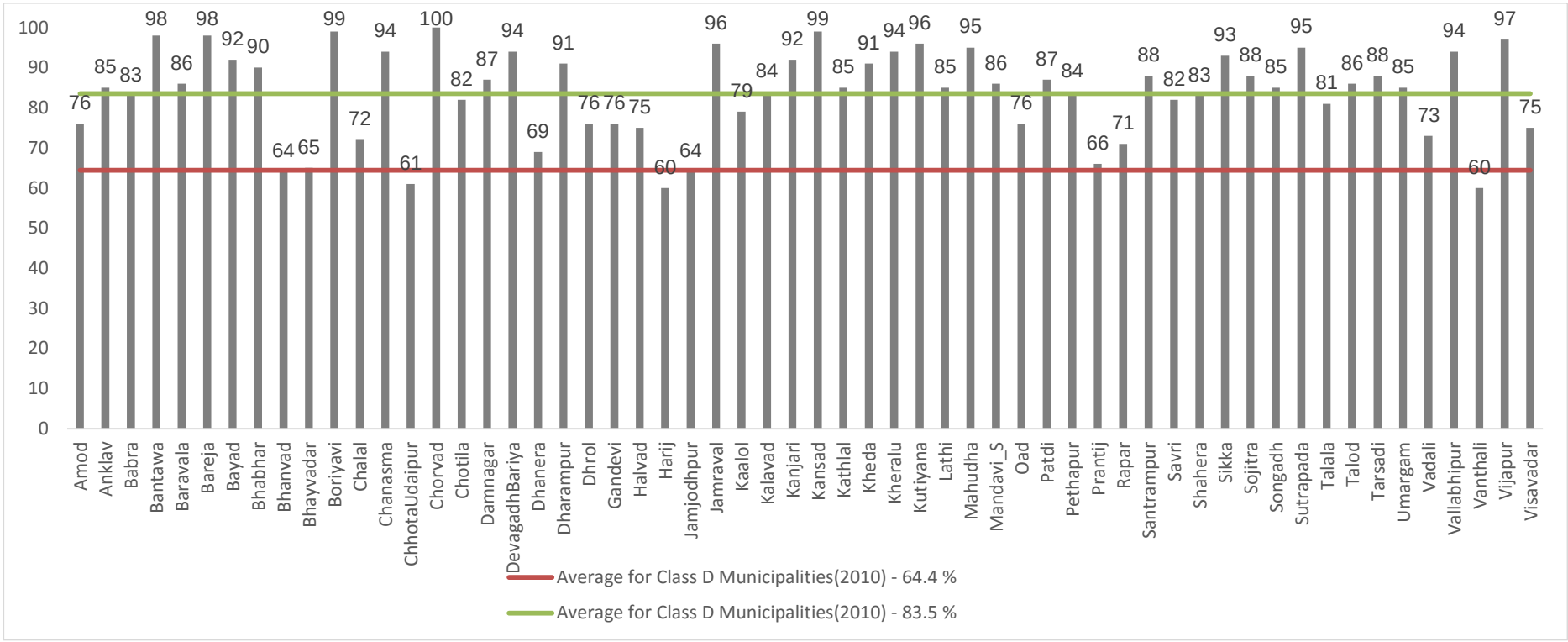
Regarding coverage of individual toilets across Class D cities, data from 58 Cities are analyzed. The class average for coverage in the year 2015 is 83.5% and has increased by 19.1% since 2010. One third of the cities have coverage below 80%, 33 citieshave coverage between 80% to90% and rest have above 90% coverage.Chorvad ranks the highest with 100% coverage as shown below in Graph.

The cities that have showna noticeable increase in coverage of toilets is listed the table below.

S. No	Name of City	Coverage (2010)	Coverage (2015)
1	Chorvad	60	100
2	Boriyavi	39	99
3	DevagadhBariya	60	94
4	Kanjari	33	92
5	Bayad	40	92
6	Kheda	63	91
7	Dharampur	69	91
8	Baravala	40	86
9	Lathi	52	85
10	Anklav	37	85

Table 3.8: Class D cities showing growth - Coverage of toilets (%)

Graph 3.9: Coverage of toilets (%) - Class D cities

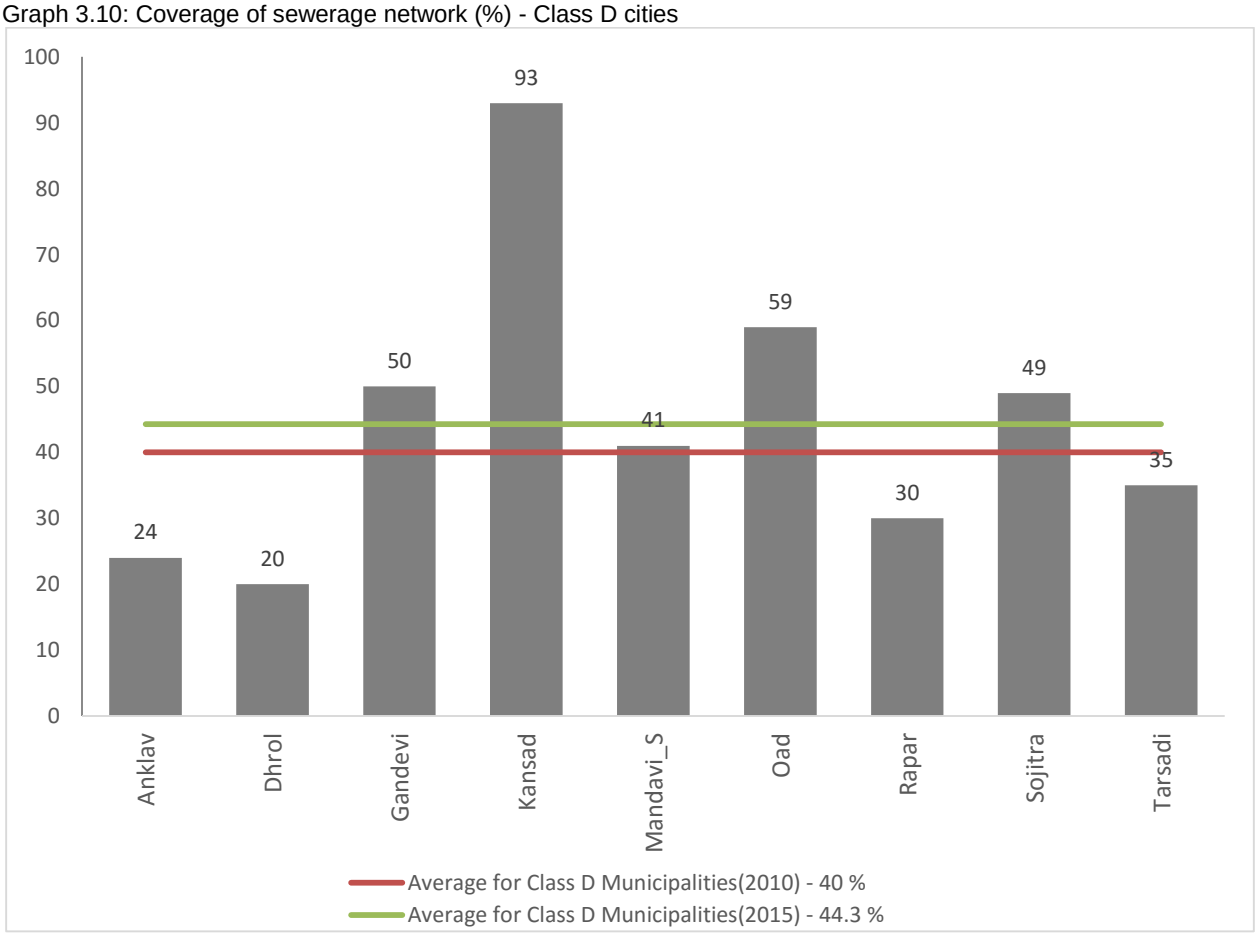


- **Coverage of Waste water Network services**

Regarding coverage of waste water network services, very less information is available for meaningful analysis. Data for only 9 Cities have been analyzed from Class D which range from 20% (Dhrol) 88% (Tarsadi) (Refer Graph) The Class average for coverage of waste water networks has marginal increased from 40 % to 44.3 % over the last five years from 2010 to 2015.

The municipality of Kansad,Oad, Gandevi and Tarsadi shows an increase of 18%, 16%, 14% and 12% respectively for coverage of sewer network. The sewer network coverage inRapar 30% in year 2015 against 0% in year 2010.

Graph 3.10: Coverage of sewerage network (%) - Class D cities



3.3 Service level and Quality

3.3.1 Collection efficiency of waste water network

Collection efficiency is defined as the quantum of waste water collected at the inlet of treatment plant as percentage of total waste water generated in the ULB. Waste water generation is considered as the total water produced, including estimated water use from other sources as given by ULB and excluding losses. Collection efficiency signifies the effectiveness of the network in capturing and conveying it to the treatment plants. Thus, it is not just adequate to have an effective network that collects waste water, but also one that treats the waste water at the end of the network.

3.3.2 Sewage treatment capacity

This is the capacity to treat quantum of waste water to secondary treatment standards (removal of BOD and COD) as percentage of total estimated waste water generated in the ULB.

- **Class A cities**
- **Collection efficiency of waste water network**

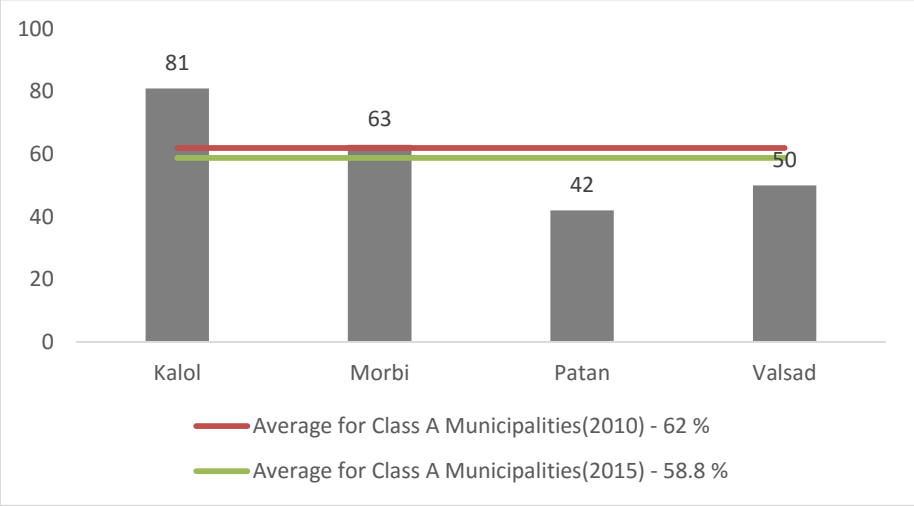
Amongst 18 class A cities, only 4 cities have sewage collection systems. The average for collection efficiency of waste water was 62 % in the year 2010 and this has further reduced to 58.8 % by 2015. The basic reason for decline in collection efficiency is due to decrease in the individual collection efficiency for the following cities listed in the table.

S. No	Name of City	Collection efficiency(2010)	Collection efficiency (2015)
1	Kalol	100	81
2	Valsad	100	50
3	Patan	75	42

Table 3.9: Class D cities showing Decline - Collection efficiency of waste water network (%)

On the contrary Morbi has an excellent increment for collection efficiency for waste water network from 8% in 2010 to 63% in 2015.Among Class A cities Valsad has a secondary treatment plant (STP), whereas Patan, Morbi and Kalol have primary treatment system (Oxidation pond).

Graph 3.11: Collection efficiency of sewerage network (%) - Class A cities



- **Sewage treatment capacity**

Valsad alone has information on capacity for sewage treatment, which is 75 %.

- **Class B cities**

- **Collection efficiency of waste water network**

With Context to Class B Cities data from only 2 cities have been analysed and the rest are not applicable due to lack of sewage treatment systems. Petlad had a collection efficiency of 63% in 2010 and has declined to 15% in 2015. Similarly, Unjha collection efficiency declined from 97% to 36%. As a result of this, the overall collection efficiency has decreased from 60.9 % to 25.6 % from 2010 to 2015.This is mainly due to non-functioning of the sewer network in cities, eventhough there is increase in the number of individual connection increasing the quantum of waste water generated whereas the capacity of collection system remain the same. Only Petladand Unjhahave primary sewagetreatment system in the form of oxidation pond.

- **Sewage treatment capacity**

Sewage Treatment facilities are not available in Class B cities.

- **Class C cities**

- **Collection efficiency of waste water network**

In Class C Cities data from only 2 cities have been analysed and the rest are not applicable due to lack of sewage collection systems. The collection efficacy for Mandavi declined from 74% to 41%and as a result the overall collection efficiency has decreased from 84.6 % to 34.6 % from 2010 to 2015. Similarly as in other Class of cities, the partial functioning or non-functioning of the sewer network and increase in the number of individual connection increasing the quantum of waste water generated whereas the capacity of collection system remain the same has led to decrease in the collection efficiency of waste water network. Only Balasinor and Mandavihaveprimary sewage treatment system in the form of oxidation pond.

- **Sewage treatment capacity**

Sewage Treatment facilities are not available in Class C cities.

- **Class D cities**

- **Collection efficiency of waste water network**

The collection efficiency for Class D cities was 32 % in the year 2010 and unlikely the other class of Cities, there has been an increase of 6.9 % by the year 2015. Anklav show a remarkable increase from 0% to 56 % and has mainly contributed to this overall increase.

In Class D cities; data from only 3 cities Anklav, Gandevi and Mandavi_Shave been analysed for and the rest are not applicable due to lack of sewage collection systems.

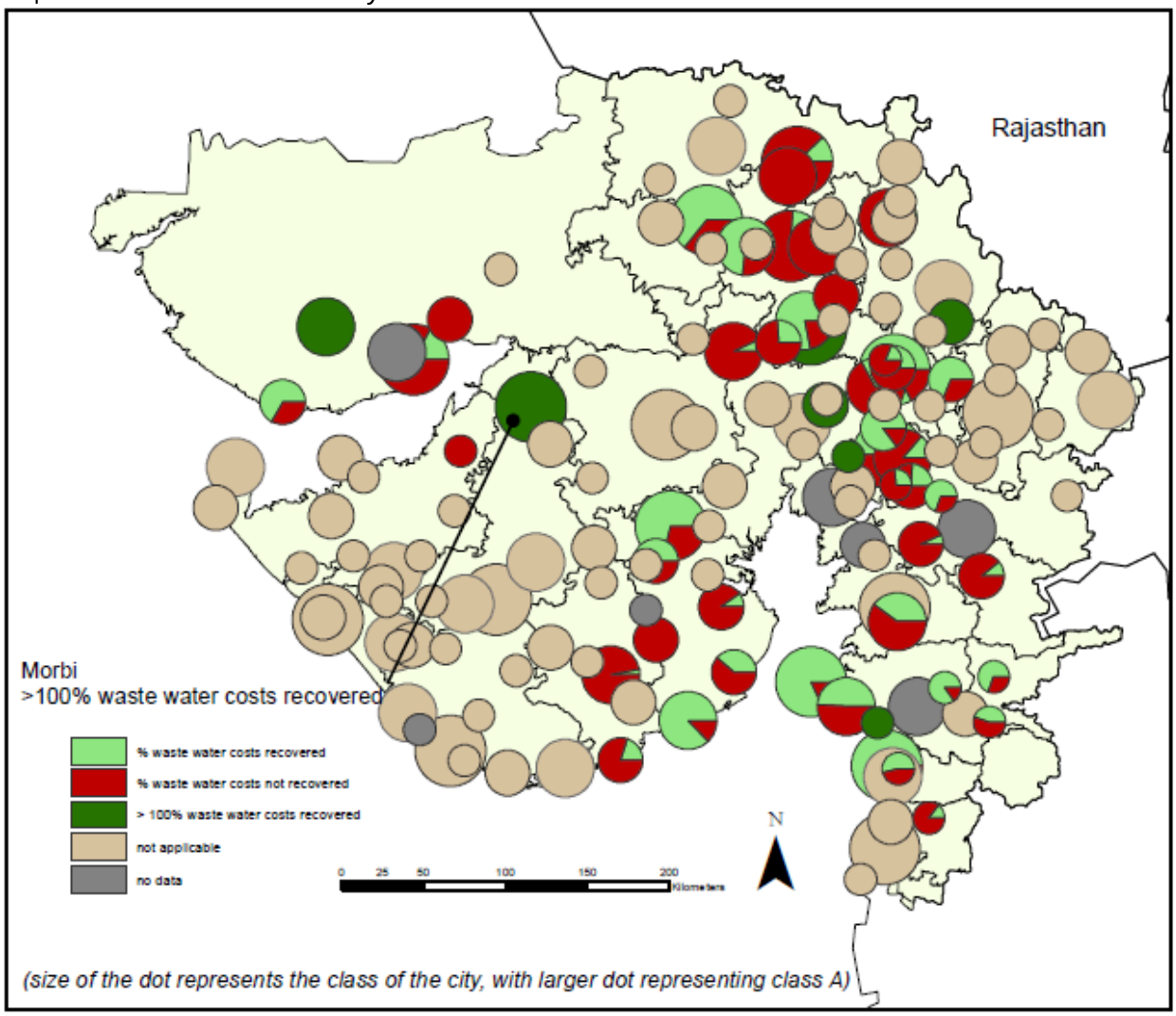
- **Sewage treatment capacity**

Sewage Treatment facilities are not available in Class D cities.

3.4 Financial Management

Financial management has been analyzed through extent of cost recovery. Cost recovery is expressed as wastewater revenues as a percentage of wastewater expenses, for the corresponding time period. Operating revenues includes all waste water related income excluding revenue grants. Operating expenses includes all expenses under waste water services excluding loan interest payment and depreciation.

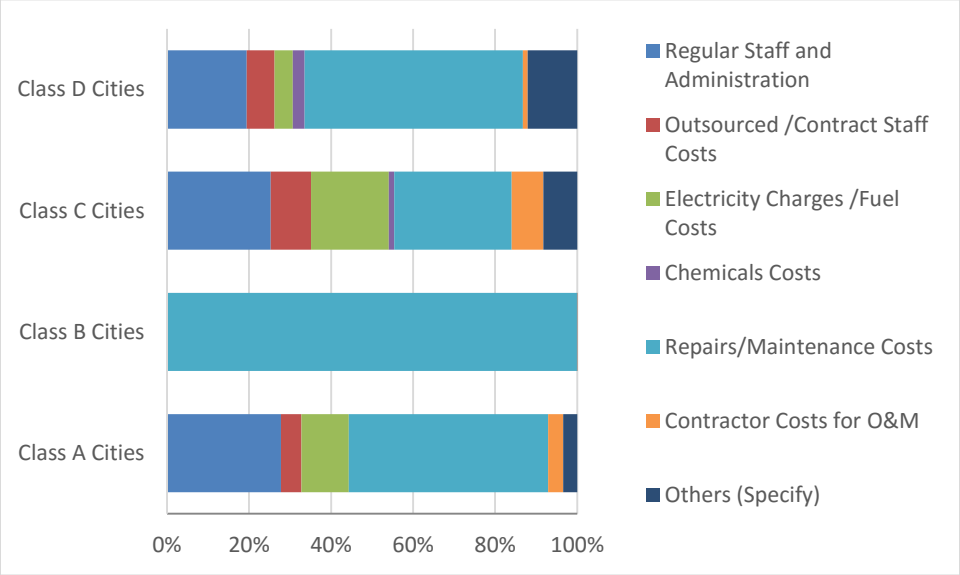
Map 3.3: Extent of cost recovery in waste water services



- **Components of Expenditure of waste water**

Looking at the various components of expenditure in waste water among municipalities, it can be seen that repairs and maintenance costs forms most of the expenses. This is highest among class B cities at almost 100%. This is followed by costs of regular staff and administration.

Graph 3.12: Revenue expenditure components in waste water among cities

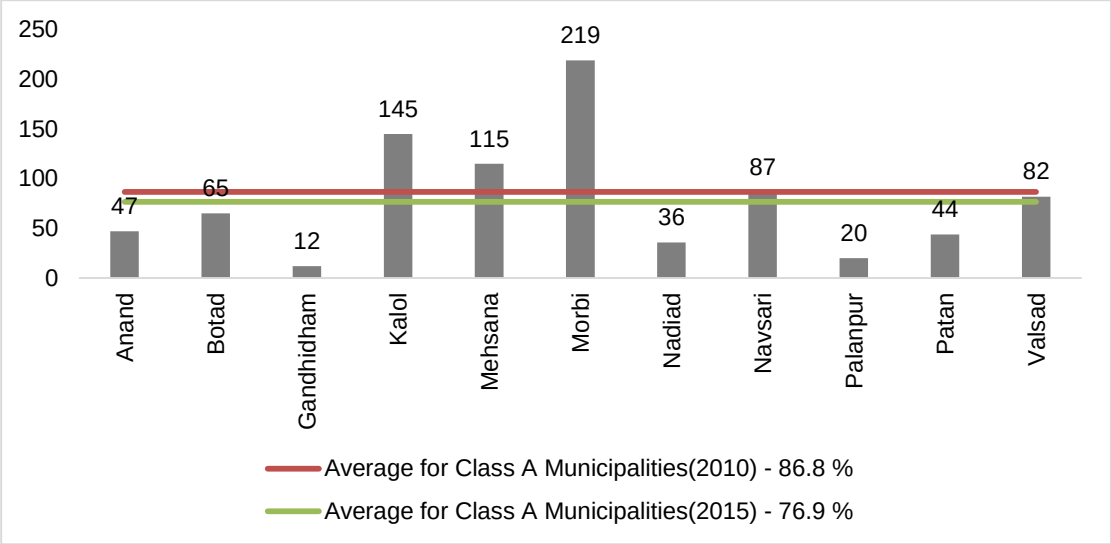


3.4.1 Extent of cost recovery

- **Class A cities**

Data from only 11 Cities are analyzed as the mechanism for cost recovery of waste water services does not exist in the rest 7Cities.The cost recovery is very poor in Gandhidham(12%). On the other hand Kalol, Mehsana and Morbihave very high cost recovery (>100%)in waste water management, as shown in Graph. This is because the revenue demand is higher than operational expenditure of waste water management services for these cities. Overall the average for extent of cost recovery for class Acities in the year 2010 was 86.8 % and it has reduced to 76.9 % by the year 2015.Morbi, Mehsana and Valsad show an increase of 20%, 27% and 22% respectively.

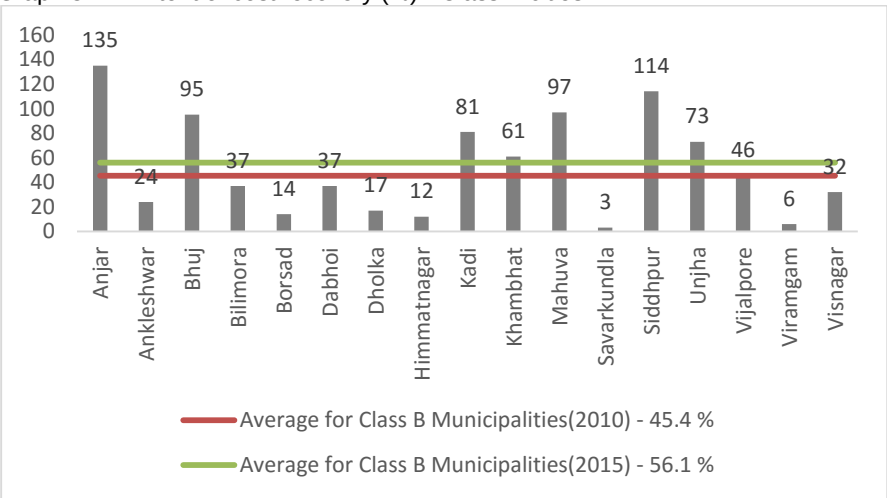
Graph 3.13: Extent of cost recovery (%) - Class A cities



- **Class B cities**

Data from only 17 citiesis analyzed as the mechanism for cost recovery of waste water services does not exist in the remaining cities. More than halfofthe cities analysedhave less than 50 % cost recovery. The cost recovery is very poor 3%(Savarkunda) and 6%(Viramgam) and this is due to the tariff for waste water charges is minimal for these cities. On the other hand Bhuj (95%), Mahuva (97%), and Siddhpur (114%)have shown very high cost recovery in waste water management which also shows a remarkable increase from 2010 by 17%, 71% and 53% respectively. As a result the average for extent of cost recovery for class Bcities has increased by 10.1 % over the last five years.

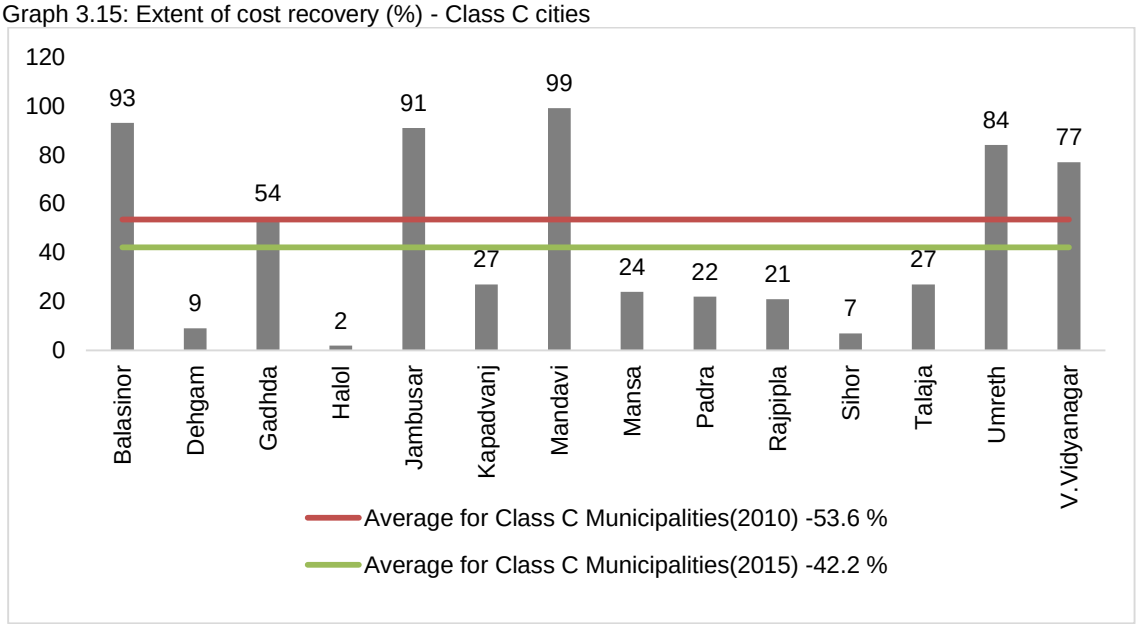
Graph 3.14: Extent of cost recovery (%) - Class B cities



- **Class C cities**

Data for only 14 Cities have been analysed for Class C cities. More than half of the cities have cost recovery below 30%. Halol (2%), Sihor (7%) and Dehgam (9%) having the least extent of cost recovery as the tariff charges is very minimal and the operational expenditure is higher than the taxes collected On the contrary, Jambusar and Balasinor are having cost recovery above 90%. Whereas Mandavi(Kutch) having around 100% cost recovery.

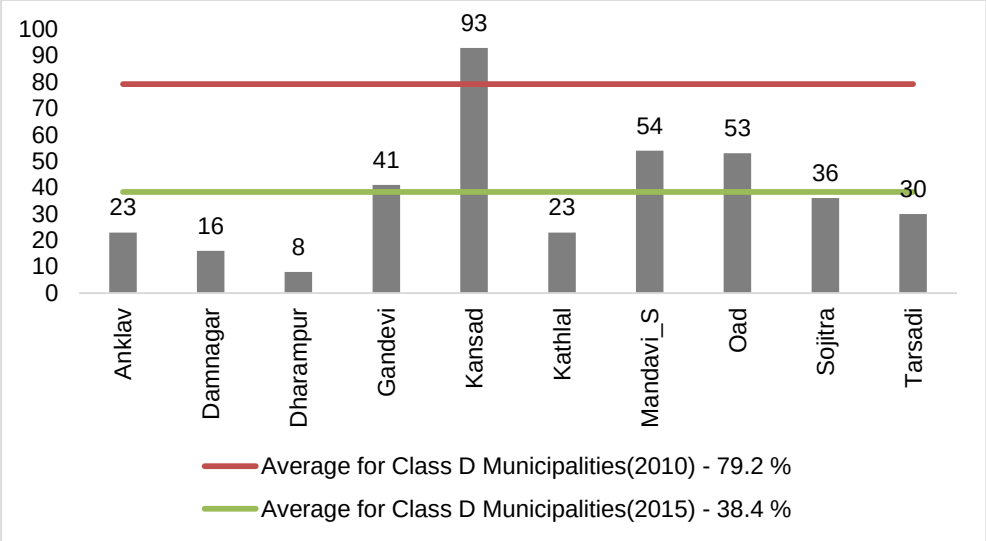
Graph 3.15: Extent of cost recovery (%) - Class C cities



- **Class D cities**

Data for only 10 Cities have been analysed in case of Class D cities. A half of the cities taken into consideration have cost recovery for sewage related services below 40%. On the other hand Kansad shows a very good cost recovery of 93 %. There is a major decline in extent of cost recovery, around 40% from 2010 to 2015. The cities of Kansad, Oad, Gandevi and Anklav has an individual decline by 8%, 72%, 173% and 30% respectively and mainly contributes for the overall decline in extent of cost recovery for waste water services.

Graph 3.16: Extent of cost recovery (%) - Class D cities



3.5 Efficiency in Service Operations

3.5.1 Quality of waste water treatment

The quality of waste water treatment is defined as total number of waste water samples (all key parameters as specified by CPHEEO) that have passed divided by the total number of waste water samples tested at the outlet of the treatment plant.

3.5.2 Extent of reuse and recycling of waste water

The term 'reuse and recycling of waste water' is defined as quantum of waste water recycled or reused as a percentage of waste water collected by the sewerage network.

3.5.3 Efficiency in redressal of customer complaints

Efficiency in redressal of customer complaints is defined as total number of waste water related complaints redressed within time as stipulated in service charter of the ULB, as a percentage of the total number of waste water related complaints received in the year.

3.5.4 Efficiency in collection of sewerage-related charges

It is defined as percentage of current year revenues collected from waste water related taxes and charges as a percentage of total billed amount for waste water.

- **Class A cities**

- **Quality of waste water treatment**

Data are available, except from Valsad which has reported that all samples from its WTP conform with/exceed the required CPHEEO parameters.

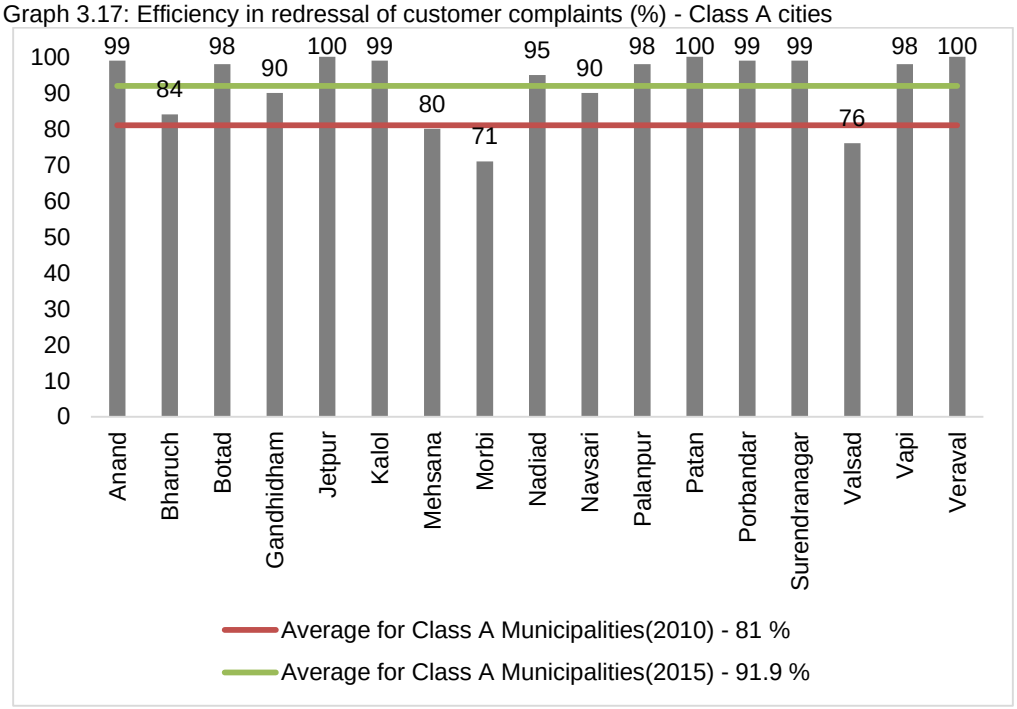
- **Extent of reuse and recycling of waste water**

No data are available, except from Valsad which does not reuse or recycle waste water.

- **Efficiency in redressal of customer complaints**

The average for efficiency in redressal of customer complaints has increased from 81% to 91.9% within a span of 5 years. Data available from 17Cities show very good efficiency (>90%) in redressal of customer complaints, which is above the service level benchmark (80%) except Morbi (71%), Valsad (76%), Mehsana (80%) and Bharuch (84%).

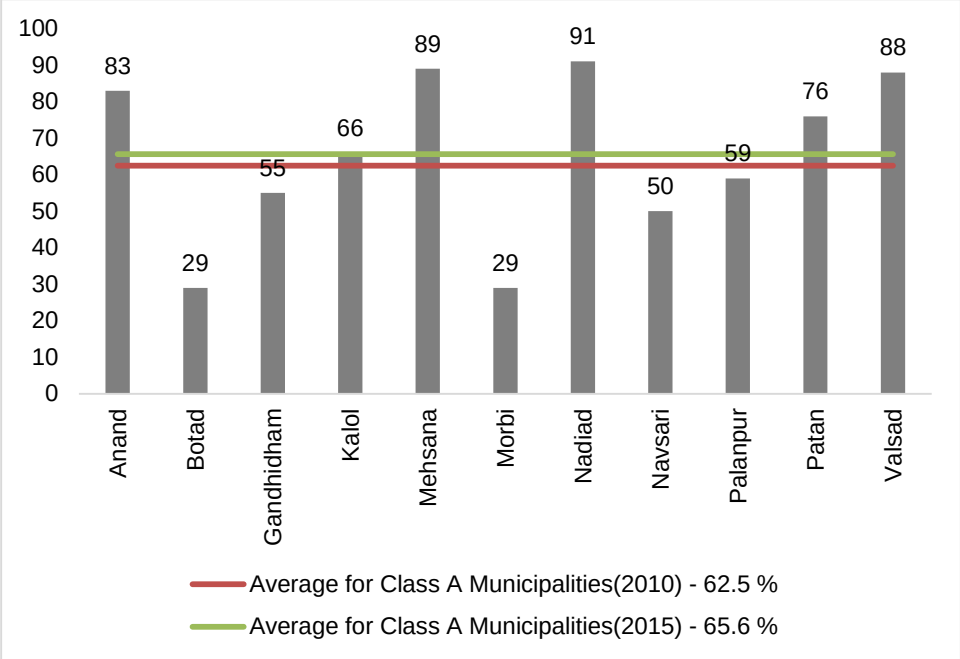
Graph 3.17: Efficiency in redressal of customer complaints (%) - Class A cities



- **Efficiency in collection of sewerage-related charges**

Data from 11 Citieshave been analyzed as these cities have sewerage network and they have levied sewerage charges. Rest 7 Cities neither have sewerage system nor have levied sewerage related charges. The average efficiency in class A is66% which very low as compare to service level benchmark (90%). The collection efficiency ranges from 29% (Botad and Morbi) to 91 % (Nadiad). (Refer Graph). Apparently there has been an increase of efficiency from 81% (2010) to 92% (2015). Palanpur shows an immense growth of 56% followed by Nadiad (25%) for efficiency in collection of sewer related charges over last five years. WhereasGandhidham, Navsari and Morbi have shown decline of 30%, 28% and 19 % from 2010 to 2015.

Graph 3.18: Efficiency in collection of sewer related charges (%) - Class A cities



- **Class B cities**

- **Quality of waste water treatment**

Waste water treatment facilities are not available for class B cities.

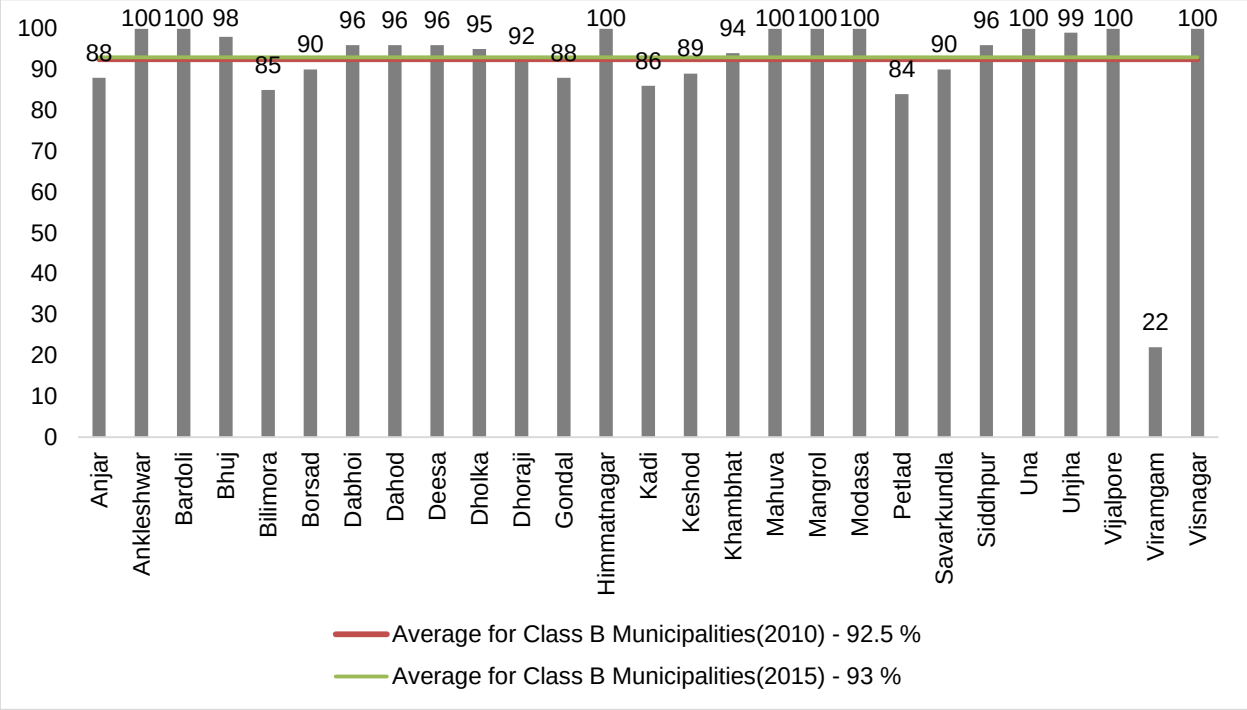
- **Extent of reuse and recycling of waste water**

Class B cities do not have services pertaining to reuse or recycle of waste water.

- **Efficiency in redressal of customer complaints**

The class average for efficiency in redressal of customer complaints for class B cities almost remained the same from 2010 to 2015. Out of the 27 cities analysed, one third has 100% efficiency, more than one third has efficiency lying in the range of 90-100%. Viramgam has the least efficiency of 22% followed by Petlad(84%), Bilimora (85%), Kadi (86%), Anjar&Gondai (88%) and Keshod (89%).

Graph 3.19: Efficiency in redressal of customer complaints (%) - Class B cities



- **Efficiency in collection of sewerage-related charges**

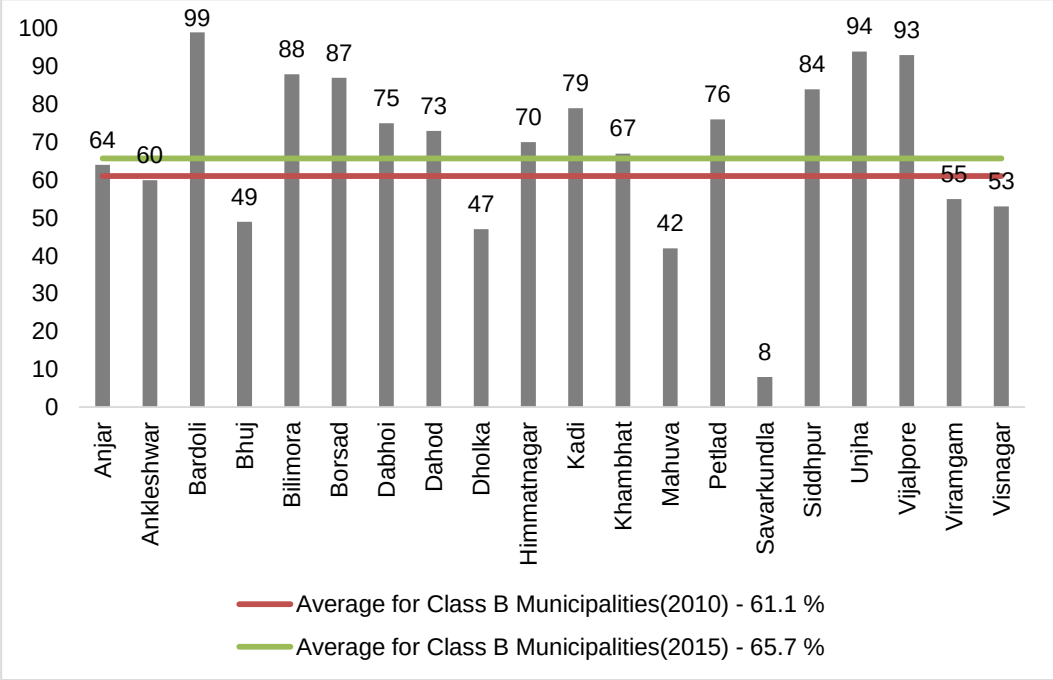
20 Cities of Class B have been analysed for information on sewerage tax collection, whereas in 9Citiessewerage tax is not levied, hence not included in the analysis. The class average for collection efficiency is 66% and ranges between 8% (Savarkundla) to 99% (Bardoli).Cities such as Siddhpur (84%), Borsad (87%), Bilimora (88%), Vijalpore (93%), Unjha (94%) and Bardoli (99%) have showngood collection efficiencies.

The following table lists the cities which have impacted on the overall increase in collection efficiency of sewerage related charges from 2010 to 2015.

S. No	Name of City	Efficiency (2010)	Efficiency (2015)
1	Borsad	63	87
2	Kadi	57	79
3	Visnagar	39	53
4	Dholka	16	47

Table 3.10: Cities showing increase in collection efficiency of sewerage related charges (%) - Class B cities

Graph 3.20: Efficiency in collection of sewer related charges (%) - Class B cities



- **Class C cities**
- **Quality of waste water treatment**

Waste water treatment facilities are not available for Class C cities.

- **Extent of reuse and recycling of waste water**

Class C cities do not reuse or recycle waste water.

- **Efficiency in redressal of customer complaints**

Analysis for 37 cities revealed excellent 100% or near 100% efficiency in redressal of customer complaints, except Salaya (67%), Talaja (75%), Halol(80%), Kodinar (80%) and Manavadar (84%). There is a marginal increase or no increase in the efficiency of redressal of customer complaints from 2010 to 2015

Graph 3.21: Efficiency in redressal of customer complaints (%) - Class C cities

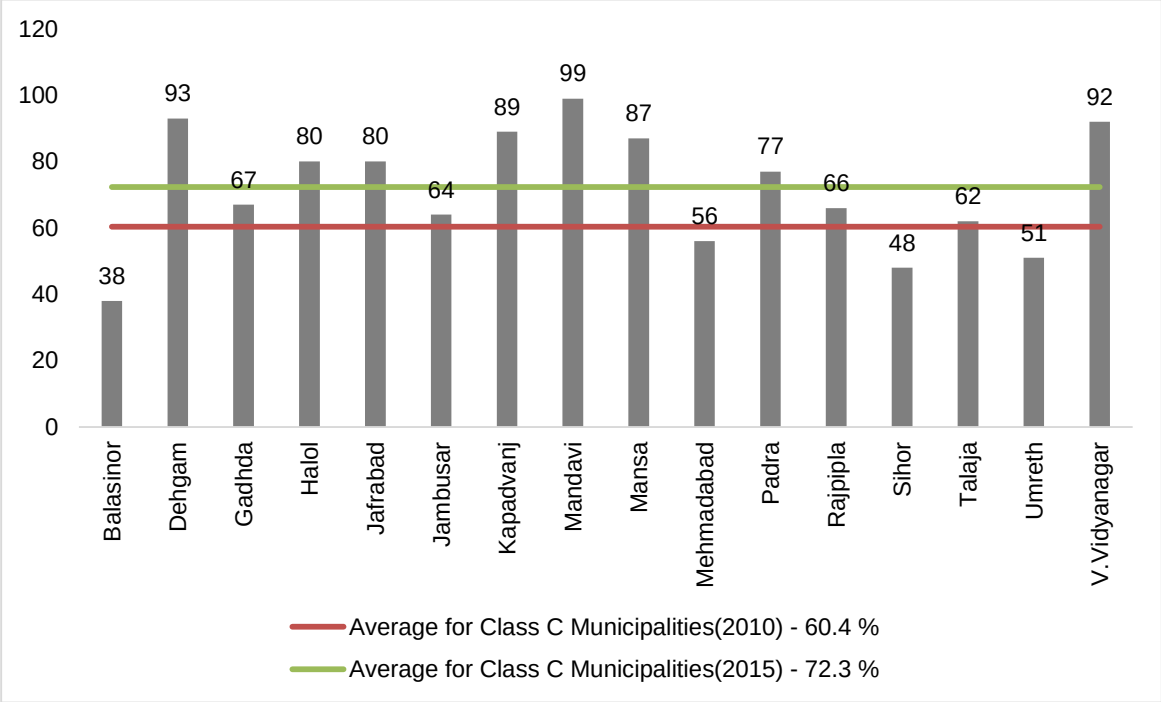
- **Efficiency in collection of sewerage-related charges**

Data from 16 Cities is analyzed and the average collection efficiency in class C is 72%. However, the efficiency is varied from city to city ranging from 38% to 99% across the class C cities. Only two cities Balasinor (38%) and Sihor(42%) have less than 50% collection efficiency, whereas VallabhVidyanagar (92%), Dehgam(93%) and Mandavi-Kutch (99%) have reported more than the service level benchmark that is 90%. Remaining 26Cities are not considered for analysis due to non-existence of sewerage taxes/charges.

S. No	Name of City	Efficiency (2010)	Efficiency (2015)
1	Kapadvanj	65	89
2	Jambusar	100	64
3	Memdabad	15	56
4	Jafrabad	12	48

Table 3.11: Cities showing increase in efficiency in collection of sewer related charges (%) - Class C cities

Graph 3.22: Efficiency in collection of sewer related charges (%) - Class C cities



- **Class D cities**
- **Quality of waste water treatment**

Waste water treatment facilities are not available for Class D Cities.

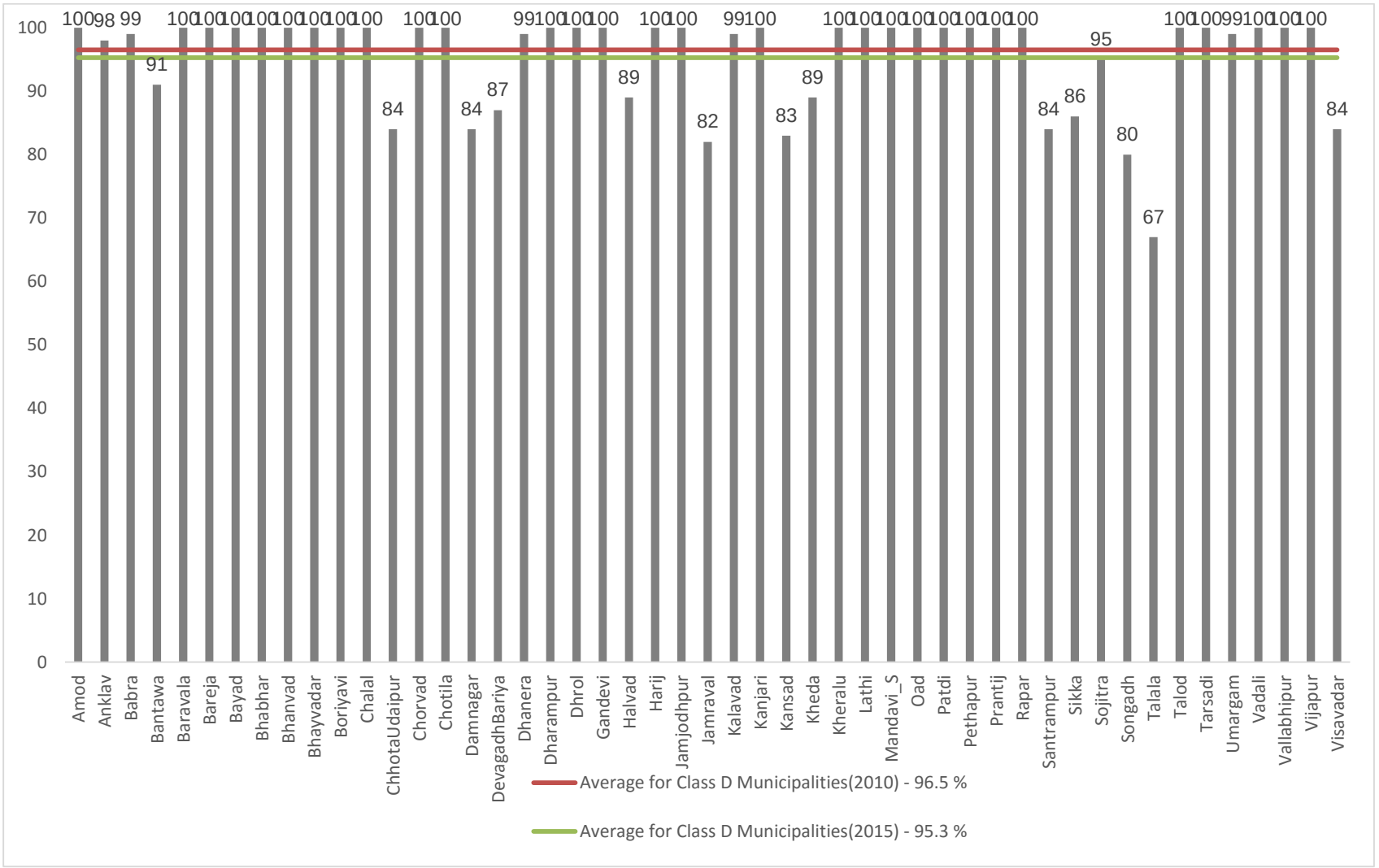
- **Extent of reuse and recycling of waste water**

Class B cities do not reuse or recycle waste water.

- **Efficiency in redressal of customer complaints**

Among Class D Cities, 30 cities have shown 100% and five cities have shown 98%-99% efficiency in complaint redressal system. The remaining 13 cities have efficiency lying within the range of 80-95% on complaints received and redressed. The data of remaining 10 cities have not been analysed due to non- availability of data.20 Citieshave shown no changes and retained 100% efficiency in complaint redressal over last five years.

Graph 3.23: Efficiency in redressal of customer complaints (%) - Class D cities



- **Efficiency in collection of sewerage-related charges**

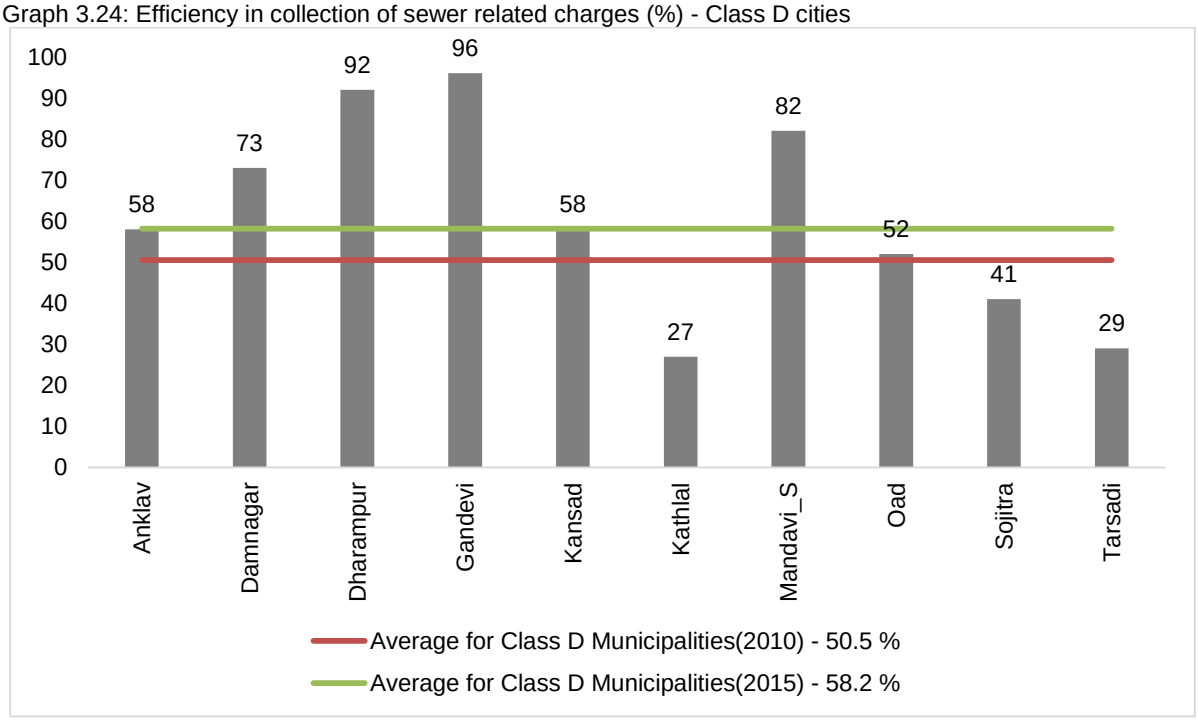
As shown in Graph, data from only 10Cities are analyzed and ranges from 27% (Kathlal) to 96%(Gandevi). Sewerage taxes/ charges are not imposed more than 80% Cities of class D. The average for efficiency in collection of sewer related charges increased from 50.5% in 2010 to 58.2% in 2015.

The following table lists the Citieswho have shown tremendous increase in collection efficiency from 2010 to 2015 which has impact on the overall increase in for Class C Cities.

S. No	Name of City	Efficiency (2010)	Efficiency (2015)
1	Mandavi_S	17	82
2	Damnagar	43	73
3	Kansad	22	58

Table 3.12: Coverage of individual toilets in slums - Class C cities

Graph 3.24: Efficiency in collection of sewer related charges (%) - Class D cities



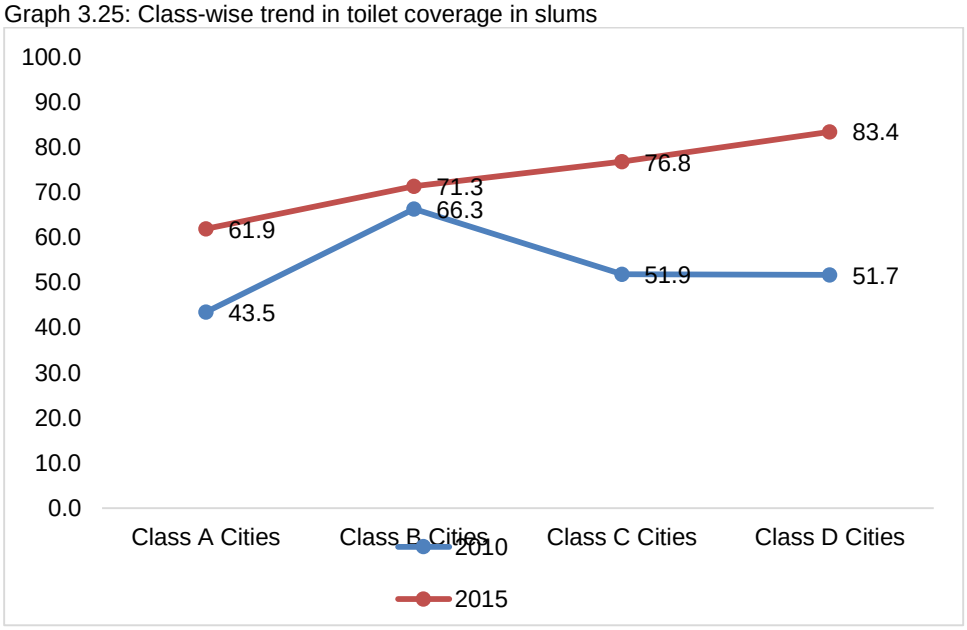
3.6 Equity in waste water services

3.6.1 Coverage of toilets in slums

Coverage of toilets in slums is expressed as total households in slum settlements with individual toilets as percentage of total households in slum settlements in the ULB.

There is a huge difference in coverage of toilets in slums across the years 2010 and 2015. There is an increase in toilet coverage in slums owing to concerted efforts of Govt. of Gujarat under the programs namely Nirmal Gujarat Sauchalayayojana (NGSY) and Mahatma Gandhi Swachhata mission (MGSM). Class D municipalities show the maximum toilet coverage in slums at 83.4% while Class A cities show least coverage at 61.9%.

Graph 3.25: Class-wise trend in toilet coverage in slums



3.6.2 Coverage of sewerage connections in slums

Coverage of sewerage connections in slums denotes total number of households in slum settlements with sewerage connections as percentage of total households in all slum settlements in the ULB.

There is marginal difference in coverage of sewerage connections in slums across 2010 and 2015 and across classes. Class B municipalities show the maximum coverage of sewerage connections in slums at 62.5% while Class D cities show least coverage at 29.3%. Class B municipalities show a high average due to high coverage in Borsad, Mahuva and Vijalpore.

Graph 3.26: Class-wise trend in Coverage of sewerage connections in slums

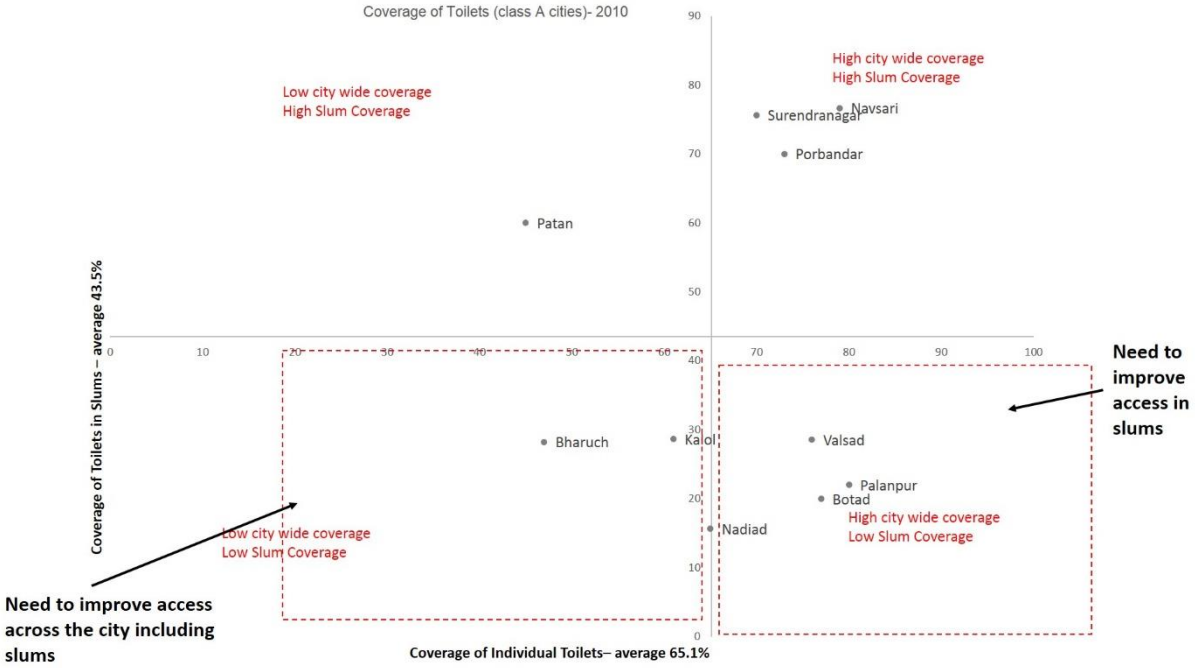
- **Class A cities**
- **Coverage of toilets in slums**

Data from 12 cities show variability ranging from 0% (Vapi) to 100% (Kalol). Overall, the coverage of toilets in slums is 62% and is less than the class A average (82%). Only Porbandar and Jetpur have comparable coverage of toilets in slums to that of the overall city.

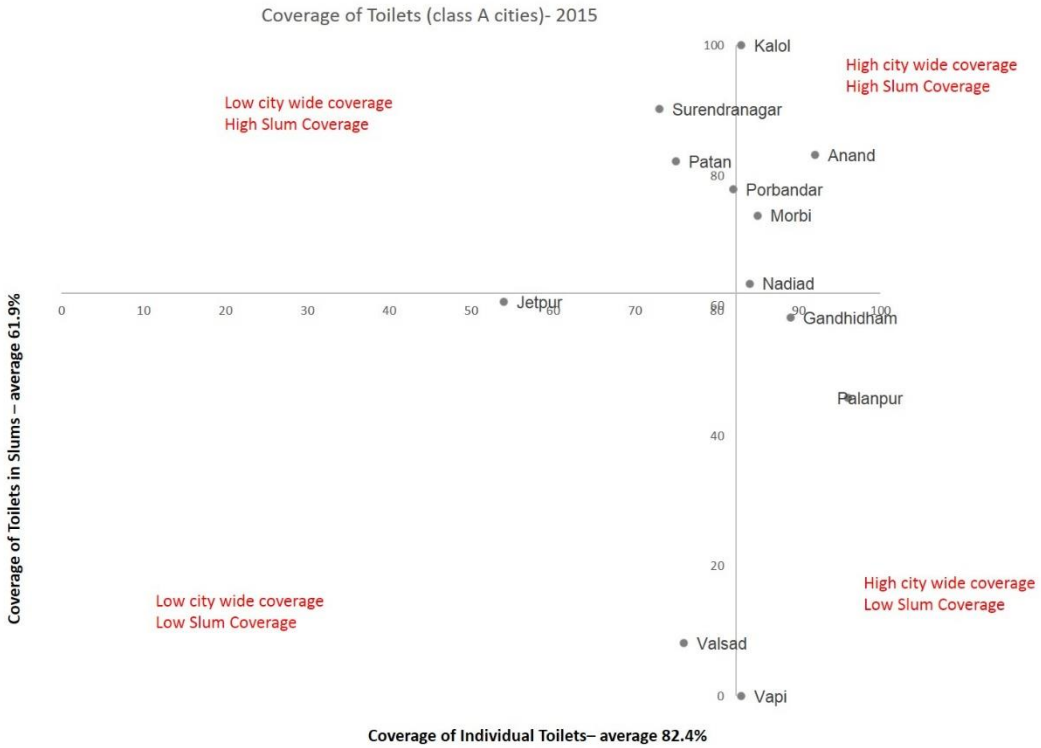
Vapi (83%) and Valsad (76%) have relatively high coverage of toilets in the city than their coverage in slums. Whereas Surendranagar (90%) and Kalol (100%) has higher coverage of toilets in slums compared to the coverage of toilets in the city.

The scatter diagrams in Graph 27 and 28 shows that Surendranagar falls in the quadrant with Low city wide coverage and a High slum coverage for the year 2010. Subsequently, improvement in city wide coverage of toilets due to government intervention Surendranagar falls in the quadrant with high city wide coverage and a high slum coverage for the year 2015.

Graph 3.27: Coverage of individual toilets in slums (2010) - Class A cities



Graph 3.28: Coverage of individual toilets in slums (2015) - Class A cities

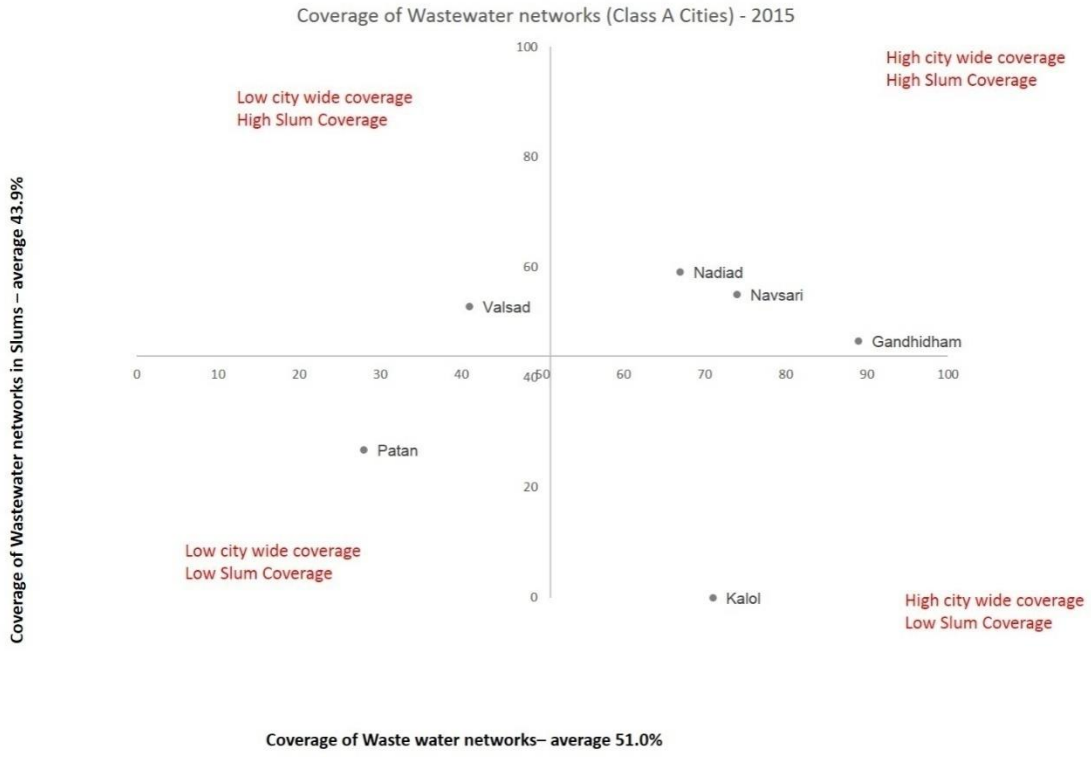


- **Coverage of sewerage connections in slums**

Data from only five cities are analysed. Overall the coverage of sewerage network in slums is 44% and is lesser than the overall city average for Class A cities (51%). The data analysis seem to reflect a highly variable range from kalol (0%) to Nadiad (59%). Only Nadiad and Patanhave comparable sewerage network in slums to the coverage of city.

Kalol (71%) and Gandhidham (89%) have relatively high coverage of Sewerage network in the city than their coverage in slums which is 0% and 47% respectively. Whereas, only Valsad (53%) has higher coverage of sewerage network in slums compared to the coverage in the city (41%).

Graph 3.29: Coverage of wastewater network in slums (2015) - Class A cities



- **Class B cities**

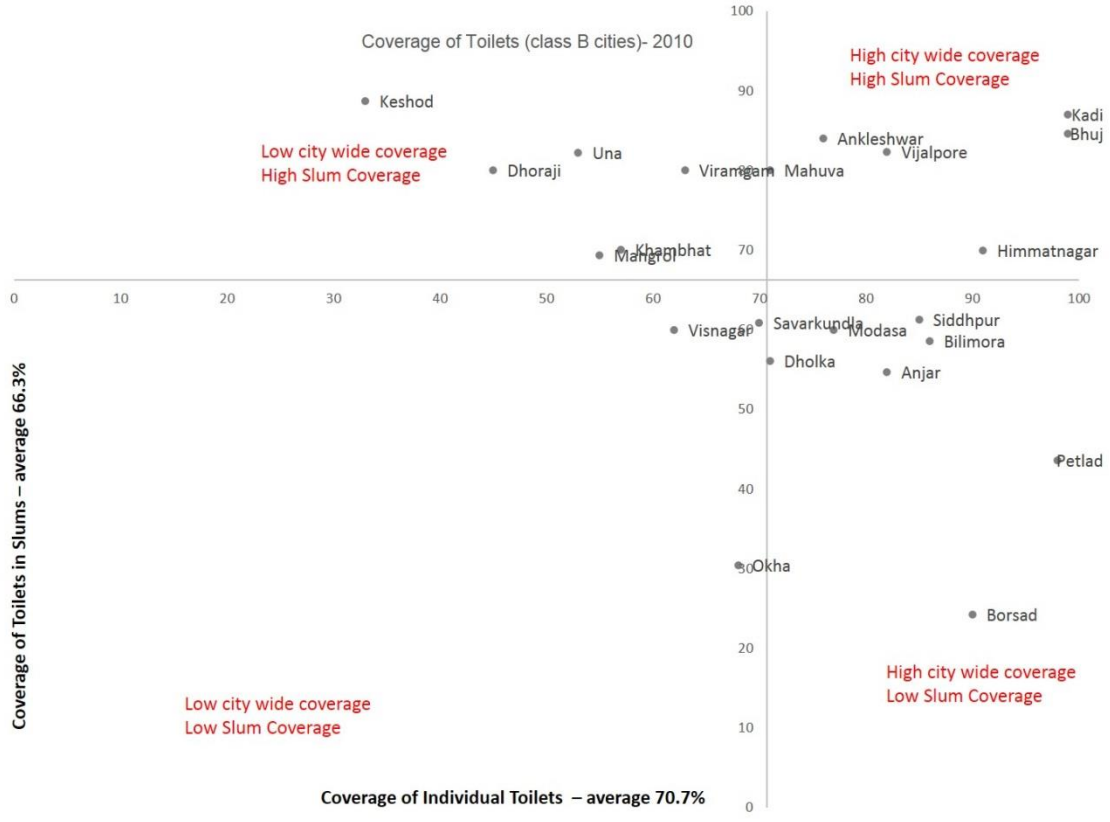
- **Coverage of toilets in slums**

24 cities are analysed and as seen earlier, the data are extremely variable, ranging from 0% to 100%. The average toilet coverage across slums of Class B cities is 71% and is less compared the Class average (84%) across cities.

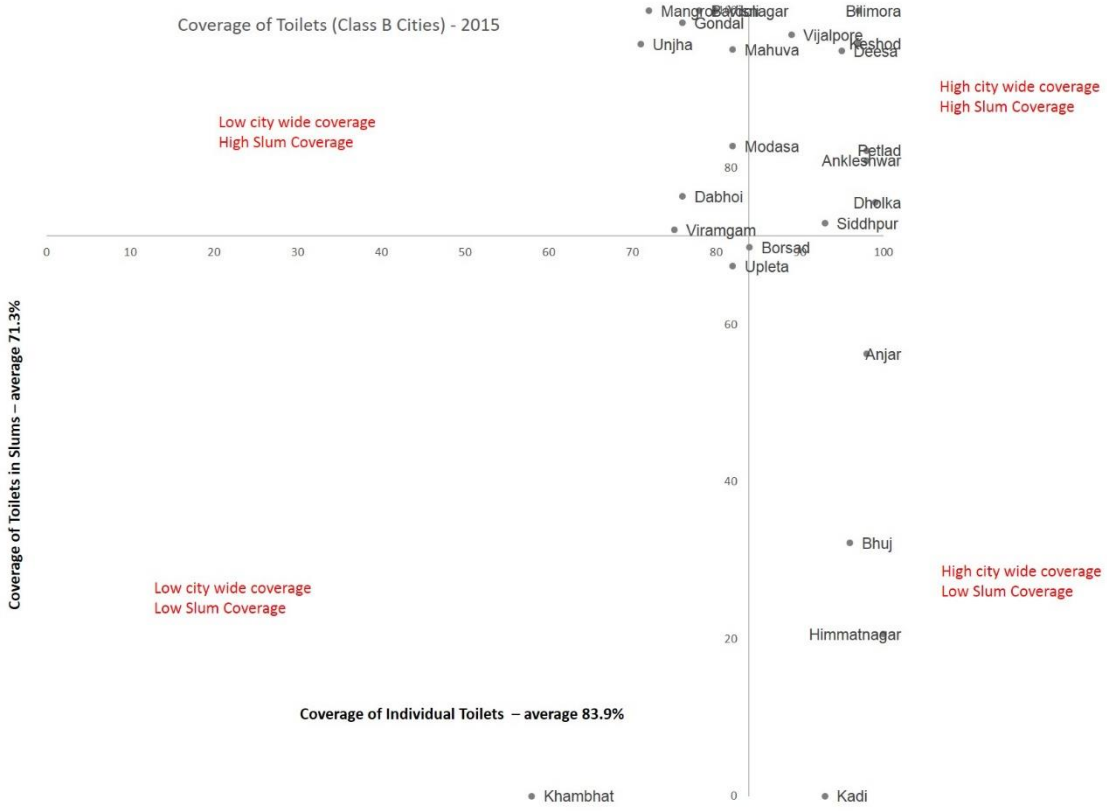
A quarter of the cities has values below 70%. Bardili, Bilimora, Mangrol and Visnagar have achieved 100% coverage in slums, and is higher than the coverage of toilets in overall city. Keshod, Deesa, Dabhoi and viramgam have comparable coverage of toilets in slums as compared to the city.

The scatter graph 30 shows that Petlad and Borsadhas been inequitable in providing toilets in slums for 2010. Petlad showed a transition to a high city wide coverage and a high slum coverage for the year 2015. Borsad on the other hand showed a decline from high city coverage to a low city coverage, toilet coverage in slums remaining low for both the years.

Graph 3.30: Coverage of individual toilets in slums (2010) - Class B cities



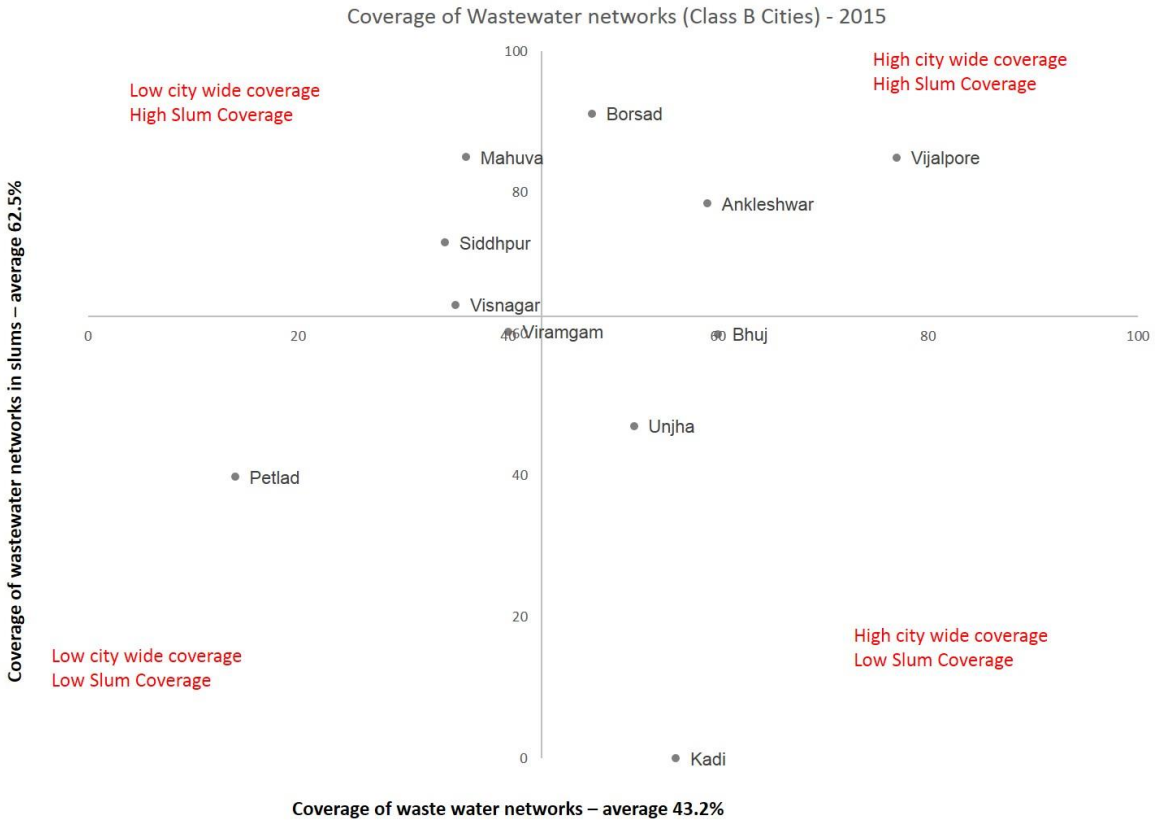
Graph 3.31: Coverage of individual toilets in slums (2015) - Class B cities



- **Coverage of sewerage connections in slums**

Data from only 11 cities are available for analysis, among which Kadi shows no sewerage connections in slums whereas the city has 56% coverage of sewerage network in the city. Coverage of sewerage network in slums is higher than overall city coverage for Viramgam, Visnagar, Siddhpur, Ankleshwar, Vijalpore, Petlad, Mahuva and Borsad. Only Bhuj has comparable coverage of sewerage connections in slums compared to the city.

Graph 3.32: Coverage of waste water networks in slums (2015) - Class B cities



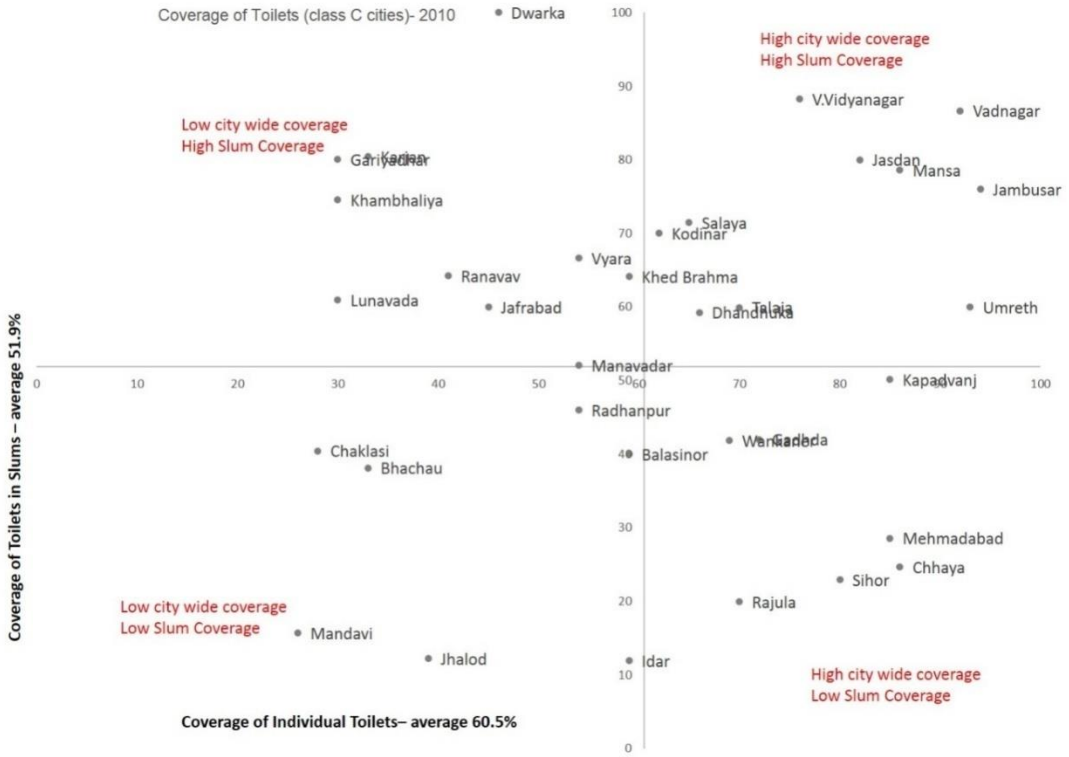
- **Class C cities**

- **Coverage of toilets in slums**

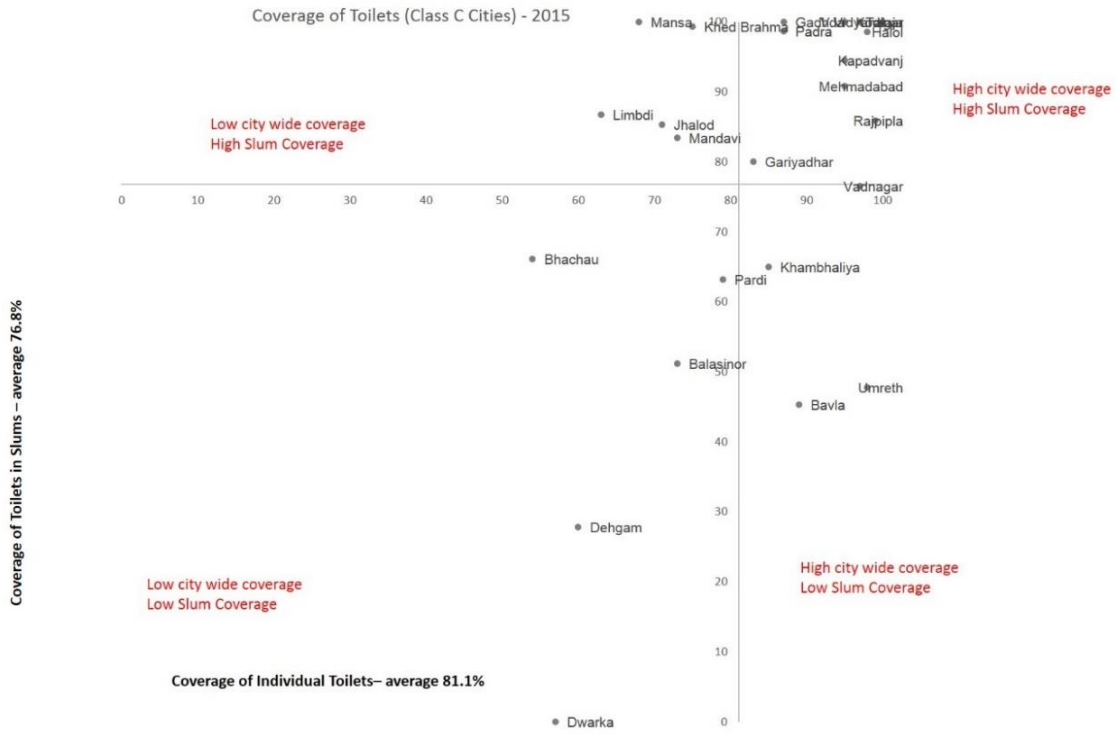
24 cities analyzed seem to have a highly variable range from Dwarka(0%) to 100% in Gadhda, Kodinar, Mansa, Talaja and V. Vidyanagar. In terms of equity, there is inequity in Bavla and Dehgam where slum coverage is below 50% and coverage in overall cities are above 85%. In cities like Gariyadhar, Rajpipla, Kapadvanj, Halol, Kodinar, and V. Vidyanagar where coverage of toilets in slums and in cities are above 80%, it means there is marginal difference in coverage. On the other hand, in cities like Mehmadabad, Padra, Gadhada, Talaja, Mansa, Khed Brahma, Mandavi, and Vadanagar coverage of toilets in slums is higher than the overall city coverage.

The scatter graph 33 shows that Umrethhas been inequitable in providing toilets in slums and Jhelod falls in the quadrant with Low city wide coverage and a low slum coverage for the year 2010. Umreth has been successful in providing equity in terms of coverage of toilets in 2015. Whereas Jhalod showed a transition to a high slum coverage keeping city wide coverage low.

Graph 3.33: Coverage of individual toilets in slums (2010) - Class C cities



Graph 3.34: Coverage of individual toilets in slums (2015) - Class C cities

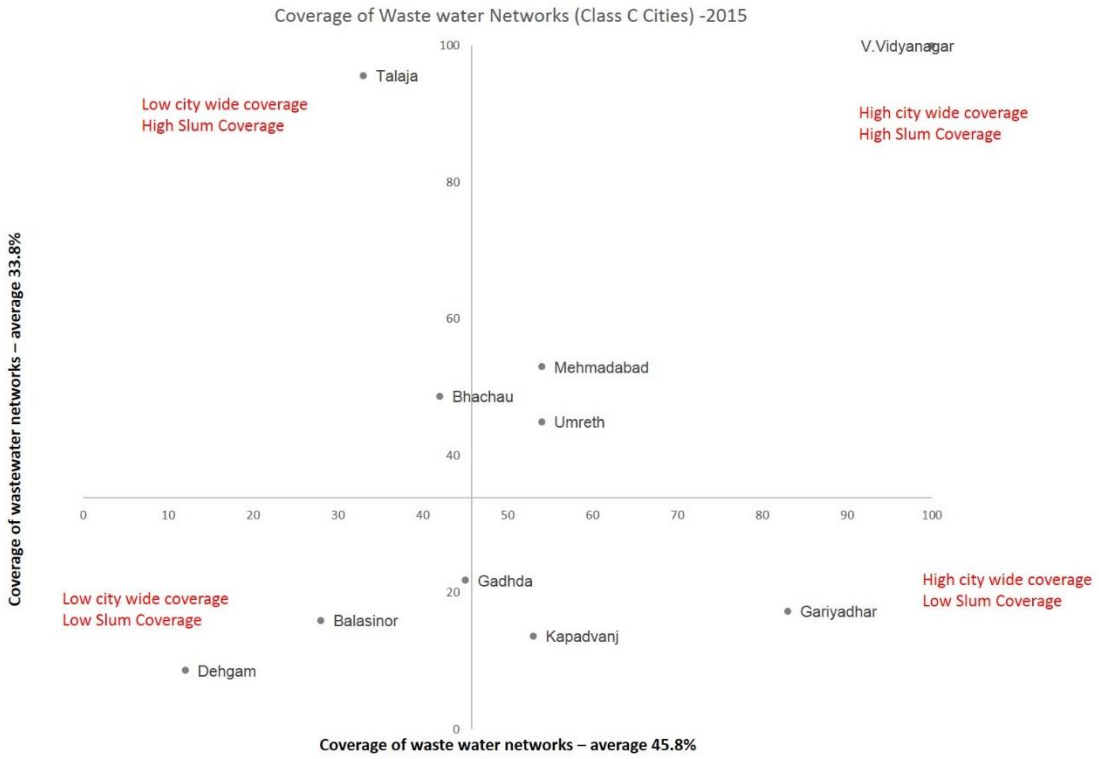


- **Coverage of sewerage connections in slums**

Only 17 cities have sewerage systems and 10 have sewerage connections in slum settlement ranging from 9% to 100% coverage. Talaja and Bhachau have reported very high coverage in slums compared to coverage in overall cities.

There is high inequity in coverage of sewerage network in overall city and in slums for Kapadvanj(53% and 14%), Gariyadhar (83% and 17%) and Gadhda (45% and 22%). Dehgam has a very low coverage of 9% in slums and 12% at the city level. V. Vidyanagar reported same coverage in city and in slum settlement (100%). Only Mehmedabadhave comparable data from the total city and slums regarding coverage of sewerage network.

Graph 3.35: Coverage of waste water network in slums (2015) - Class C cities



- **Class D cities**

- **Coverage of toilets in slums**

The data pertaining to coverage of toilets in slum settlements are available for 32 cities and analysed. The class average coverage of toilets in slums is 50%, much lower than the coverage in ULB 83.5%.

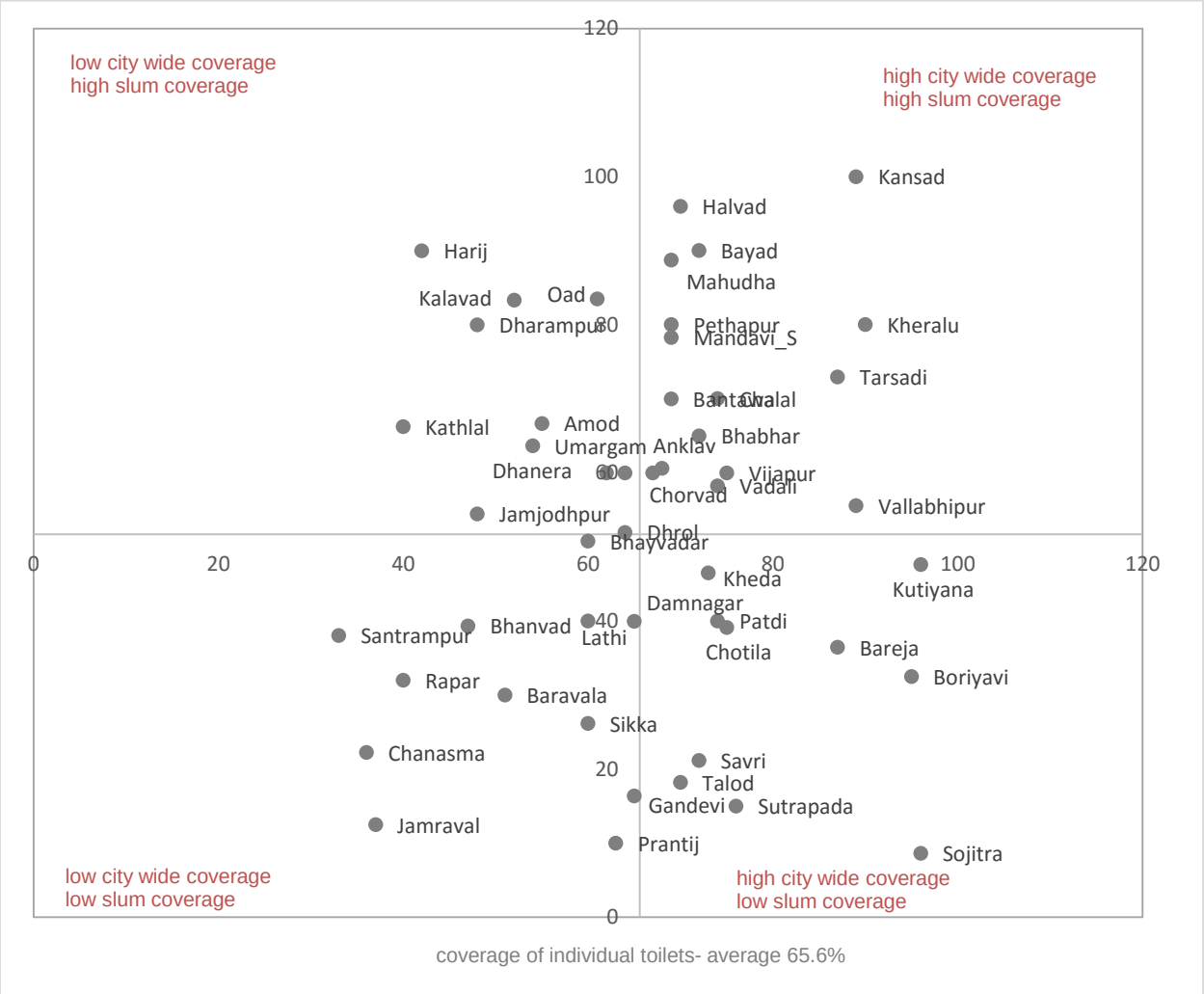
There is inequity in Jamraval, Kheralu and Sikka, where toilet coverage in ULB is greater than 90% and slum coverage is less than 60%. There is marginal difference in coverage of toilets in cities and in slums for (Kalavad 84% and 83%), Mahudha (95% and 98%), Boriyavi (99% and

100%). Kansad(99%) and Vijapur (97%) reported same coverage in cities and in slum settlement.

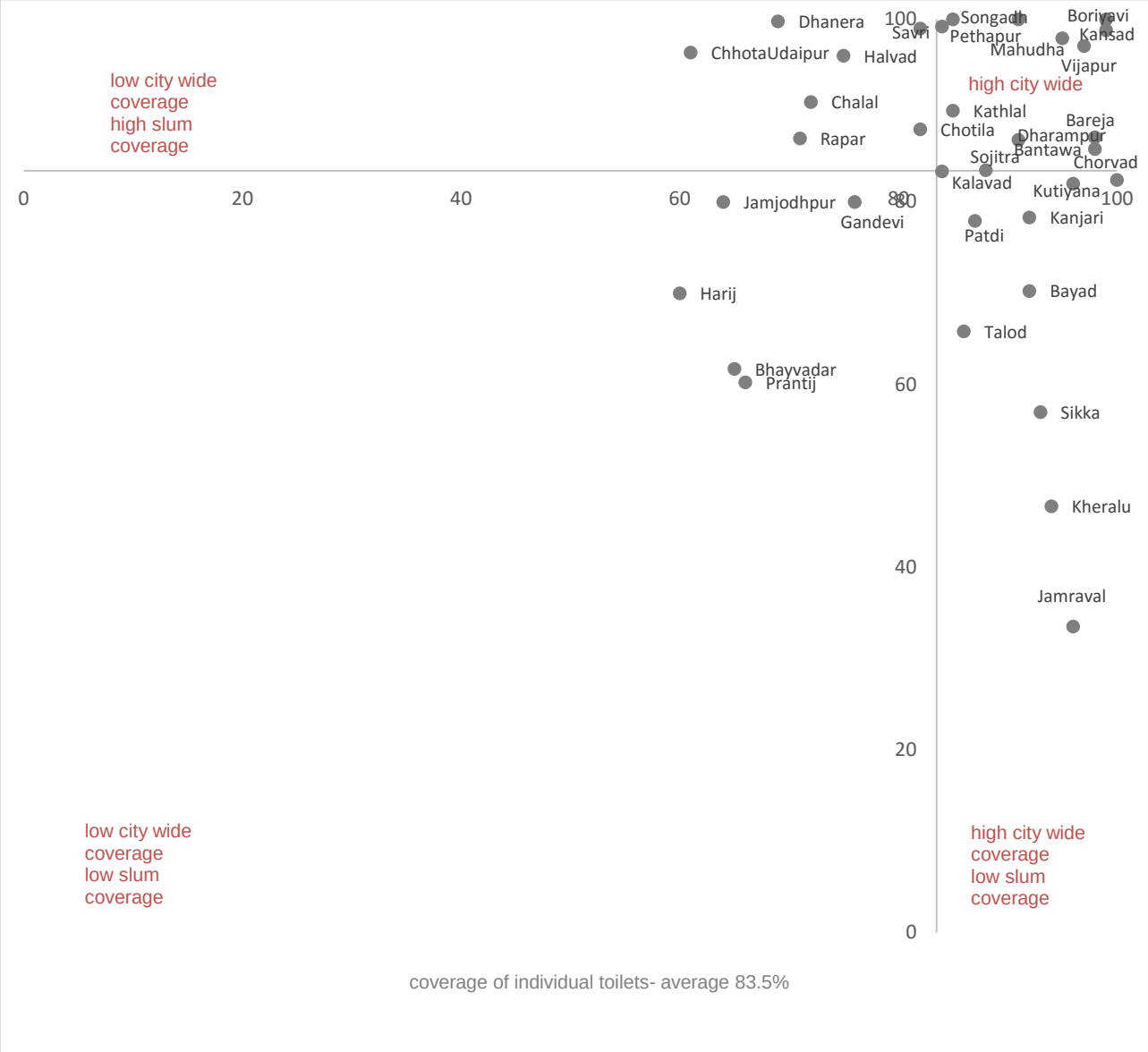
Kheda, Songadh, Dhanera, Pethapur, Savri, ChotaUdipur, Chalal and Rapar reported higher coverage in slum than coverage of toilets in overall cities.

The scatter diagrams in Graph 36 and 37 shows that Boriyavi falls in the quadrant with High city wide coverage and a low slum coverage for the year 2010. Programs initiated by the state government in providing basic services to the slums increased coverage of toilets. Boriyavifalls in the quadrant with high city wide coverage and a high slum coverage for the year 2015.

Graph 3.36: Coverage of individual toilets in slums (2010) - Class D cities



Graph 3.37: Coverage of individual toilets in slums (2015) - Class D cities



- **Coverage of sewerage connections in slums**

Among Class D cities, only 9 have sewerage network and 2 of them have sewerage connections in slum settlements.

Kansad has 93% coverage at city level, whereas in slums the coverage is 72.5%. Sojitra shows high inequity where coverage of sewerage in city is 49% and toilet coverage in slums is 16%.

3.7 Storm Water Drainage

Storm water drainage system (SWD), comprises a hierarchical network of road side surface drains, underground drains and laterals, including nallahs, which discharge all the surface runoff into rivers or other natural water bodies. The design and layout of the drainage network would vary significantly depending on factors such as topography and city layout, Cities need and effective storm water drainage system to prevent water stagnation/ logging on roads.

3.7.1 Coverage of storm water drainage network

Coverage of storm water drainage network is defined in terms of the percentage of road length covered by the storm water drainage network. As per Service Level Benchmark (SLB) guidelines, only those roads are considered which are more than 3.5 meter wide carriageway and storm water drains that are trained, made of pucca construction and are covered. The benchmark value for this indicator is 100 percent.

Data for SWD is available from 122 municipalities as detailed in table 5.1. The SWD coverage ranges between 1% to 100% coverage. The coverage is least across the Class C and Class D cities at 10% and 11% respectively. Half of the cities across municipalities have less than 10% coverage. There are 15 cities that have less than 2% coverage and 5 cities reported more than 85% coverage. Only VallabhVidyanagar (Class C) has reported 100 % coverage of storm water drainage network. Apart from storm water drainage network, municipalities have natural drains (Kaans) to carry the runoff, which however is not be considered as storm water drainage by SLB guidelines.

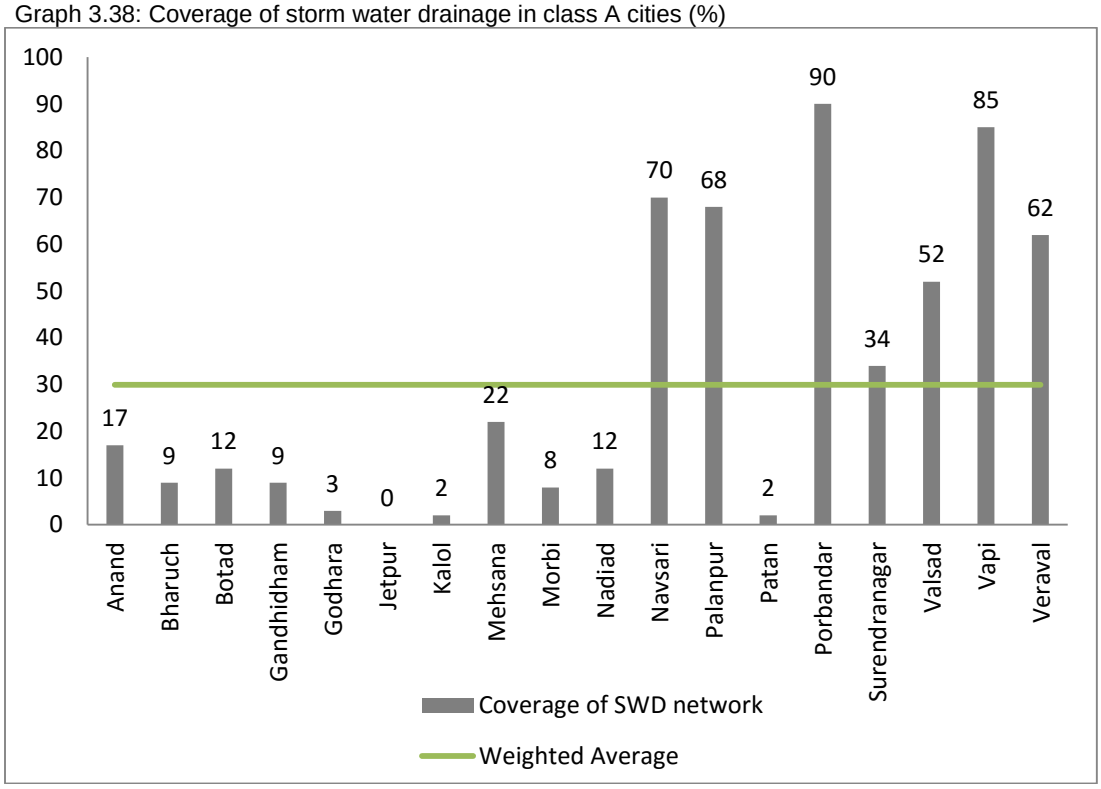
Class of municipalities	Total number of cities	Number of ULBs with available data	Weighted average in Percentage
Class A	18	17 (94%)	30
Class B	33	28 (85%)	14
Class C	45	33 (73%)	10
Class D	63	44 (70%)	11
Total	159	122 (77%)	

Table 3.13: Coverage of Storm Water Drainage across municipalities

- **Class A cities**

The overall average of SWD in class A cities is 30%. Jetpur city has not been included in analysis due to non availability of data. The coverage of SWD network is ranges between 2% to 90%. Kalol and Patan have reported 2% coverage whereas Vapi and Porbandar have reported 85% and 90% respectively.

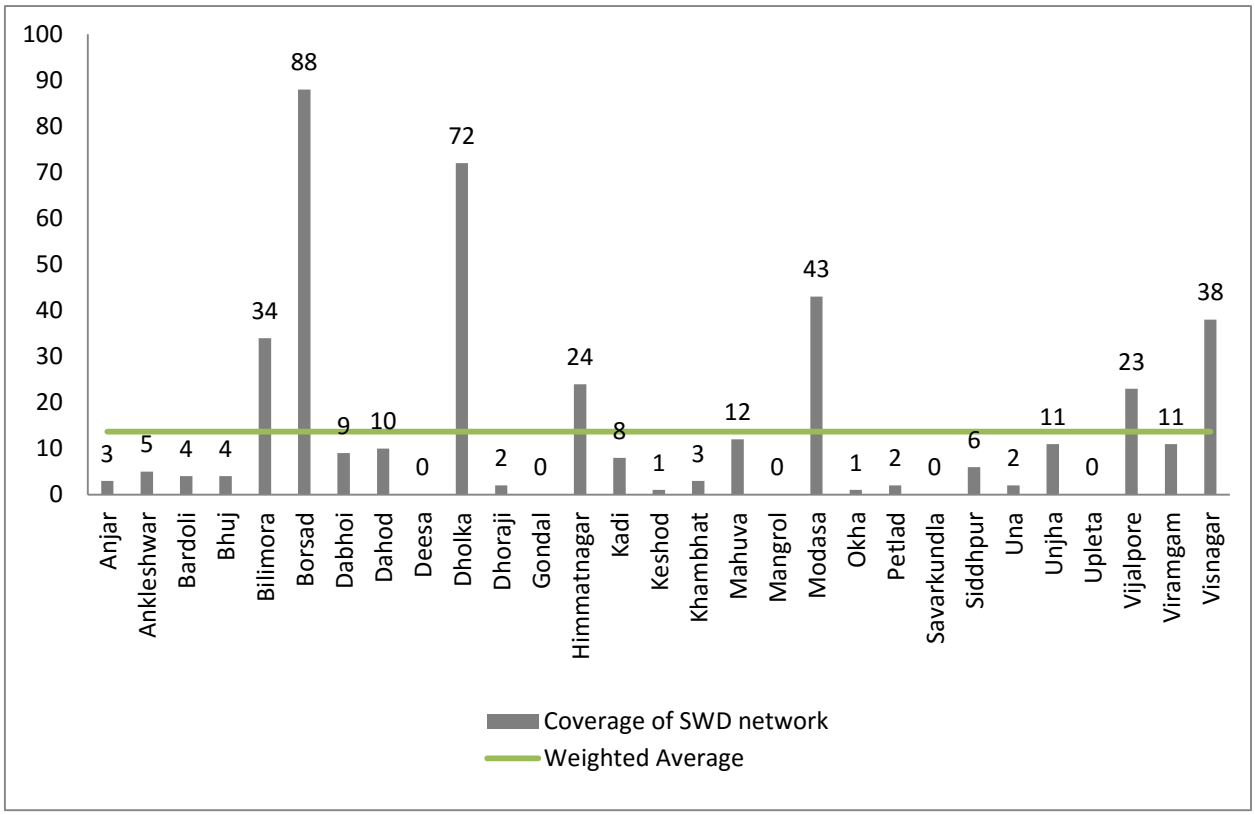
Graph 3.38: Coverage of storm water drainage in class A cities (%)



- **Class B cities**

Data from 28 cities (85%) is available and have been analysed. Only 14% of all roads in class B cities are covered by SWD. The lowest coverage (1%) of SWD is reported by Keshod and Okha and highest in Borsad at 88%. Half of the cities have reported less than 10% coverage of storm water drainage network.

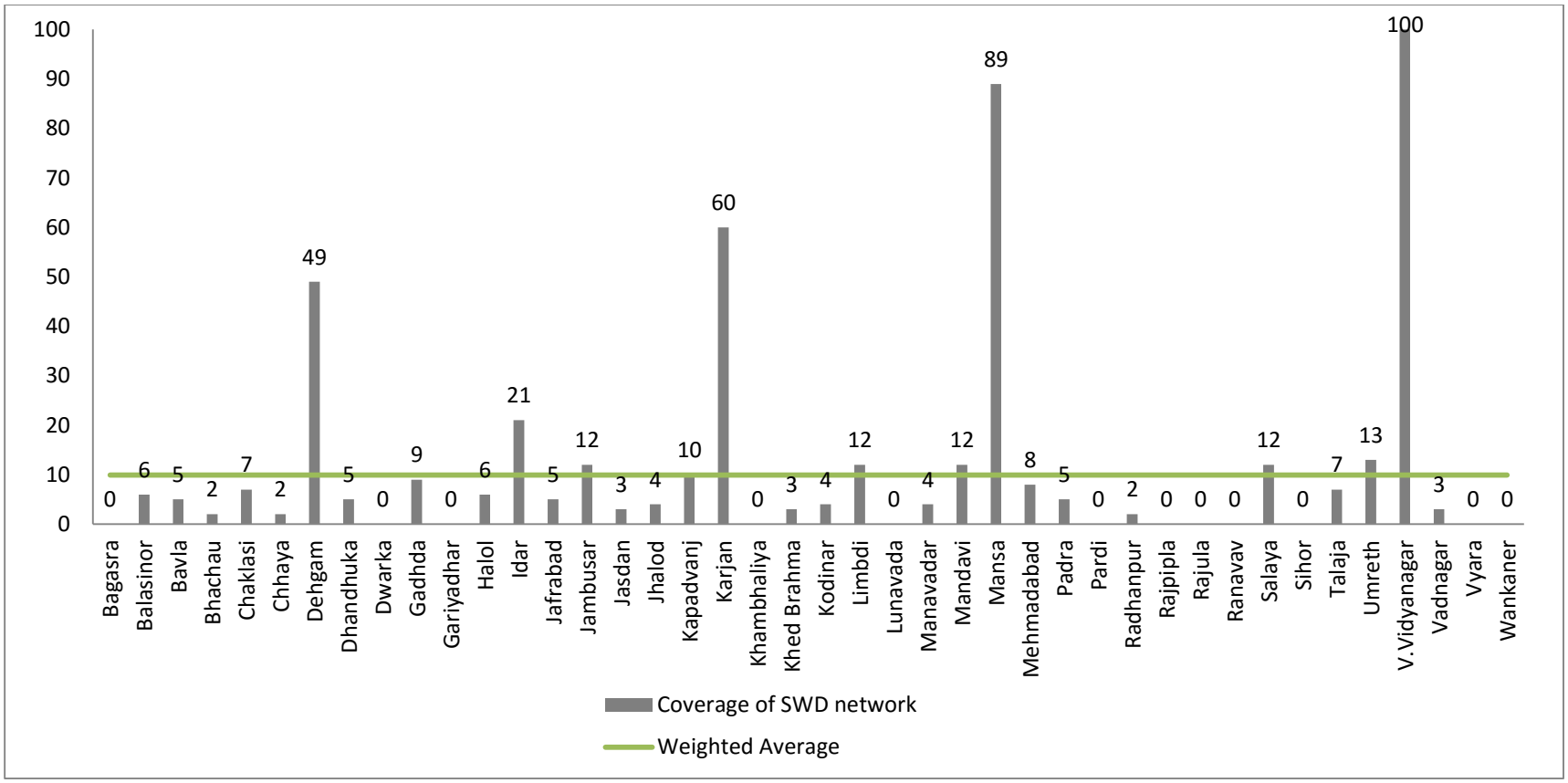
Graph 3.39: Coverage of storm water drainage in class B cities (%)



- **Class C cities**

Data of 33 cities has been analysed. The weighted average for Class C is 10%, lowest among all the class of municipalities. The coverage of storm water drainage network varies from 2% to 100%. Twenty cities (60%) have reported less than 10% coverage of storm water drainage network in their cities. Bhachau, Chhaya and Radhanpur have least coverage of 2%. Only two cities Mansa and Vallabh Vidyanagar have reported SWD coverage more than 85% at 89% and 100% respectively.

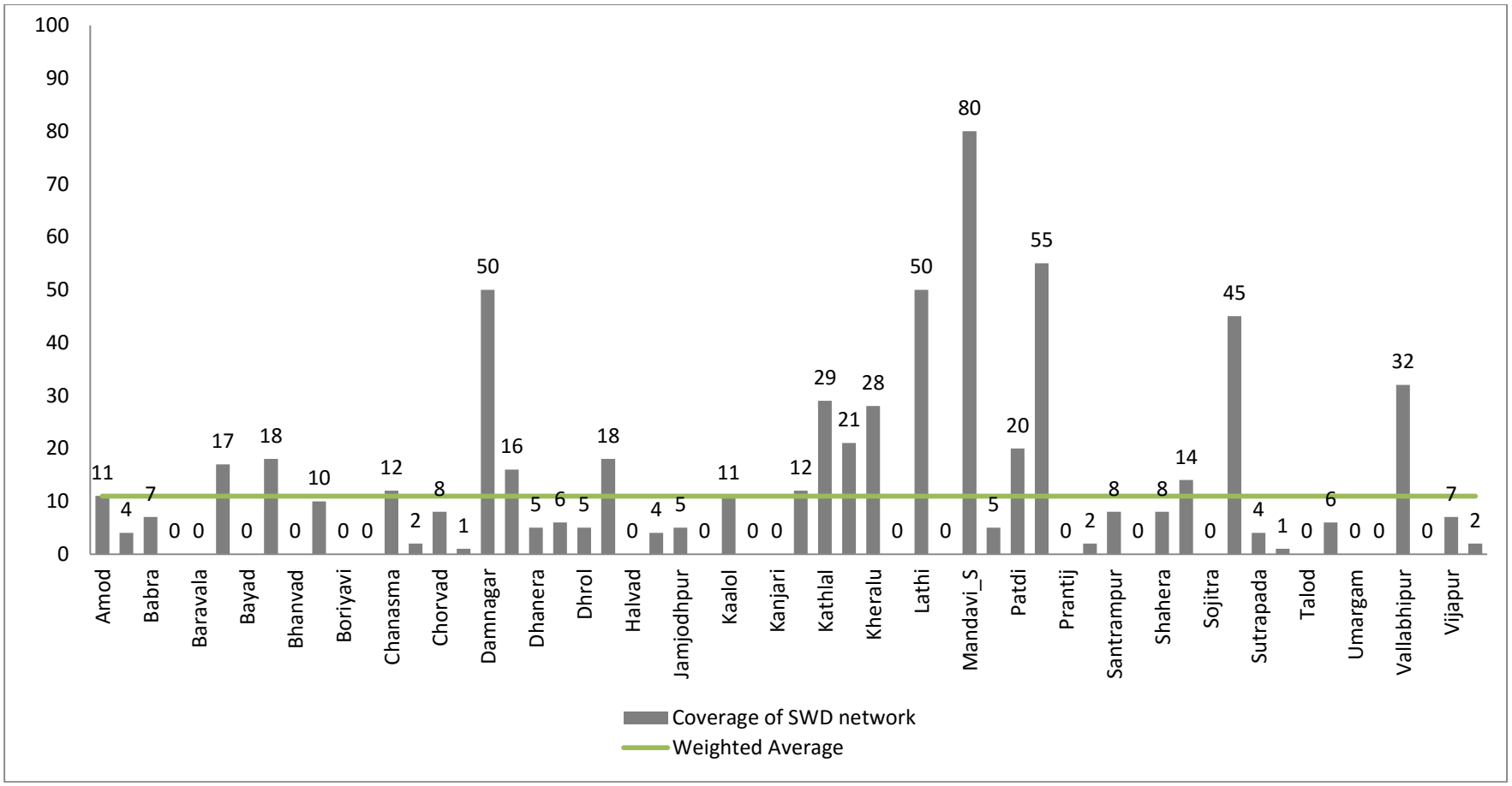
Graph 3.40: Storm water drainage network coverage in class C cities (%)



- **Class D cities**

Data from 44 cities (70%)has been analysed. The average of coverage of SWD network in Class D cities is 11%. Half of the cities have less than the class average. Chotila and Talala have lowest coverage of 1% where asMandavi- Surat has highest coverage of 80%.

Graph 3.41: Storm water drainage network coverage in class D cities (%)



3.7.2 Incidence of water logging/Flooding

This indicator reveals the extent to which water logging and flooding are reported in the ULB within a year, which have impacted a significant number of persons as well as normal life and mobility. This indicator provides an assessment of the impact or outcome of storm water drainage systems. As per SLB guidelines, the benchmark value of this indicator is zero.
This indicator is defined as the number of times water logging is reported in the year, at flood prone points within the city. Flood prone points within the city should be identified as locations that experience water logging at key road intersections, or along a road length of 50 meter or more, or in a locality affecting 50 households or more. An incident of flooding/ water logging should be considered, if water stagnant for more than four hours and more than six inches of depth.

As per SLB guidelines, the data should be captured by time, date, location and extent of flooding. The flood prone points in the city should be first identified based on reports/complaints filed by citizens, or by direct observation and reported into a central control room. Though the data is provided by all 147 municipalities, the reliability of data for this indicator is very poor. Cities have provided the information based on their experiences and observations without any supporting documents or records. None of the municipalities has a central control room and maintaining complaints/reports register. The table 3.14 provides details of incidents of water logging/ flooding in municipalities.

Data from 147 municipalities is available for analysis.

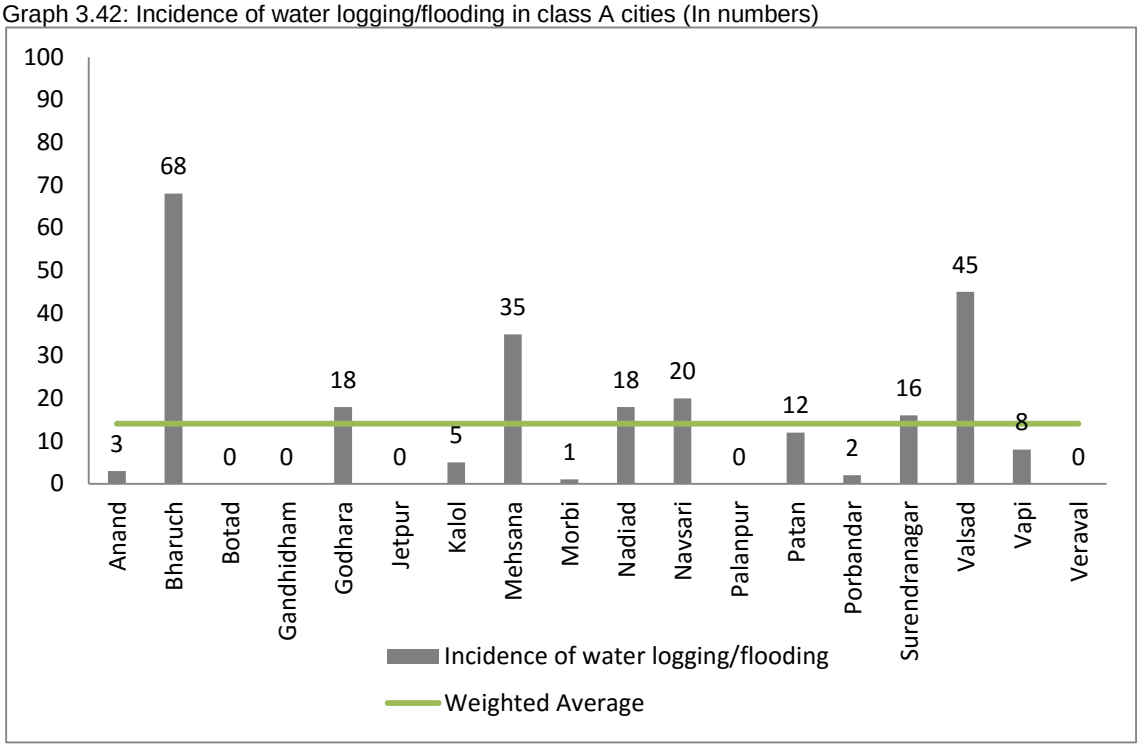
Sr.No.	Range for Incidence of Water logging/ flooding	Number of Municipalities
1	zero	64
2	1 to 5	48
3	6 to 10	19
4	11-20	11
5	Above 20	5
	Total	147

Table 3.14: Incidence of water logging/flooding in cities (In Numbers)

- **Class A cities**

The average of incidence of water logging/ flooding across class A cities is 14. The value ranges between 0 to 68 number of incidence in a year. Five cities, Botad, Gandhidham, Jetpur, Palanpur and Veraval have reported zero incidence of water logging, whereas, Mehsana, Valsad and Bharuch have reported 35, 45 and 68 incidences respectively.

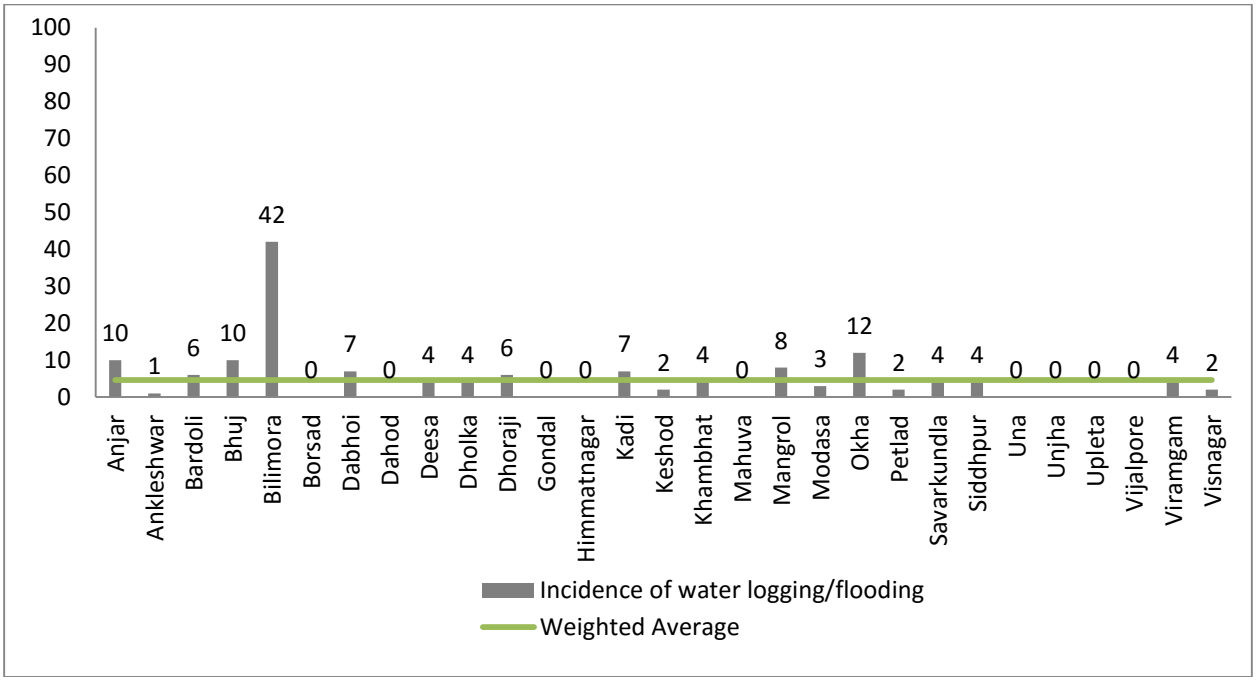
Graph 3.42: Incidence of water logging/flooding in class A cities (In numbers)



- **Class B cities**

Nine cities have reported zero incidence of water logging/flooding in a year. The class average is 5 of incidences. 19 cities have reported between 1 to 12 water logging/ flooding incidences. The highest number of incidence has been reported by Bilimora at 42.

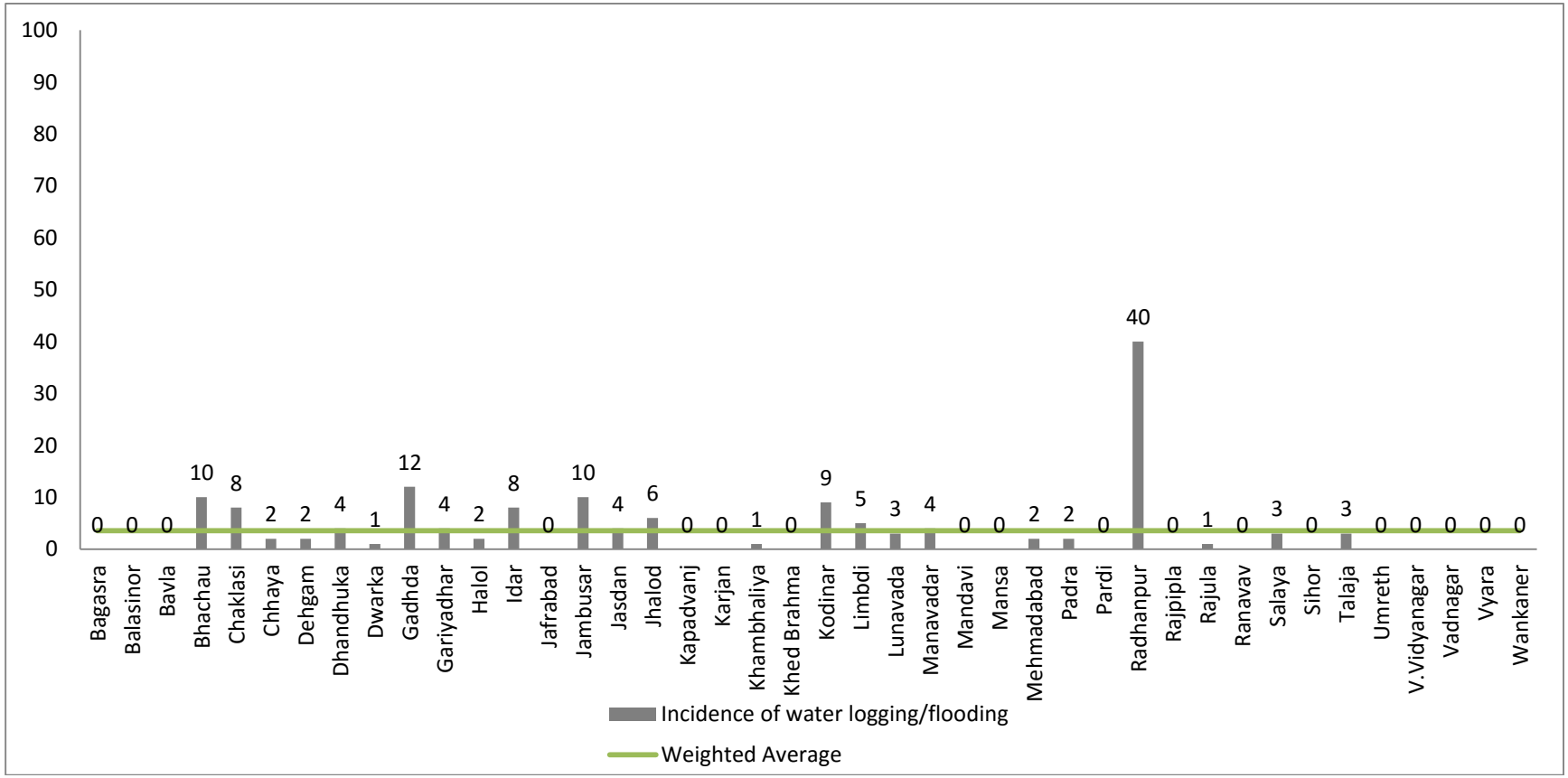
Graph 3.43: Incidence of water logging/flooding in class B cities (In numbers)



- **Class C cities**

The overall average across class C cities is 4 number of incidences in a year. The incidence of water logging in cities is ranges between 0 to 40. Eighteen cities (43%) have reported zero number of incidences of water logging/flooding, where as 23 cities (55%) have reported between 1 to 12 incidences Radhanpur has reported the highest number of incidence of water logging/flooding at 40 in a year.

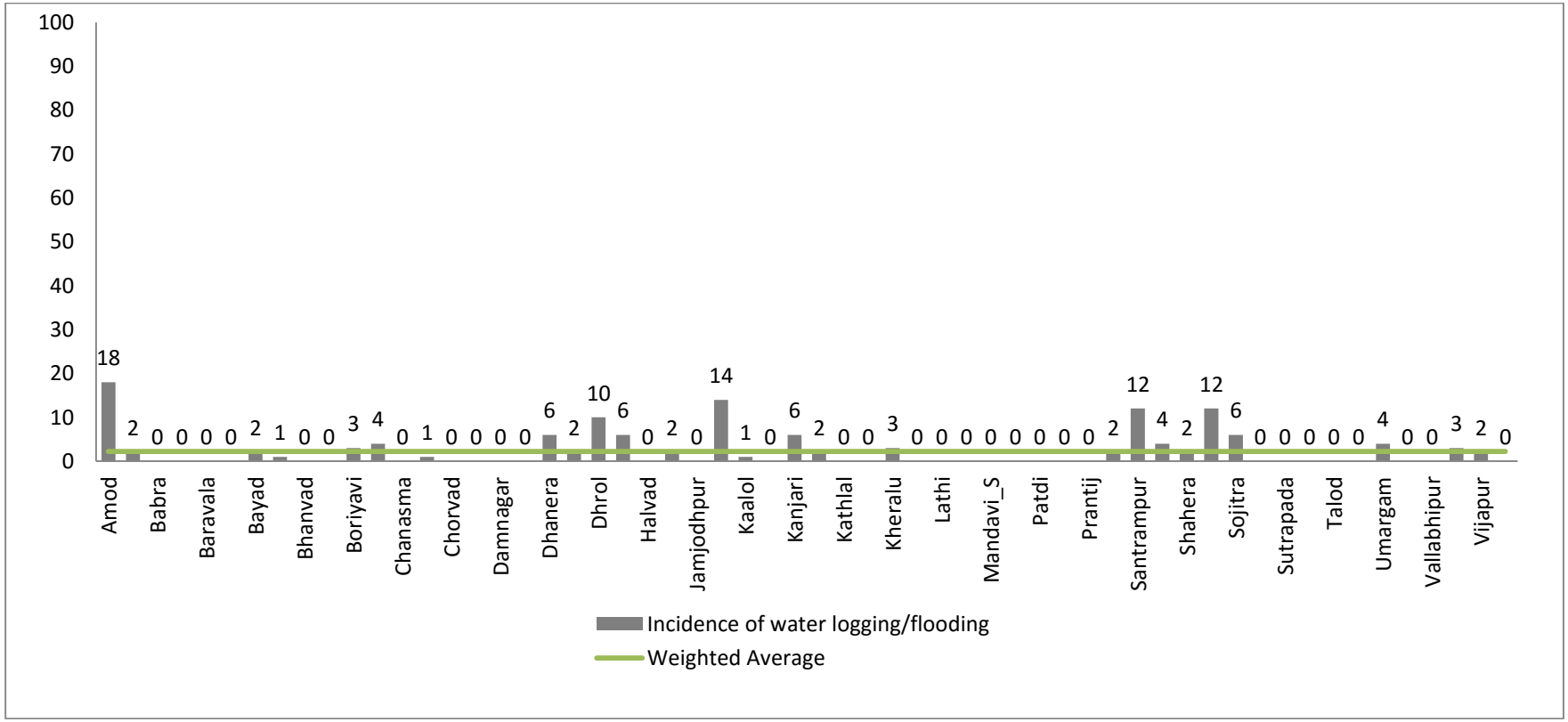
Graph 3.44: Incidence of water logging/flooding in class B cities (In numbers)



- **Class D cities**

The overall average of class D cities is 2 incidences which is lowest amongst all classes of ULBs. The number of incidence of water logging ranges from 0 to 18. More than half of cities of class D have reported zero incidence. Seven cities have reported the 1 and 2 incidences which is below the class average. The highest number of incidence is reported by Amod and Jamraval at 18 and 14 respectively.

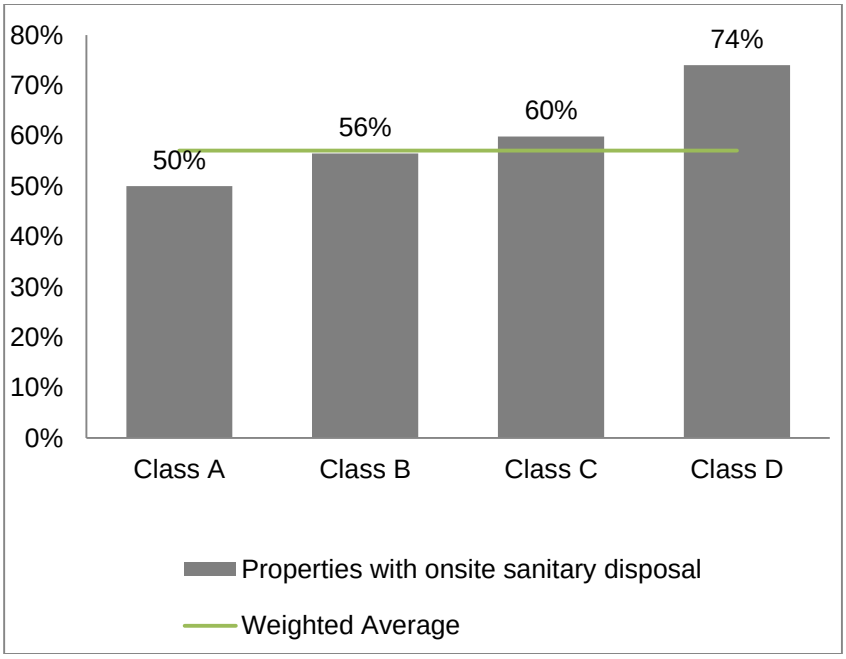
Graph 3.45: Incidence of water logging/flooding in class D cities (In numbers)



3.7.3 Analysis of Non- Sewered Indicators

Around 105cities out of 167 cities in Gujarat do not have an underground drainage system are dependent on on-site sanitation solutions for waste water treatment. It is observed that officials of urban local bodies (ULB) as well as households are rarely aware of the difference between various on-site sanitation systems such as pit systems, septic tanks and soak pits and their appropriate use and acceptability. The emptying and conveyance procedures in many cities are rudimentary and unsafe. Disposal and reuse of waste water is often unregulated.
As it has been discussed in earlier section of this chapter, 81% of properties with individual toilets out of which 23% of properties are connected with sewer network and rest are dependent on on-site sanitary disposal system. This section presents an analysis of service delivery towards on-site sanitation systems. The data reported by municipalities is based on their experience and on assumptions, since cities do not have data for septic tanks and soak-pits.
In 147 municipalities of Gujarat around 58% of properties are connected to on-site sanitation system.

Graph 3.46: % of properties dependent on on-site sanitation



- **Septage management practices in cities**
- **Septage generation**

121 cities reported that they have suction machines for septage management practices. Out of 121 cities, 108 cities have not provided information pertaining to "Total septage generated" in the city.
However, UMC has calculated septage generation based on United States Environmental Protection Agency (USEPA -1984), norms "230 litres /year per capita" septage generation. This is taken as a norm and septage generation has been calculated annually for all 147 cities. A total 14.52 lac cu.m.of septage is generated per year in 147 cities. Class wise generation of septage is mentioned in the following table:

	Number of cities	Total Septage Generation(In (Cu.m/Year)
Class A	18	4,51,153
Class B	29	4,02,245
Class C	42	3,15,875
Class D	58	2,82,762
Total	147	14,52,036

Table 3.15: List of cities with no septage management service

121 cities reported having some septage management practices. Among cities which do not have a sewerage network system and have not reported having a septage management service are in the following table:

No.	Class	City Name	Dependency on onsite sanitary disposal system
1	B	Dholka	98.32%
2	C	Chhaya	96.15%
3	D	Chanasma	93.31%
4	D	Kanjari	91.68%
5	D	Vallabhipur	90.98%
6	C	Ranavav	86.87%
7	D	Kheda	86.42%
8	D	Damnagar	85.01%
9	C	Jasdan	83.74%
10	D	Pethapur	83.66%

11	D	Shahera	82.58%
12	D	Savri	81.57%
13	C	Vadnagar	81.16%
14	C	Dhandhuka	78.00%
15	C	Vyara	66.23%
16	D	Bhanvad	61.64%
17	D	Anklav	60.28%
18	B	Dhoraji	56.79%
19	C	Chaklasi	54.41%
20	D	Vanthali	51.86%
21	A	Jetpur	51.63%
22	D	Dhrol	49.71%
23	C	Gadhada	39.56%
24	D	Kansad	6.68%

Table 3.16: Dependency on onsite sanitary disposal system

- **Availability of equipment for septage management**

121 cities (82%) have reported as having septage sucking machines for emptying septic tanks. A few cities like Kalol, Veraval, Visnagar, Jambusar and Bareja also use outsourced septage sucking machines which are licensed by the ULBs for providing services. The following table shows the equipment with various class sizes of ULBs. 66% cities have reported to have at least one septage sucking machine, while 34% cities have reported more than one machines. The details are illustrated in Table 2. Given below

Number of Septage sucking machines available	NA/ND	0	1	2	3	>3
Class A	1	1	7	5	3	1
Class B	1	1	16	9	1	1
Class C	5	3	21	7	5	1
Class D	11	3	36	6	2	
Total	18	8	80	27	11	3

Table 3.17: Number of septage sucking machines across cities

Morbi, Bhuj and Jambusarhave 5, 6 and 8 septage sucking machines available with the ULB respectively. Jambusar also reported that ULB has 1 private septage sucking machine.

46% that is 67 cities have not responded for the number of septic tanks cleaned in a year.

Chapter- 4: Solid Waste Management

4.1 Introduction

Solid waste management is one of the key services carried out by the urban local bodies to keep our cities clean. It basically comprises of five parts that is segregation, collection, transportation, processing and disposal of solid waste. It is one of the most important aspects as improper disposal of municipal solid waste can create unsanitary conditions and these conditions can lead to pollution of the environment and outbreak of diseases.

The tasks of solid-waste management present complex technical challenges. They also pose a wide variety of administrative, economic, and social problems that must be managed and solved.

The above figure shows the key performance indicators of solid waste management. Indicators are Access and Coverage, Service Level and Quality and Financial Management whereas indicators for reform actions are efficiency in service operation, and equity.

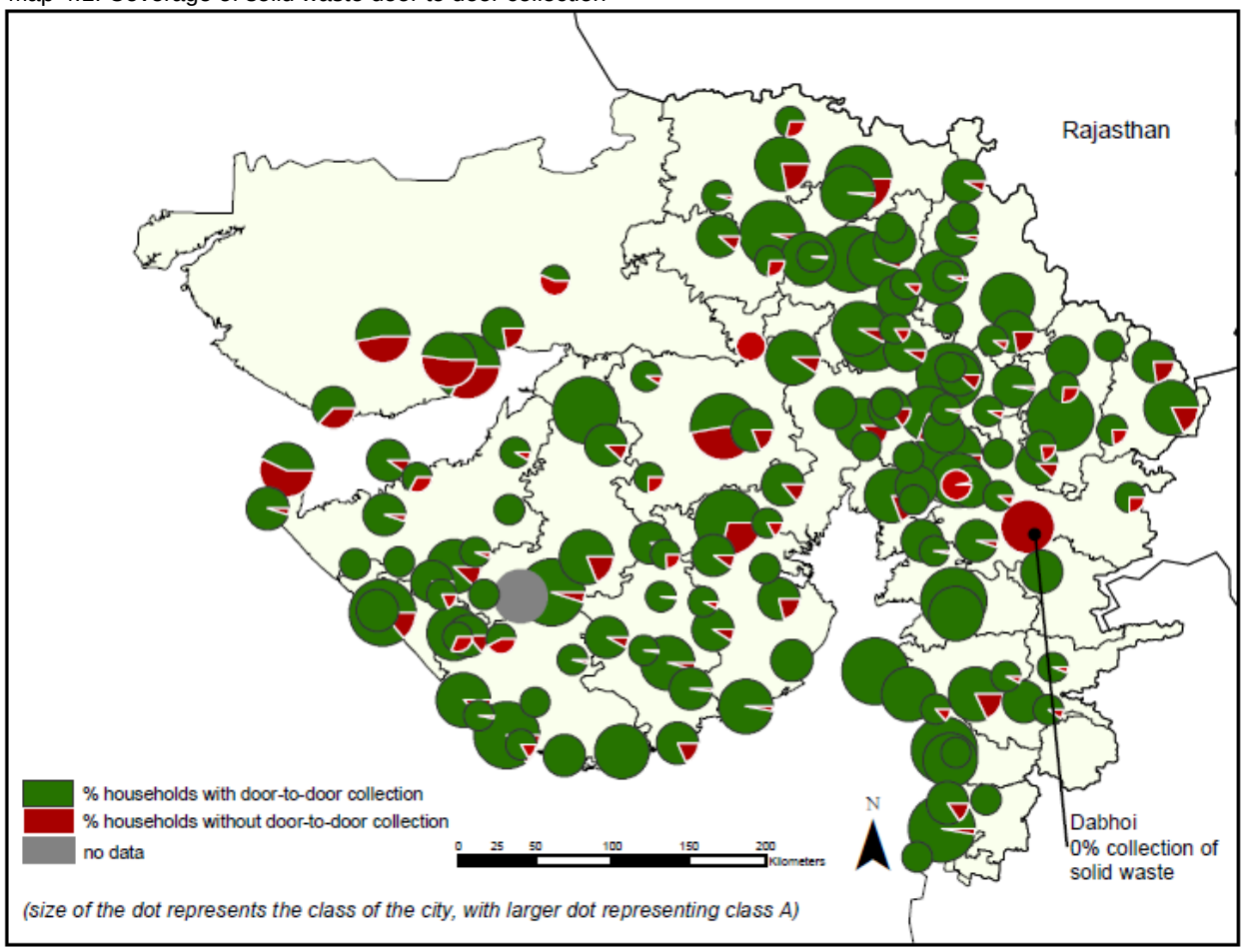
The Draft Municipal Solid Wastes (Management and Handling) Rules, 2013 shall apply to every municipal authority responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid wastes.

4.1.1 State Scenario

There are a total 167 ULBs in Gujarat, out of which analysis of 147 municipalities with respect to solid waste management are covered in this chapter. Class A municipalities are 18 in number; Class B, Class C and Class D municipalities are 29, 42 and 58 in number respectively.

The number of HHs covered for solid waste door to door collection in the state for the above municipalities are 1.8 million in total. The amount of solid waste generated comes to 4179 MT/day, out of which 4000 MT/day of solid waste is received at processing/disposal facility and recycled.

Map 4.1: Coverage of solid waste door to door collection



4.1.2 Coverage of Solid Waste Door to Door Collection

Graph 4.1: Solid waste coverage, 2014-2015

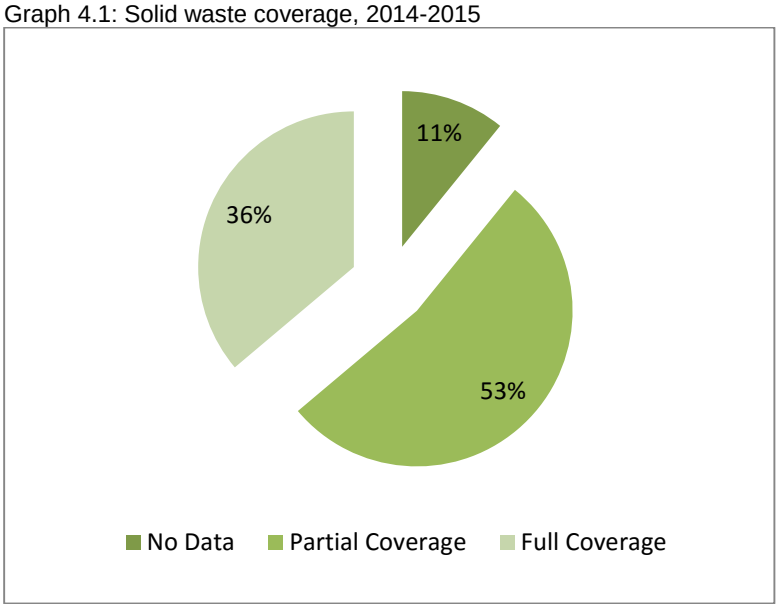


Figure 1: Door to door collection, Ahmedabad

In Gujarat, municipalities have initiated door to door collection service after implementation of Municipal Solid Waste Management Handling Rules 2000. Figure 1 shows the coverage of solid waste door to door collection in the state. All the Municipalities have initiated the process of door to door collection. 36% of the Municipalities have reported 100% door to door collection. 53% of the Municipalities have reported partial coverage.

In 2010, 15% of the Municipalities had reported 100% door to door collection and 82% of the Municipalities had reported 82% partial coverage.
In 2010, 1% of the total municipalities were not fully covered with door to door collection but were brought under the coverage later.

4.1.3 Reliability

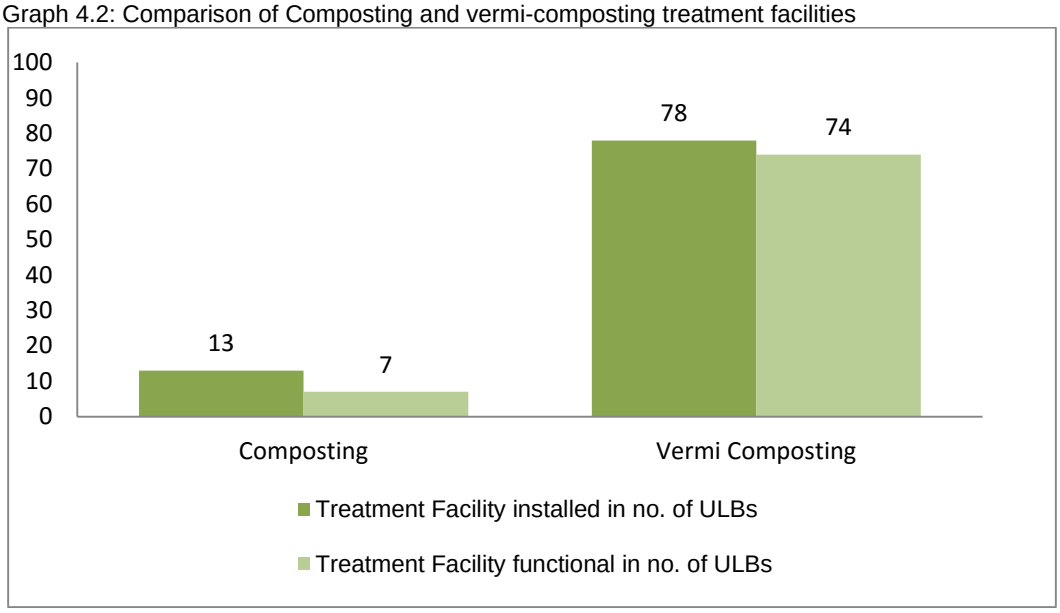
Most of the data is extracted by sanitation inspectors from SW[illegible]es based on their experience and assumptions. There is no d[illegible]is provided by the city as such. That is the reason why the reliabilit[illegible].

4.1.4 Treatment Facility

Treatment facilities implemented in Gujarat Municipalities are composting, vermi-composting, RDF, and waste to energy. Vermi-composting facility is implemented in most of the Municipalities.

Figure 3 shows the comparison of implementation of composting and vermi-composting. It has been observed that in most of the Municipalities, treatment facilities are installed but are not functional.

Graph 4.2: Comparison of Composting and vermi-composting treatment facilities



As per Municipal Solid Wastes (Management and Handling) Rules 2000, "Vermicomposting is a process of using earthworms for conversion of bio-degradable wastes into compost and Composting means a controlled process involving microbial decomposition of organic matter.

The biodegradable wastes shall be processed by composting, vermicomposting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used fr processing wastes in specific cases."

4.2 Access and Coverage

Access and coverage is analysed through Household (HH) level coverage of SWM services and is defined as percentage of households and establishments that are covered by a daily doorstep collection system.

Graph 4.3: HH level coverage of SWM services (%)

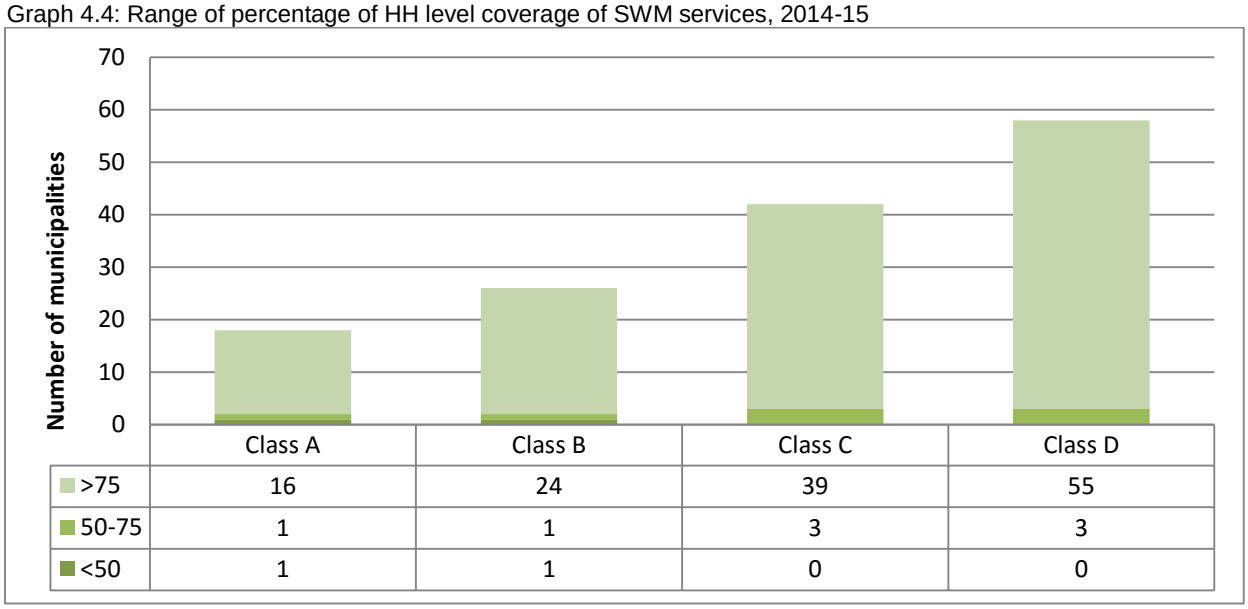
The figure shows the comparison between HH level coverage in all municipalities in the year 2009-2010 and 2014-2015. As mentioned above, there is a marginal increase in the collection of waste in most of the cities in all classes.

Municipalities across Gujarat have deployed various methods for door to door collection ranging from outsourcing to NGOs/sakhi mandals/CBOs, tractor based collection (in case of lack of staff) and cycle/tricycle rickshaw based collection system in narrow lanes.

Gujarat has reached the SLB benchmark of 100% door to door collection in most of the cities. Class A Municipalities are at 97.5 percent and lowest are the Class C Municipalities with average of 94.5% for 2014-2015 year but there is a noticeable progress from what it was in 2010 as seen in the figure.

4.2.1 Household Level Coverage of SWM services

Graph 4.4: Range of percentage of HH level coverage of SWM services, 2014-15

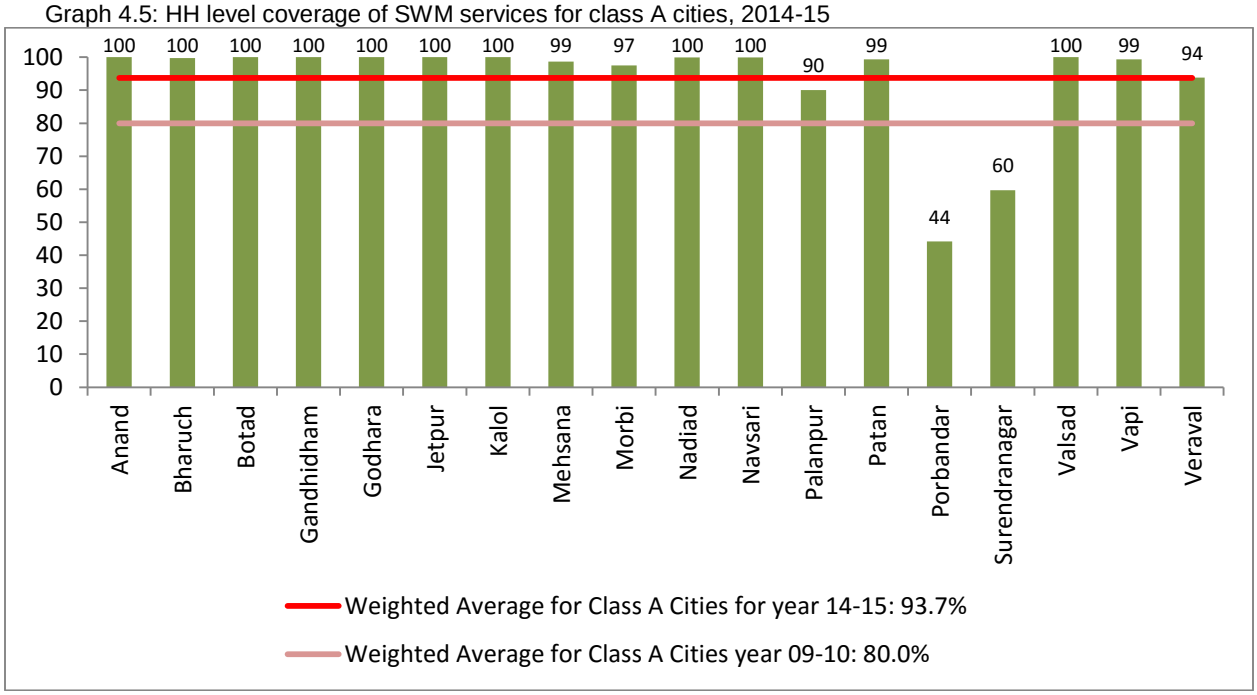


	Class A	Class B	Class C	Class D
>75	16	24	39	55
50-75	1	1	3	3
<50	1	1	0	0

As we can see in the figure, most of the municipalities have covered 75-100% HH through door to door waste collection services. The target of 100% door to door collection is yet to be achieved by many municipalities. But in comparison to the year 2010, the range has moved towards the higher end.

- **Class A cities**

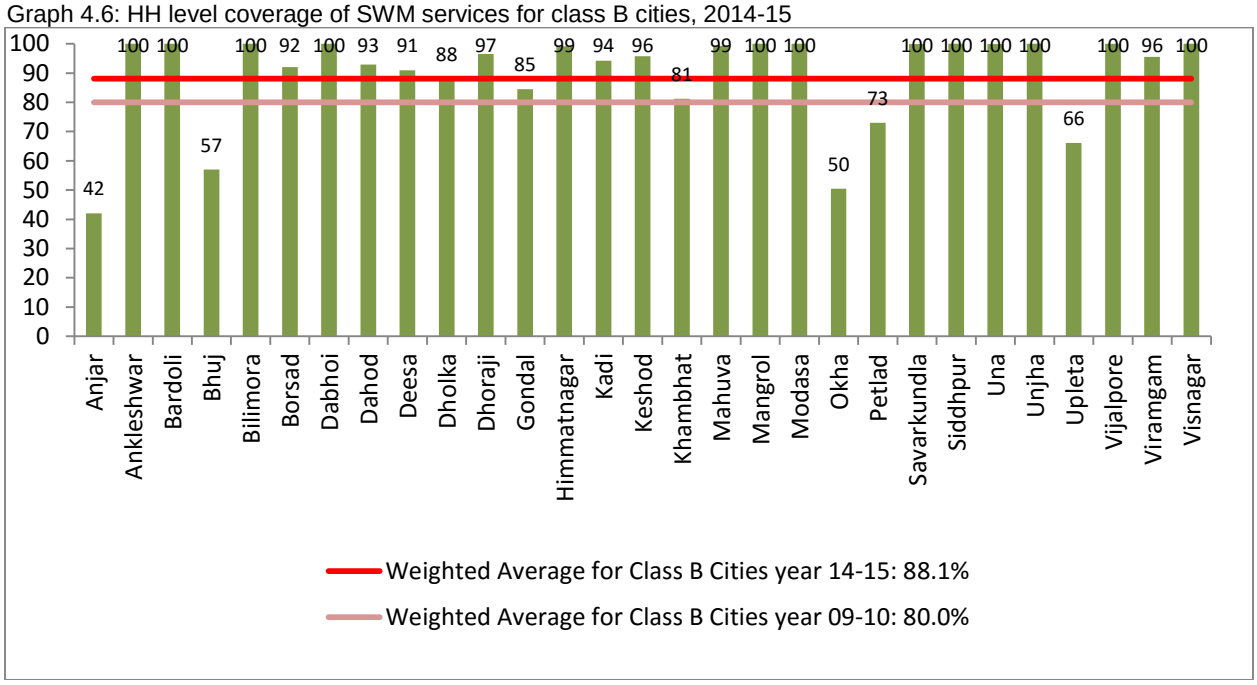
Graph 4.5: HH level coverage of SWM services for class A cities, 2014-15



As we can see in the above figure the weighted average for class A Municipalities for the year 2014-2015 is 93.7%. Household level coverage of solid waste management of most of the cities have reached the target of 100% door to door collection but is very low in the cities Porbandar and Surendranagar. We can see a considerable growth in weighted average for Class A Municipalities for 2014-2015 year; previously in 2010 the HH level coverage of SWM was 80%.

- **Class B cities**

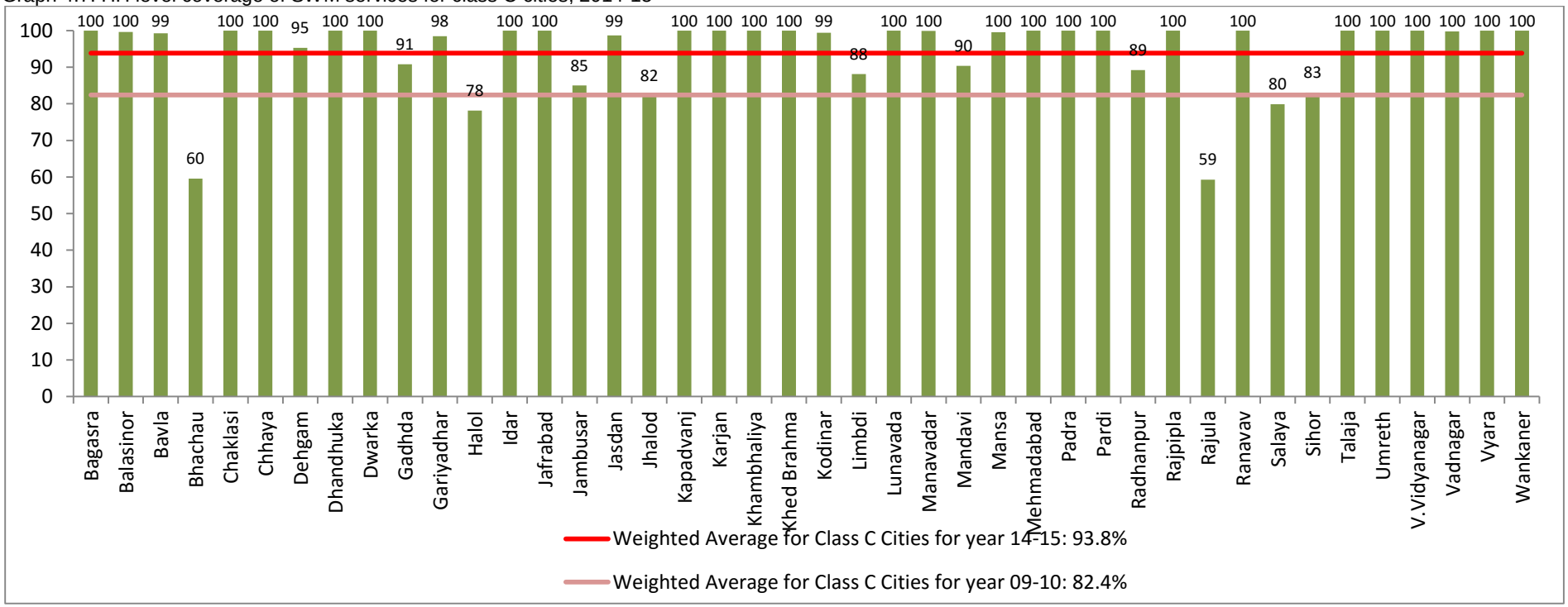
Graph 4.6: HH level coverage of SWM services for class B cities, 2014-15



As we can see in the above figure the weighted average for class B Municipalities for the year 2014-2015 is 88.1%. Most of the Municipalities in terms of household level coverage are yet to reach the target of 100% door to door collection. The Municipalities Anjar, Bhuj, Okha, Petlad, and Upleta are falling behind the rest by a high percentage. In this case we do not see a significant growth in weighted average from what it was in 2009-2010 (80%).

- **Class C cities**

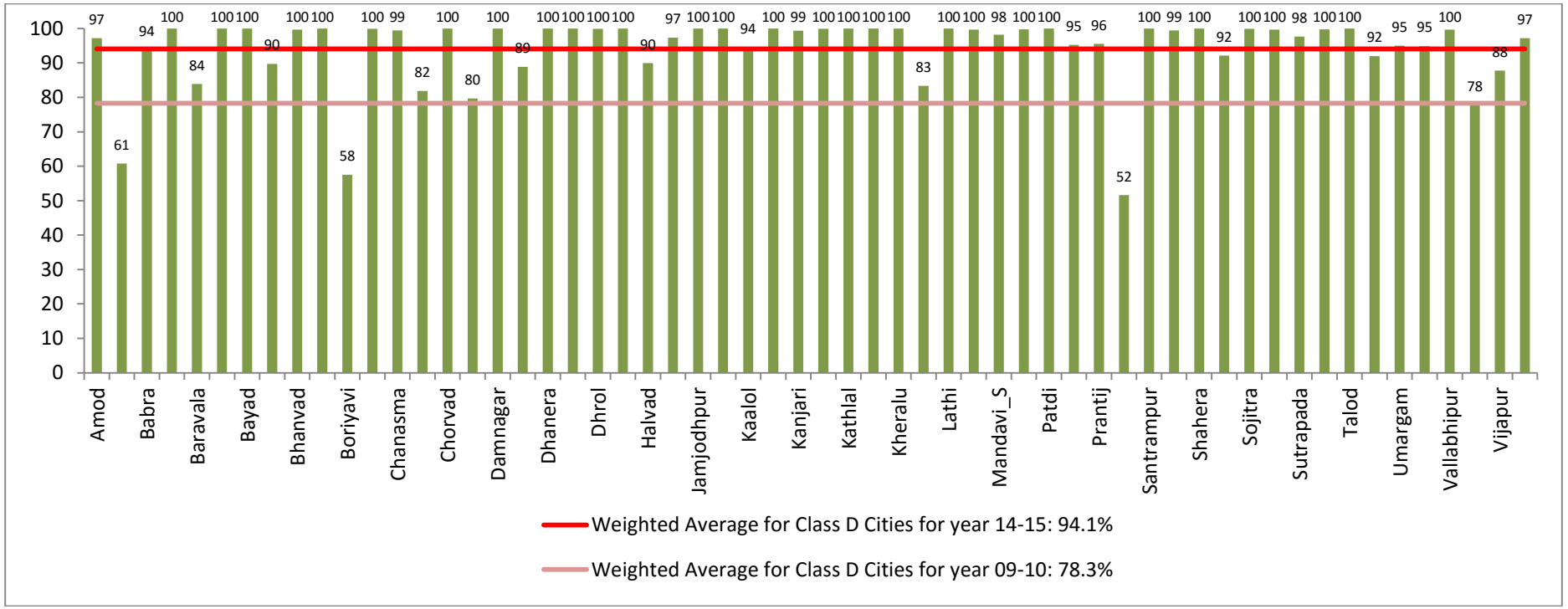
Graph 4.7: HH level coverage of SWM services for class C cities, 2014-15



As we can see in the above figure the weighted average for class C Municipalities for the year 2014-2015 is 93.8%. Household level coverage of solid waste management of most of the cities have reached the target of 100% door to door collection but is very low in the Municipalities Bhachau, Halol, Jambusar, Jhalod, Limbdi, Mandavi, Radhanpur, Rajula, Salaya, and Sihor . We can see a considerable growth in weighted average for Class C Municipalities IN 2014-15 year; previously in 2010 the HH level coverage of SWM was 82.4%.

- **Class D cities**

Graph 4.8: HH level coverage of SWM services for class D cities, 2014-15

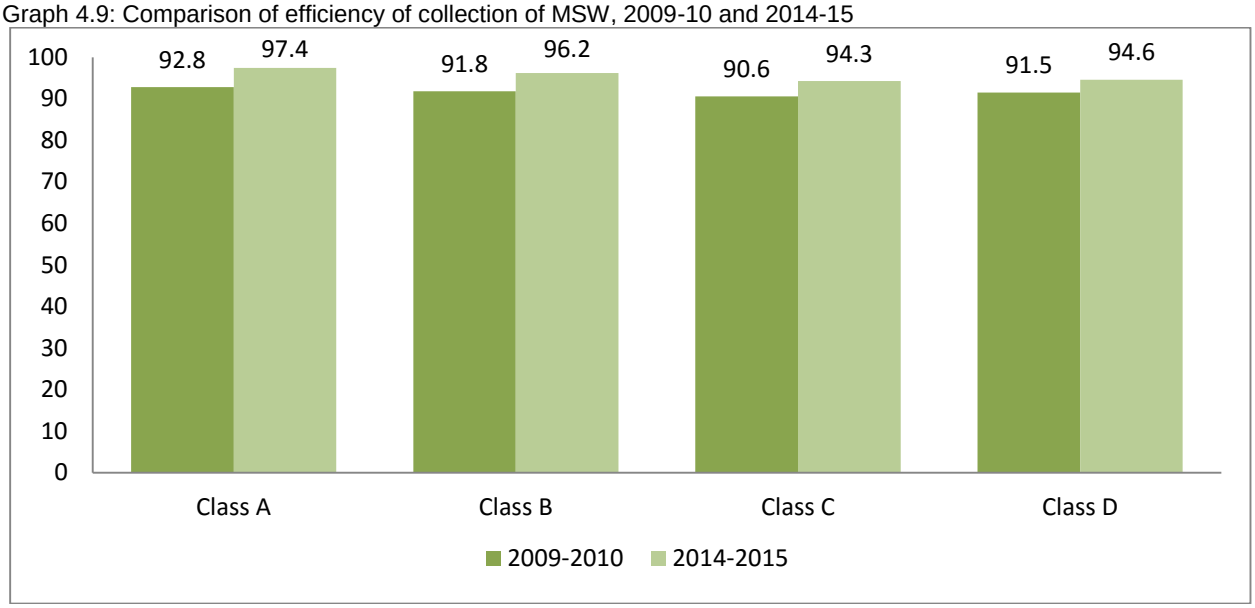


As we can see in the above figure the weighted average for class C Municipalities for the year 2014-2015 is 94.1%. Most of the Municipalities in terms of household level coverage are yet to reach the target of 100% door to door collection. The Municipalities Anklav, Boriyavi, and Rapar are falling behind the rest by a high percentage. In this case we do see a significant growth in weighted average from what it was in 2009-2010 (78.3%).

4.3 Service Levels and Quality

4.3.1 Efficiency of Collection of Municipal Solid Waste

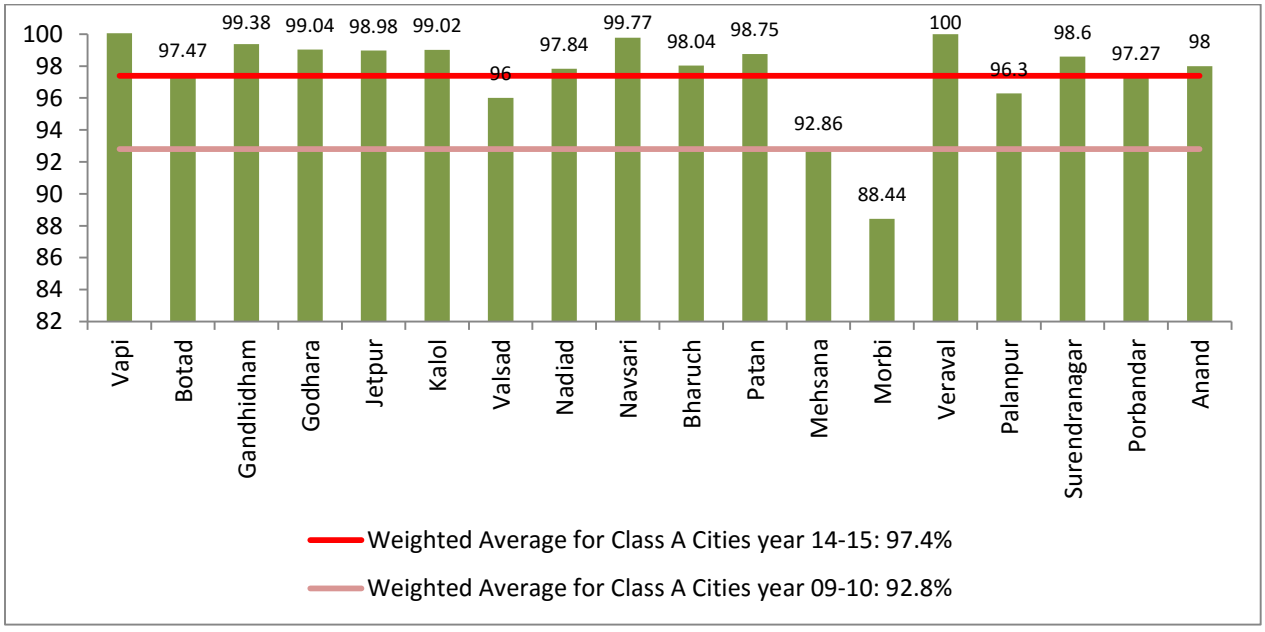
Graph 4.9: Comparison of efficiency of collection of MSW, 2009-10 and 2014-15



As we can see in the above figure, there is a marginal increase in the weighted average from year 2009-2010 to current year 2014-2015.

- **Class A**

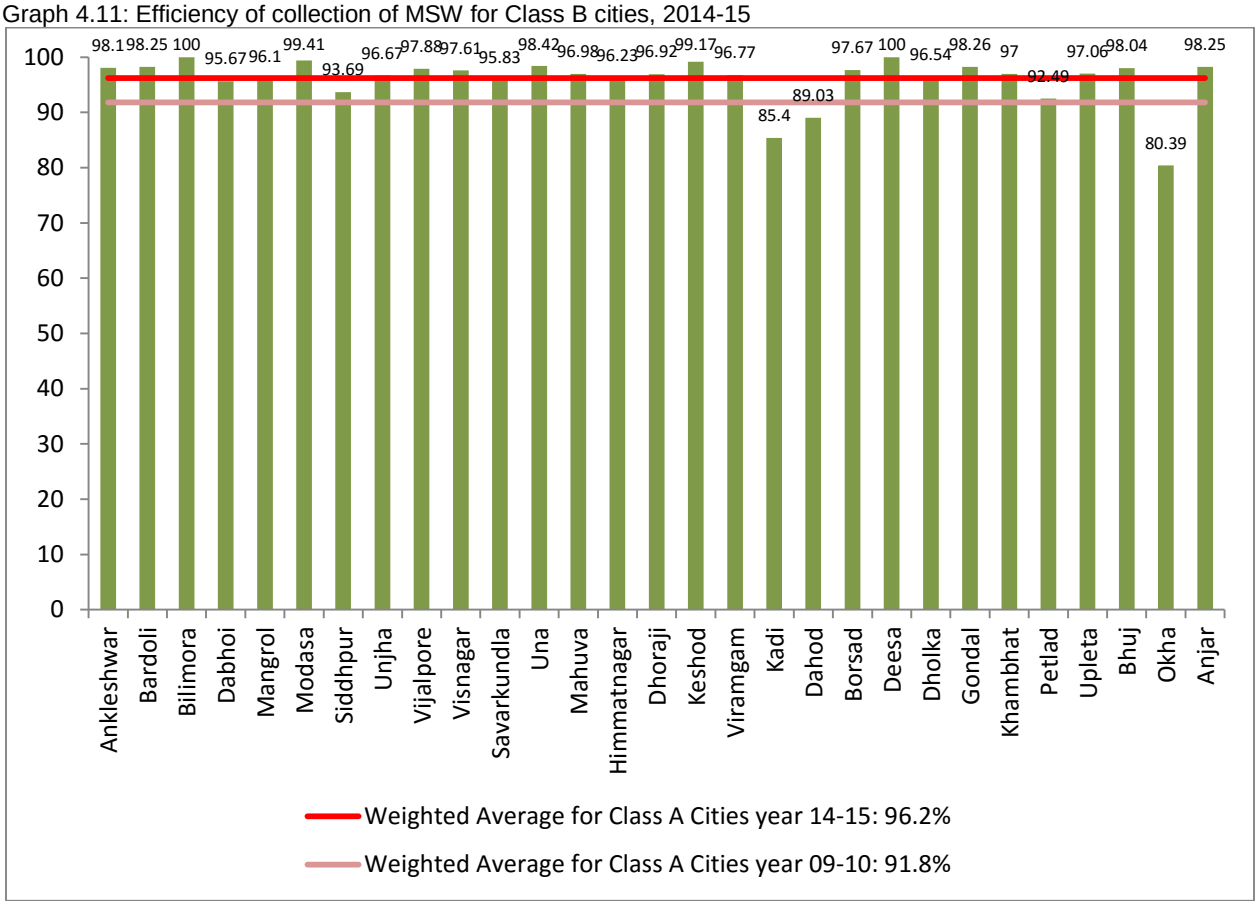
Graph 4.10: Efficiency of collection of MSW for Class A cities, 2014-15



The weighted average of Class A cities for the year 2014-2015 is 97.4% which increased from 2009-2010 year (92.8%). Cities Valsad, Botad, Mehsana, and Morbi are not efficient in terms of collection of municipal solid waste. Only Vapi, Navsari and Veraval have reached the standard of 100% in terms of collection efficiency.

- **Class B**

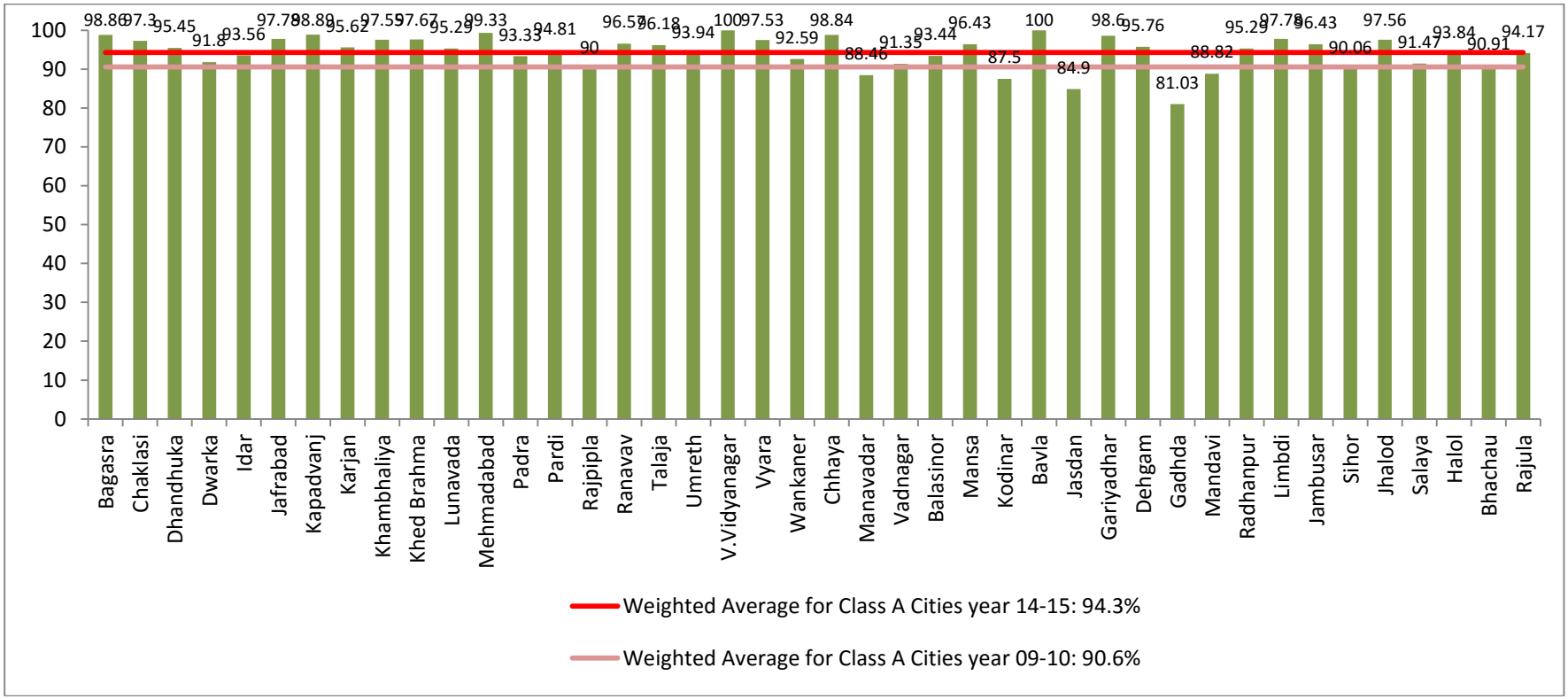
Graph 4.11: Efficiency of collection of MSW for Class B cities, 2014-15



The weighted average of Class B cities for the year 2014-2015 is 96.2% which increased from 2009-2010 year (91.8%). Cities Kadi, Dahod, and Okha are not efficient in terms of collection of municipal solid waste. Only Bilimora, Modasa, Keshod, Deesa have reached the standard of 100% in terms of collection efficiency.

- **Class C**

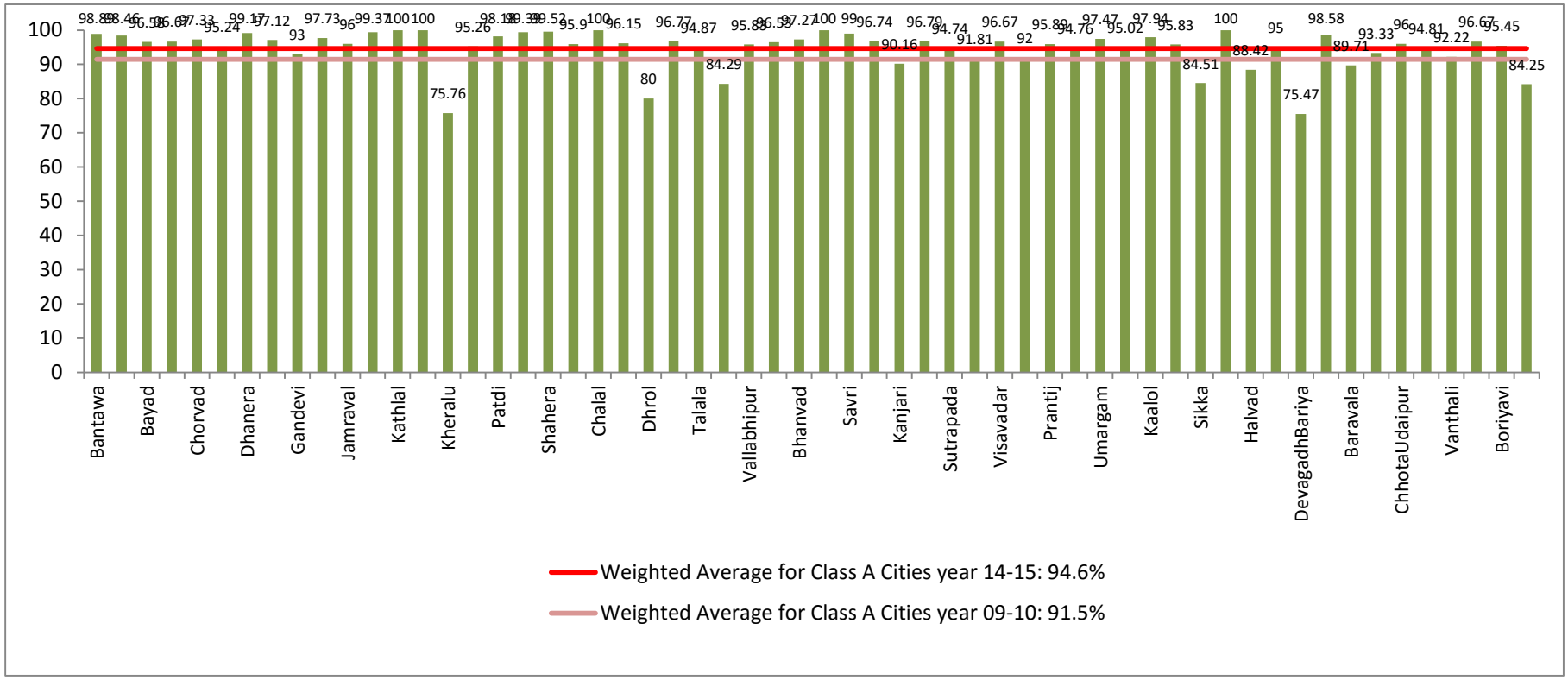
Graph 4.12: Efficiency of collection of MSW for Class C cities, 2014-15



The weighted average of Class C cities for the year 2014-2015 is 94.3% which increased from 2009-2010 year (90.6%). Cities Jasdan, Gadhdha, and Manavadar are not efficient in terms of collection of municipal solid waste. Only cities V. Vidhyanagar and Bavla have reached the standard of 100% in terms of collection efficiency.

- **Class D**

Graph 4.13: Efficiency of collection of MSW for Class D municipalities, 2014-15



The weighted average of Class D cities for the year 2014-2015 is 94.6% which increased from 2009-2010 year (91.5%). Cities Kheralu, Dhrol, Oad, Sikka, DevagadhBariya, and Rapar are not efficient in terms of collection of municipal solid waste. Only cities Kathad, Chalal, Mahudha and Tarsadi have reached the standard of 100% in terms of collection efficiency.

4.3.2 Extent of Segregation of Municipal Solid Waste

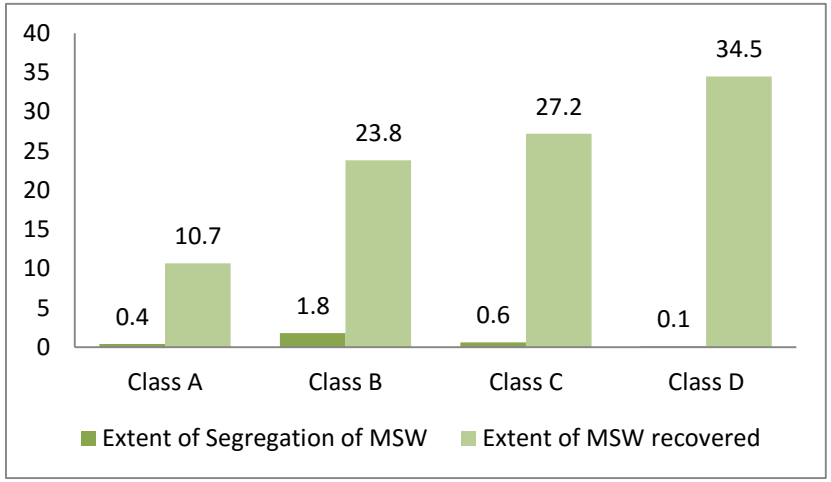
Extent of segregation of MSW is defined as percentage of waste from households and establishments that is segregated. Segregation should be at least be at the level of separation of wet and dry waste at the source, that is at the household or establishment level. It is important that waste segregated at the source is not mixed again but transported through the entire chain in a segregated manner.

Extent of MSW processed and recycled is defined as total quantity of waste that is processed or recycled as a percentage of total waste collected.

Below is the weighted average comparison of municipalities, extent of segregation and MSW recovered

Graph 4.15: Comparison of MSW segregation and recovered, 2009-10

Graph 4.14: Comparison of MSW segregation and recovered, 2014-2015

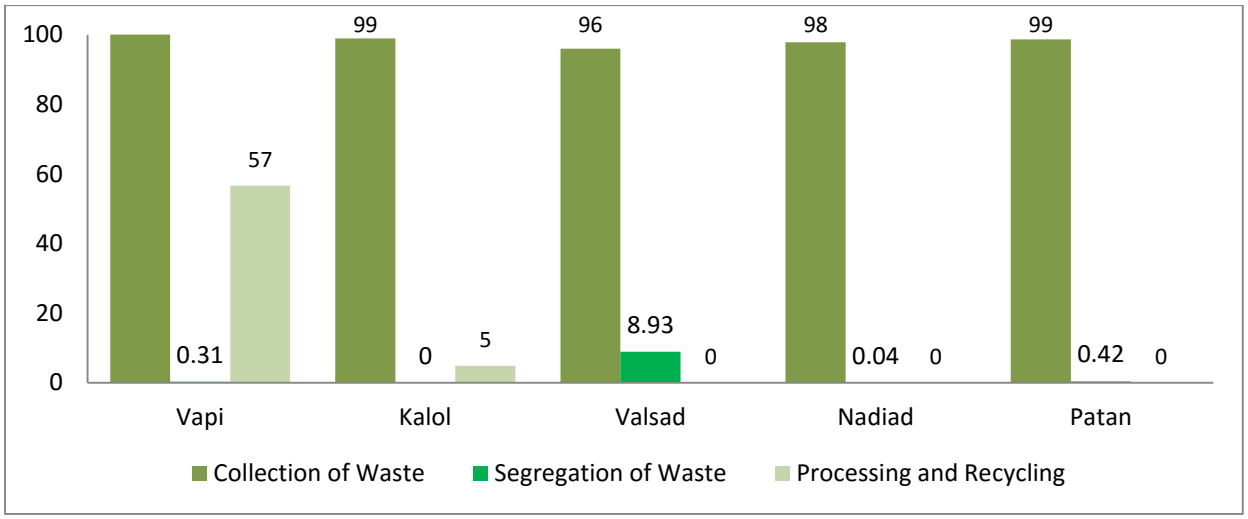


In 2009-2010, the cities had received the above data from the rag pickers but for 2014-2015 year not much data could be extracted for se

Currently not much data could be extracted on data of segregation therefore what we can see in the above figure for the year 2014-2015 is much different from the situation in 2009-2010. Earlier the extent of segregation and extent of MSW recovered was more in Class C and D cities but in 2014-2015 extent of segregation is almost negligible and extent of MSW recovered has also gone down for all the municipalities.

- **Class A cities**

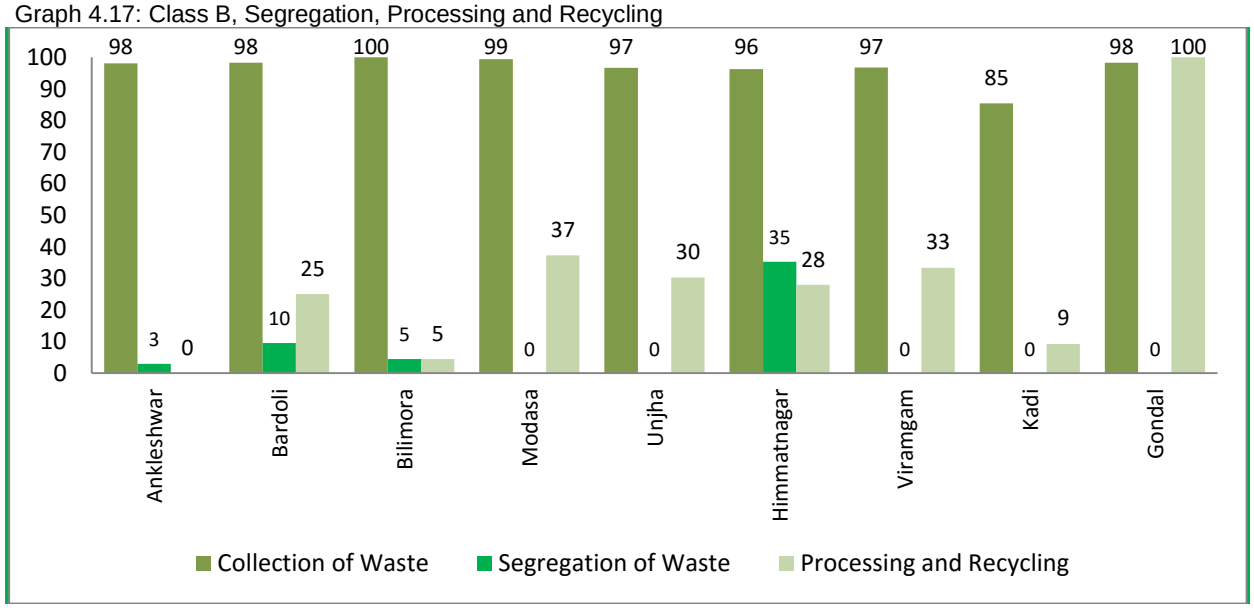
Graph 4.16: Class A, Segregation, Processing and Recycling



In some of the Class A cities all collection, segregation, processing and recycling methods are in place. In Vapi and Kalol, processing and recycling is seen but not 100% of SW collected and in 'Valsad' segregation of waste is prominent. These processes have improved from the previous year 2009-2010.

- **Class B cities**

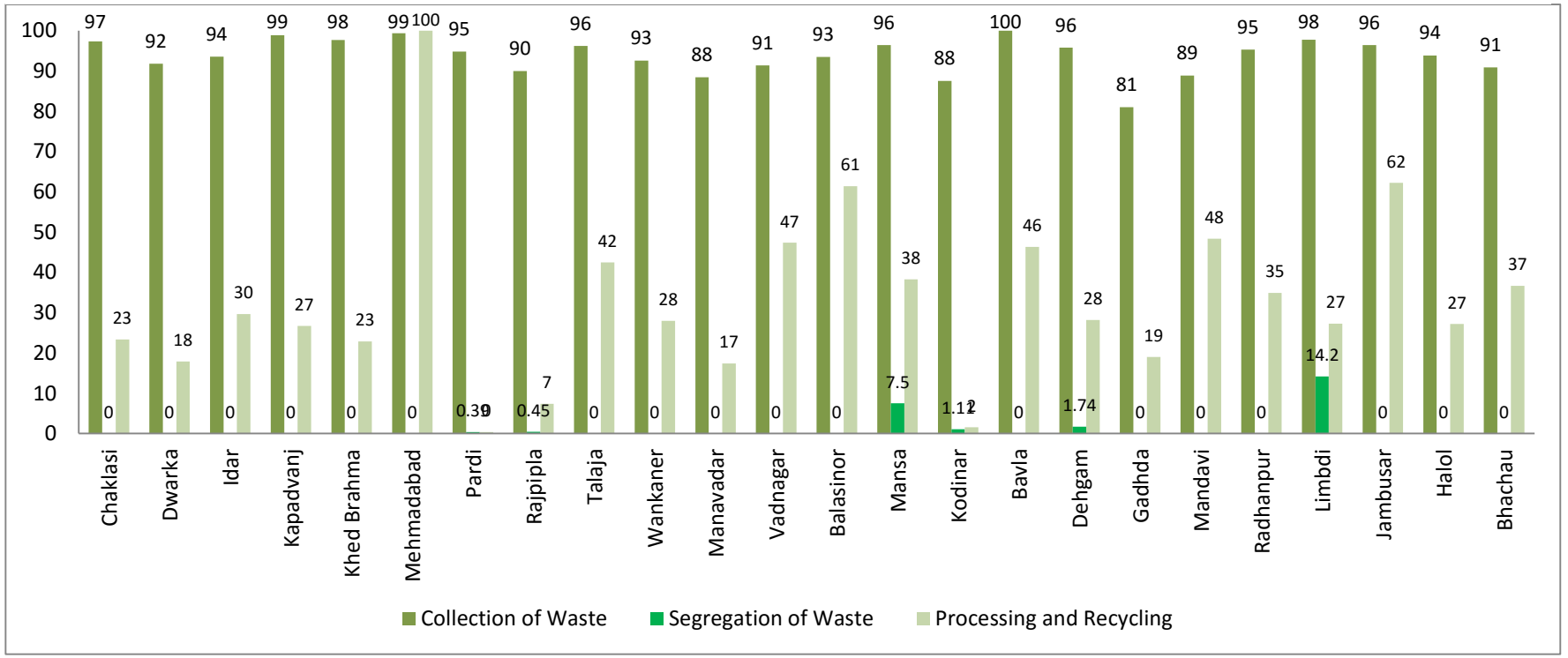
Graph 4.17: Class B, Segregation, Processing and Recycling



In some of the Class B cities all collection, segregation, processing and recycling processes are in place. In Bardoli, Bilimora, and Himmatnagar segregation, processing and recycling methods are observed but not 100% of SW collected. These methods have improved from the previous year 2009-2010.

- **Class C cities**

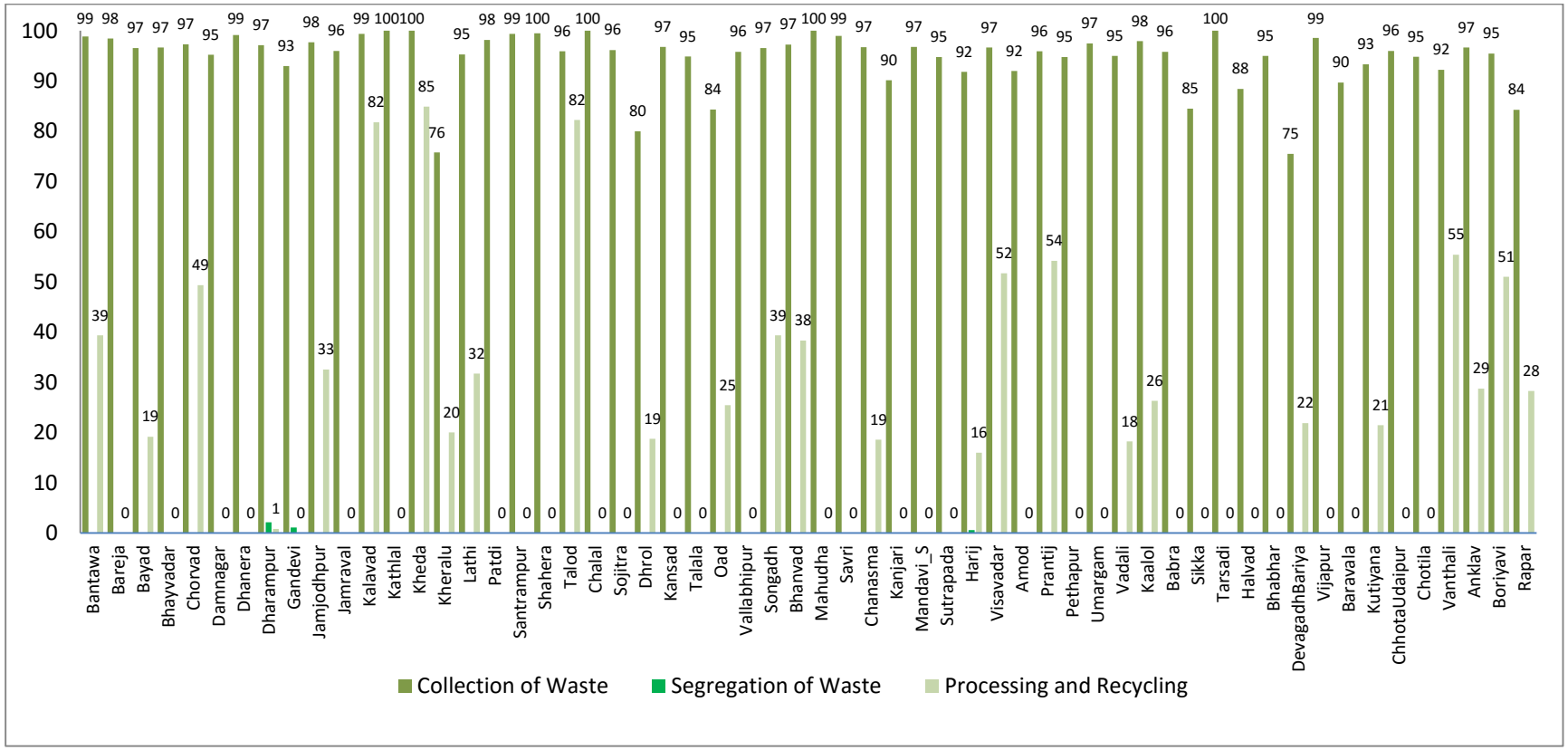
Graph 4.18: Class C, Segregation, Processing and Recycling



In some of the Class C cities all collection, segregation, processing and recycling processes are in place. In Bardoli, Bilimora, and Himmatnagar segregation, processing and recycling methods are observed but not 100% of SW collected. These methods have improved from previous year 2009-2010 percentages.

- **Class D cities**

Graph 4.19: Class D, Segregation, Processing and Recycling



In Class D cities, processing and recycling methods are in place in few cases but most of the cities do not have segregation methods functional yet. The collection has improved from what it was in the year 2009-2010.

4.4 Financial Management

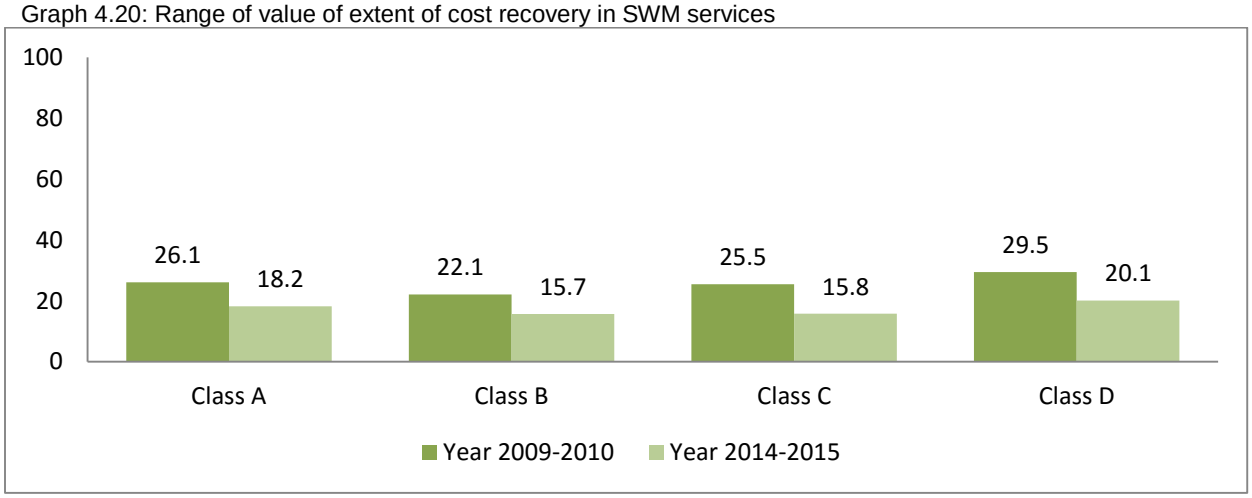
Financial sustainability includes indicators on extent of cost recovery (O&M) in SWM services and efficiency in collection of solid waste management related charges.

4.4.1 Extent of Cost Recovery (O&M) in SWM Services

Extent of cost recovery denotes the extent to which the ULB is able to recover all operating expenses related to SWM services from operating revenues of source related exclusively to SWM, which is defined as the total annual operating revenues from SWM as a percentage of the total annual operating expenses on solid waste management.

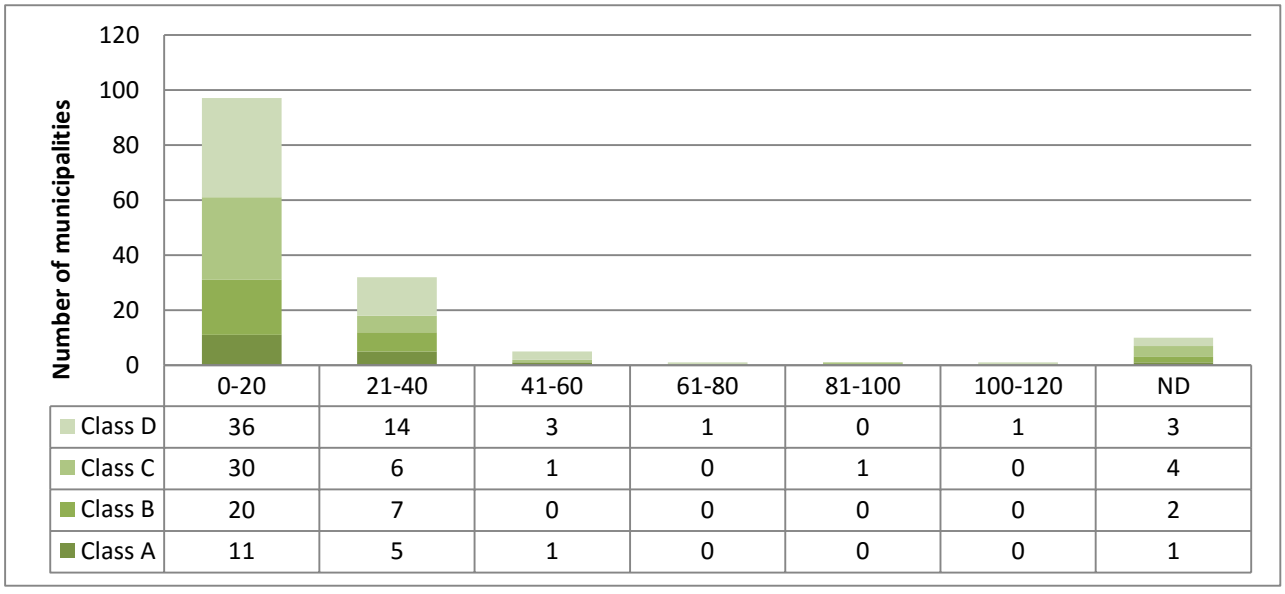
- **Weighted Average comparison of Municipalities**

Graph 4.20: Range of value of extent of cost recovery in SWM services



From the above figure it is evident that the extent of cost recovery in SWM services was much higher in the previous year 2009-2010 as compared to what it is now in the year 2014-2015.

Graph 4.21: Extent of cost recovery- comparison of municipalities

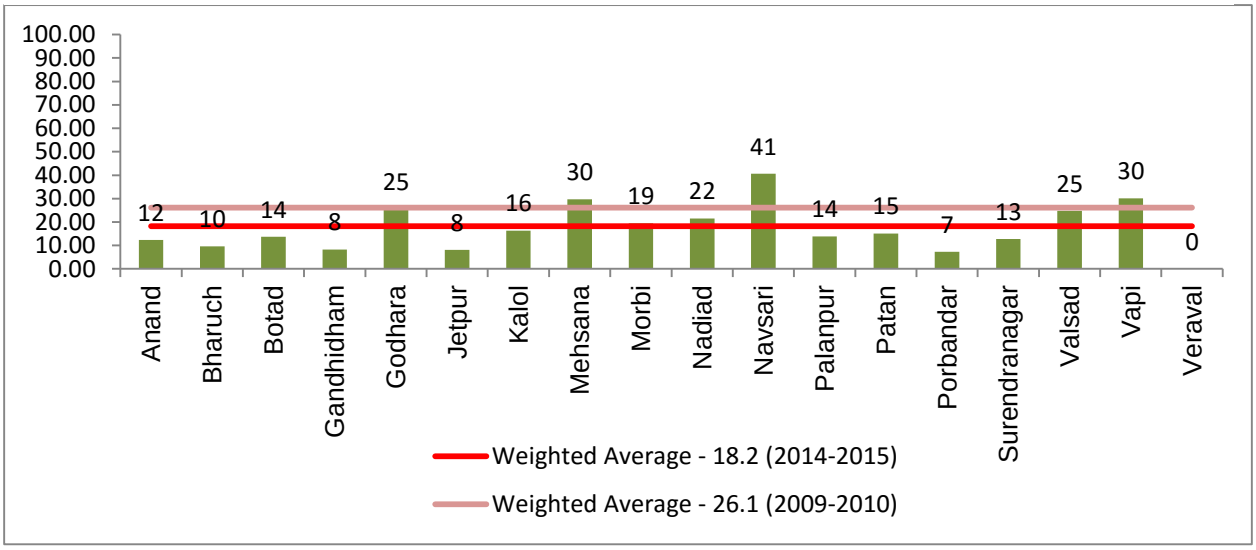


	0-20	21-40	41-60	61-80	81-100	100-120	ND
Class D	36	14	3	1	0	1	3
Class C	30	6	1	0	1	0	4
Class B	20	7	0	0	0	0	2
Class A	11	5	1	0	0	0	1

The combined weighted average of all municipalities for extent of cost recovery in SWM services is 16.3% which is lower than the state weighted average of 23.3% for the year 2009-2010. The majority of the Municipalities have very low cost recovery percentage in the range of 0-20% which is due to very low tariff levied and very high operational expenditure on solid waste management.

- **Class A cities**

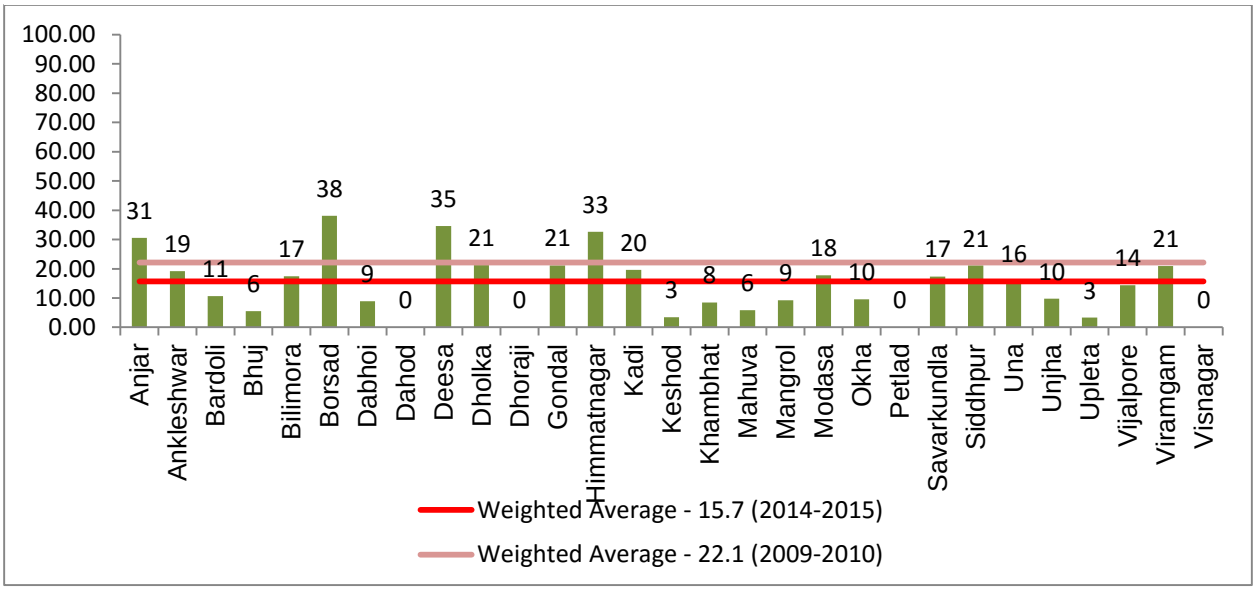
Graph 4.22: Class A, Extent of cost recovery, 2015



The weighted average of extent of cost recovery of Class A municipalities was much more in 2009-2010 (26.1%) as compared to 2014-2015 (18.2%). Bharuch, Gandhidham, and Porbandar have the lowest cost recovery whereas Navsari has got the highest. Extent of cost recovery of Veraval is not defined.

- **Class B cities**

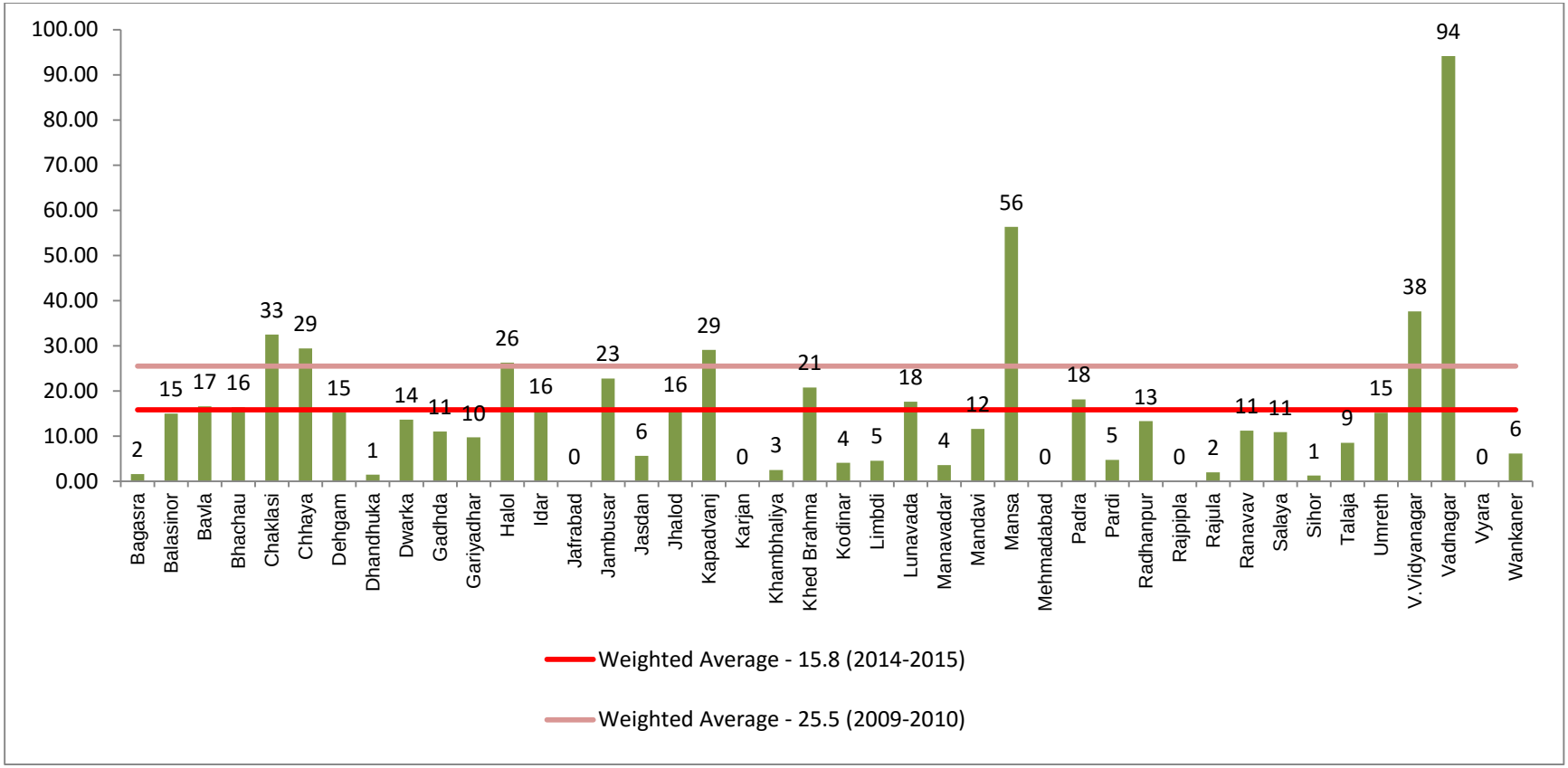
Graph 4.23: Class B, Extent of cost recovery



The weighted average of extent of cost recovery of Class B municipalities was much more in 2009-2010 (22.1%) as compared to 2014-2015 (15.7%). Bardoli, Bhuj, Keshod, Upleta. Mahuva, Mangrol and Dabhoi have the lowest cost recovery whereas Borsad has got the highest. Extent of cost recovery of Dahod, Dhoraji, Petlad, and Visnagar are not defined. Visnagar municipality has not levied tariff charges even though an expenditure of Rs. 193.12 lakhs was made on solid waste services. This has affected financial sustainability and other sector services.

- **Class C cities**

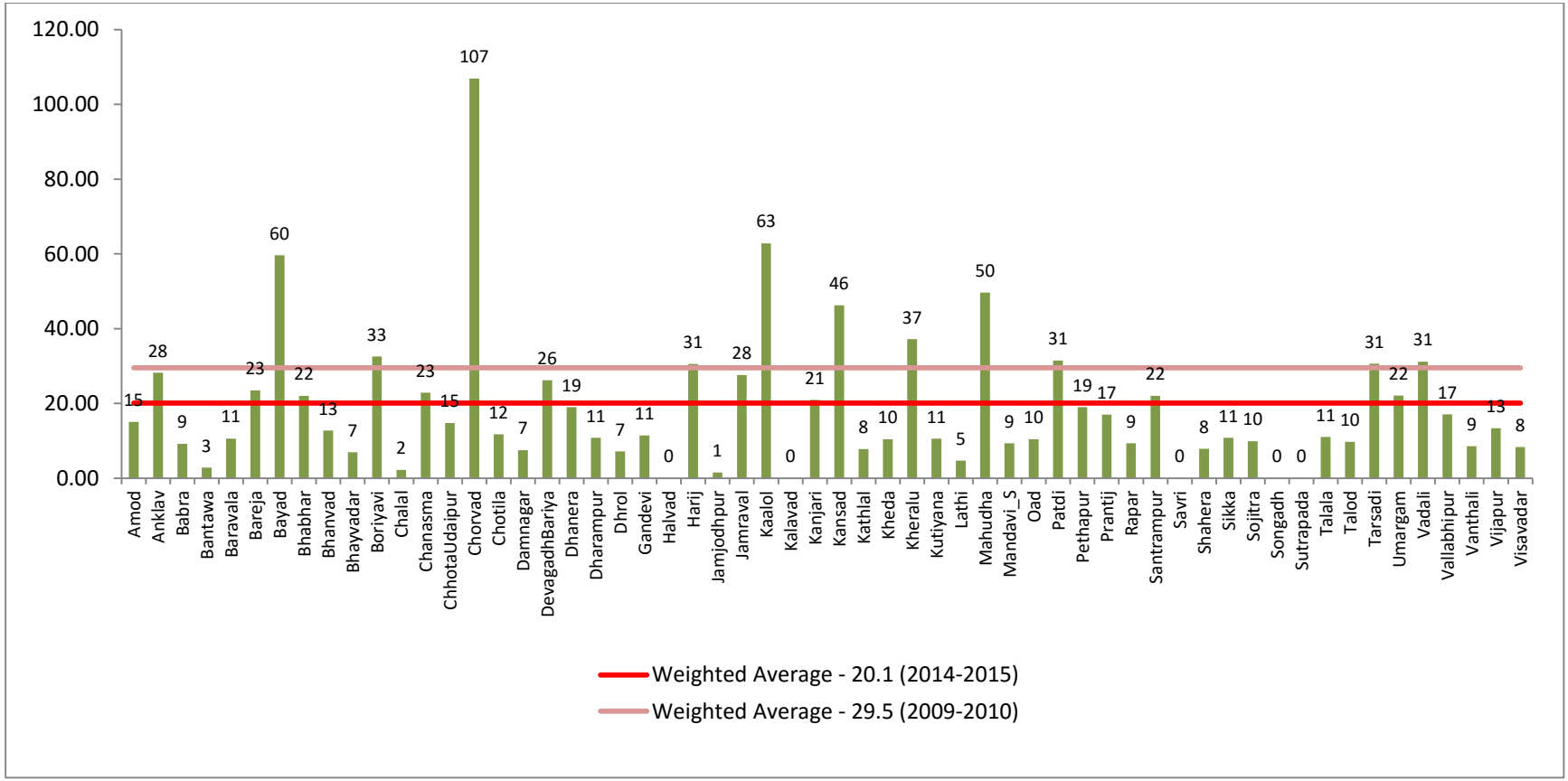
Graph 4.24: Class C, Extent of cost recovery



The weighted average of extent of cost recovery of Class C municipalities was much more in 2009-2010 (25.5%) as compared to 2014-2015 (15.8%). Bagasara, Dhandhuka, Jasdan, Khambhaliya, Kodinar, Limbdi, Manavadar, Rajula, Sihor, and Pardi have the lowest cost recovery whereas Vadnagar has got the highest as municipality followed proper billing and collection cycle for tax collection. Mansa also has the highest cost recovery. Extent of cost recovery of Jafrabad, Karjan, Mehmadabad, and Vyara are not defined.

- **Class D cities**

Graph 4.25: Class D, Extent of cost recovery



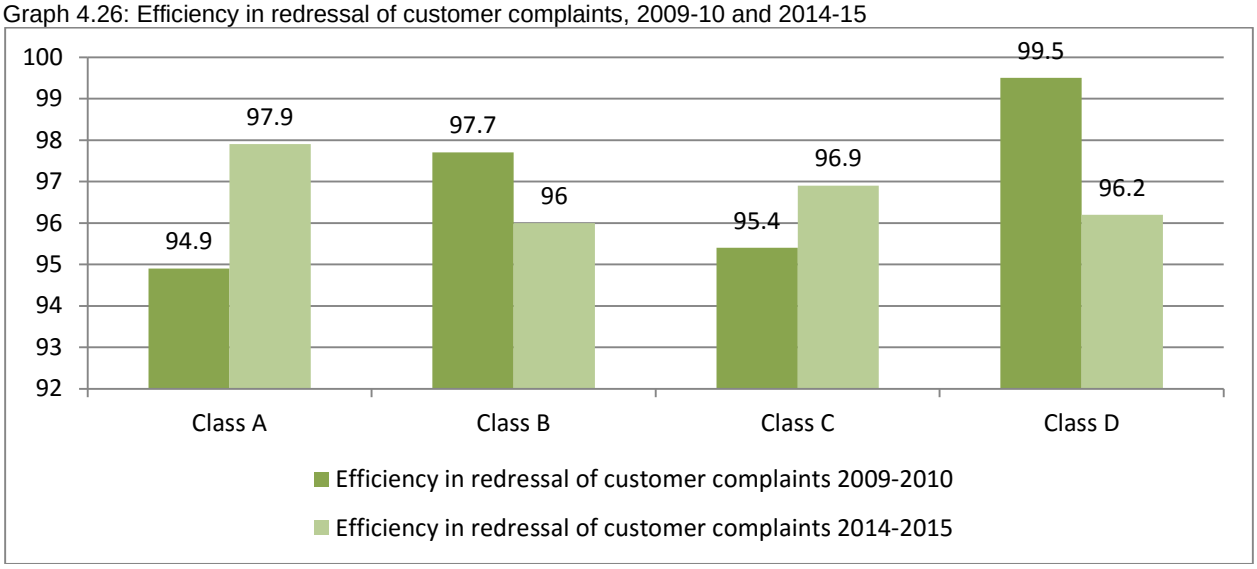
The weighted average of extent of cost recovery of Class D municipalities was much more in 2009-2010 (29.5%) as compared to 2014-2015 (20.1%). Bantawa, Chalal, and Jamjodhpur have lowest cost recovery whereas Chorwad has got the highest followed by Kalol and Bayad. Data could not be extracted for the cities Halvad, Kalavad, Savri, Songadh, and Sutrapada.

4.5 Efficiency in Service Operation

4.5.1 Efficiency in redressal of customer complaints

Efficiency in redressal of customer complaints is defined as the total number of SWM-related complaints redressed within 24 hours of receipt of the complaint, as a percentage of the total number of SWM complaints received in the given time period.

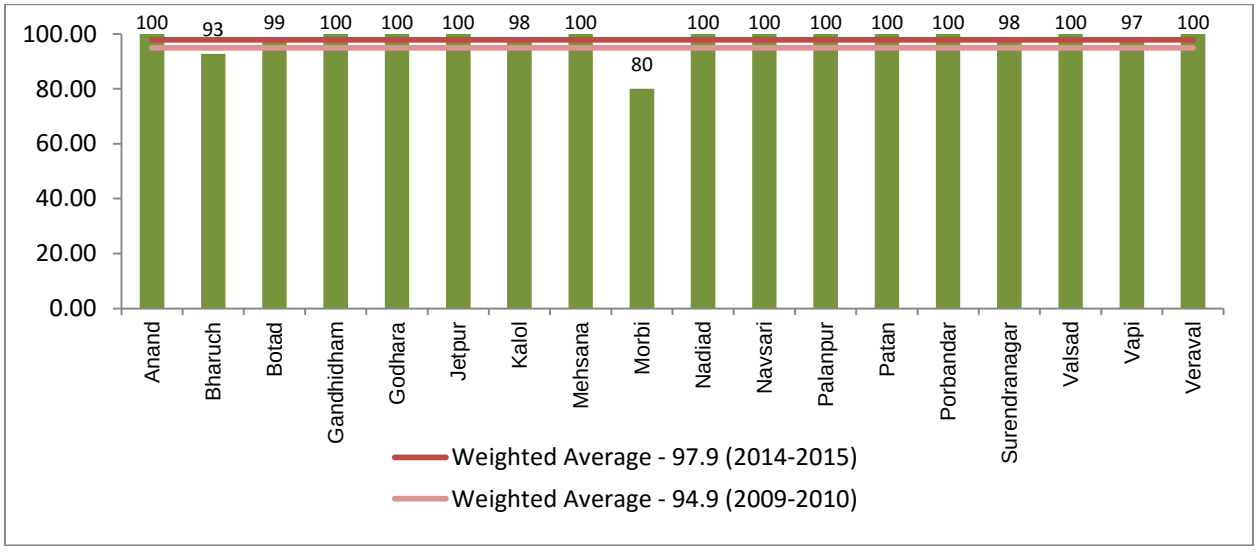
Graph 4.26: Efficiency in redressal of customer complaints, 2009-10 and 2014-15



After comparing weighted average of all classes for the year 2009-2010 and 2014-2015, we understand that efficiency in redressal of customer complaints was much higher for Class B and D previously which has gone down by a marginal number in 2014-2015. For all other classes it has increased to some extent.

- **Class A cities**

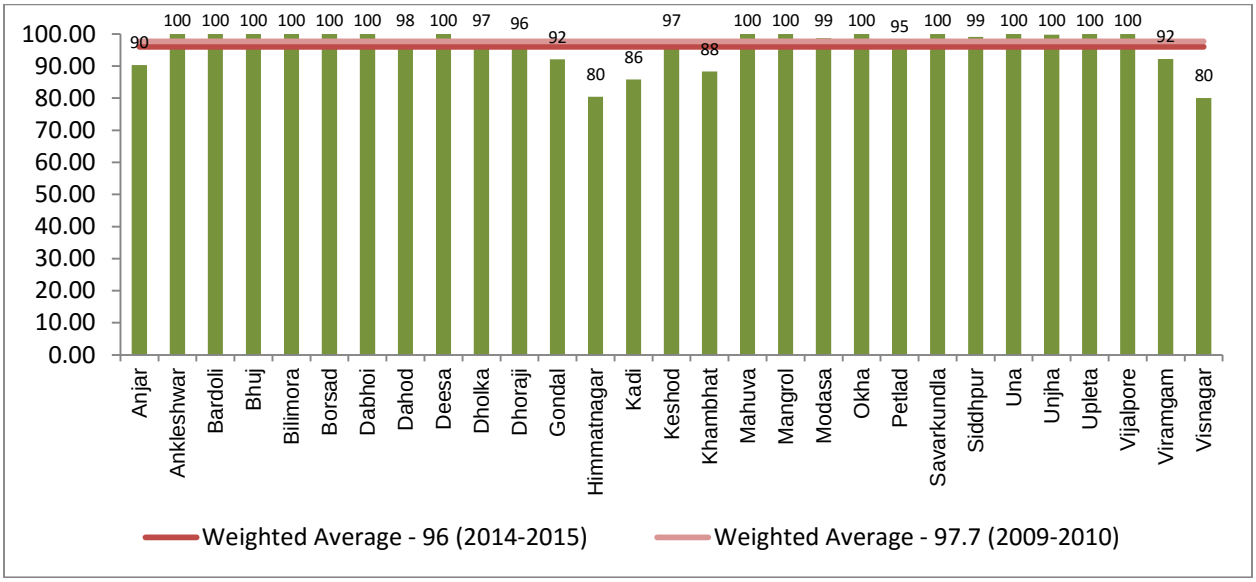
Graph 4.27: Class A, Efficiency in redressal of customer complaints



The weighted average of efficiency in redressal of customer complaints of Class A municipalities were a bit less in 2009-2010 (94.9%) as compared to 2014-2015 (97.9%). Morbi has the lowest efficiency. Most of the cities have reached the 100% efficiency standard.

- **Class B cities**

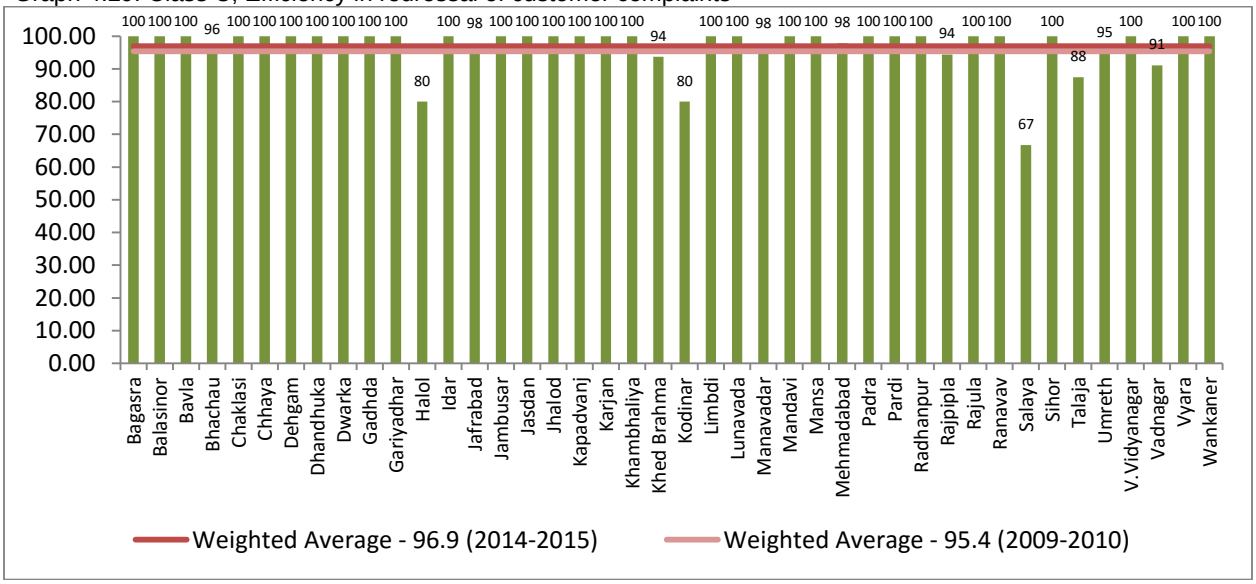
Graph 4.28: Class B, Efficiency in redressal of customer complaints



The weighted average of 'efficiency in redressal of customer complaints of Class B municipalities' was less in 2009-2010 (97.7%) as compared to 2014-2015 (96%). Visnagar and Himmatnagar have low efficiency as compared to others. Most of the cities have reached the 100% efficiency standard.

- **Class C cities**

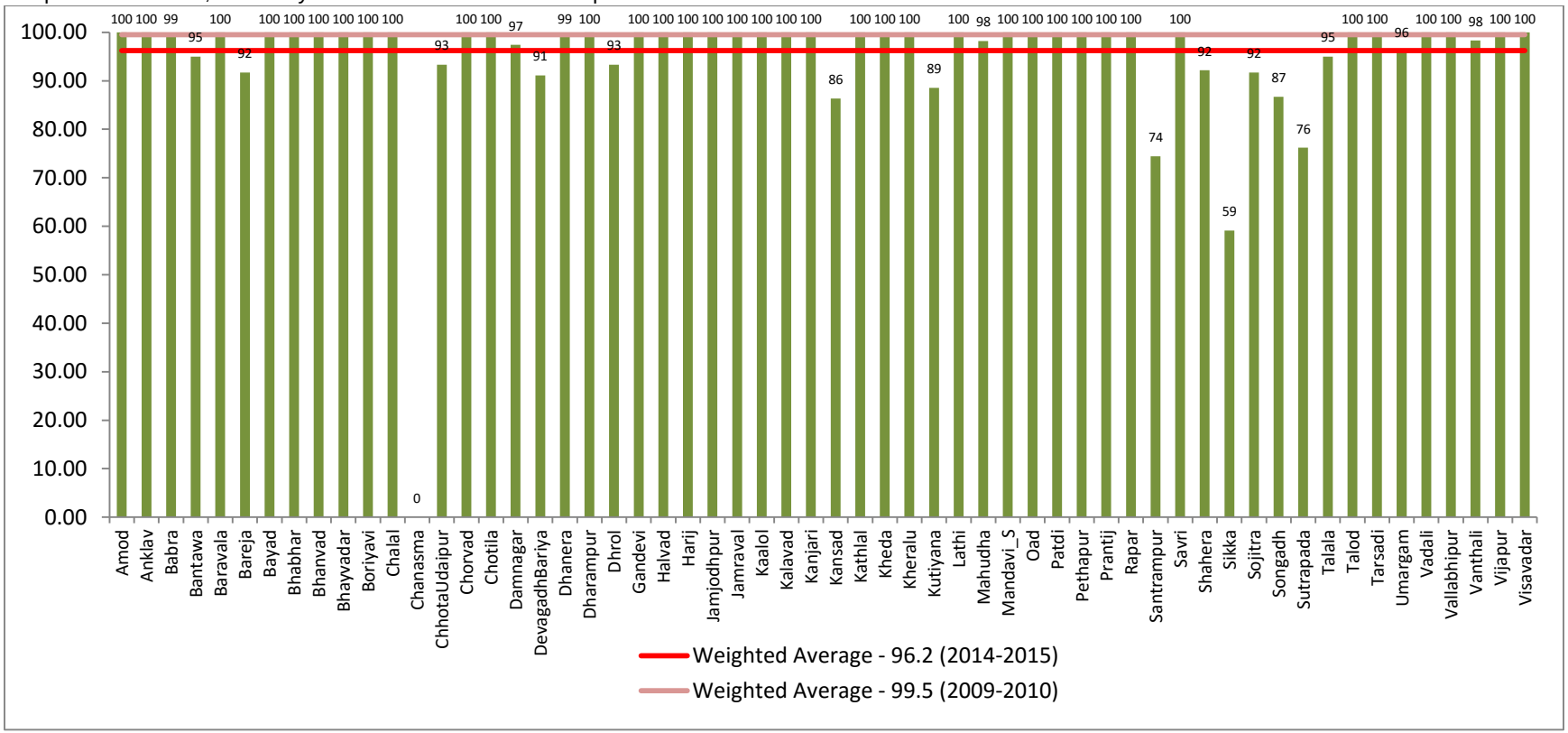
Graph 4.29: Class C, Efficiency in redressal of customer complaints



The weighted average of efficiency in redressal of customer complaints of Class C municipalities was a bit less in 2009-2010 (95.4%) as compared to 2014-2015 (96.9%). Salaya has the lowest efficiency. Most of the cities have reached the 100% efficiency standard.

- **Class D cities**

Graph 4.30: Class D, Efficiency in redressal of customer complaints

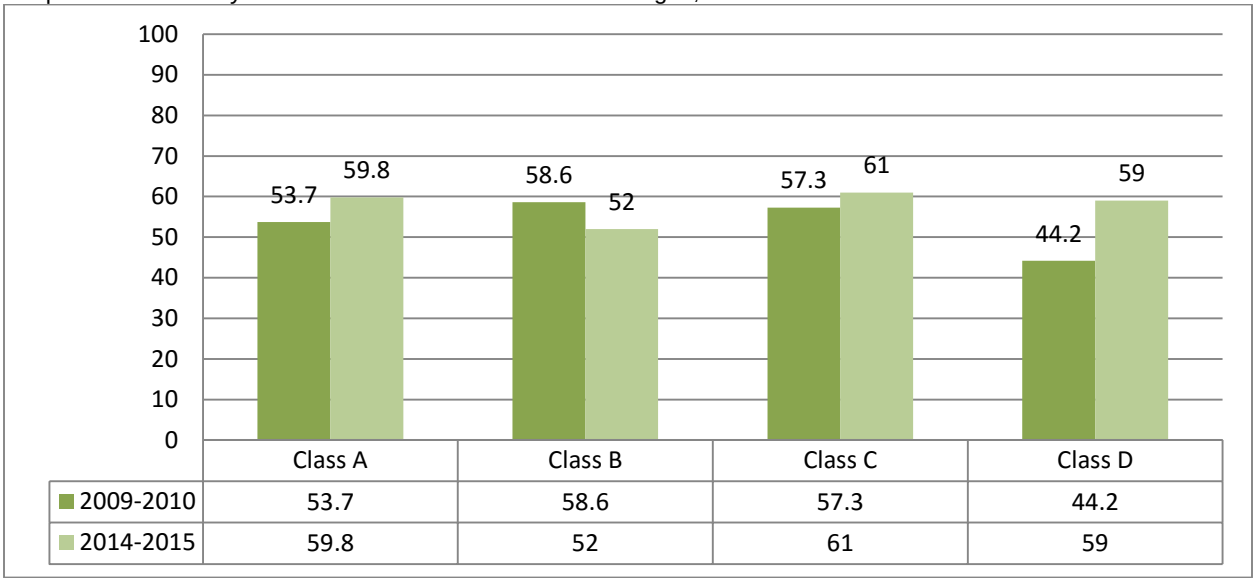


The weighted average of efficiency in redressal of customer complaints of Class D municipalities was more in 2009-2010 (99.5%) as compared to 2014-2015 (96.2%). Sikka has the lowest efficiency. Most of the cities have reached the 100% efficiency standard.

4.5.2 Efficiency in collection of SWM – related user charges

Efficiency in collection of SWM-related user charges (%) is defined as current year revenues collected, expressed as a percentage of total operating revenues, for the corresponding time period.

Graph 4.31: Efficiency in collection of SWM-related user charges, 2009-10 and 2014-15

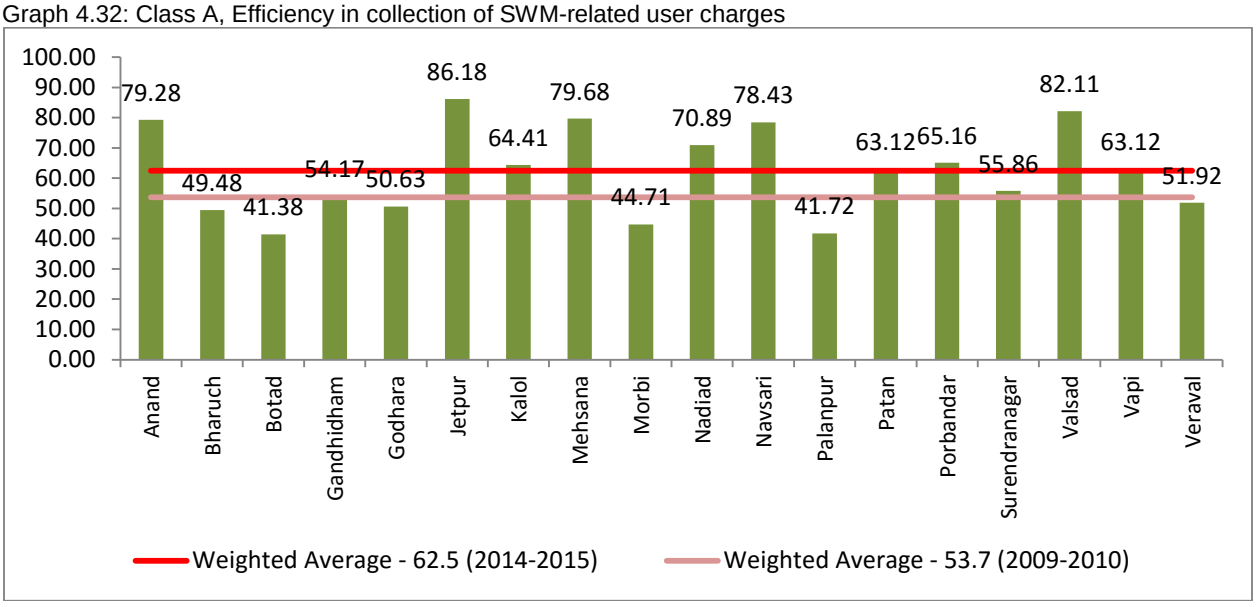


	Class A	Class B	Class C	Class D
2009-2010	53.7	58.6	57.3	44.2
2014-2015	59.8	52	61	59

After comparing weighted average of all classes for the year 2009-2010 and 2014-2015, we understand that efficiency in collection of SWM related user charges have marginally gone up for Classes A, C and D and gone down for Class B.

- **Class A class**

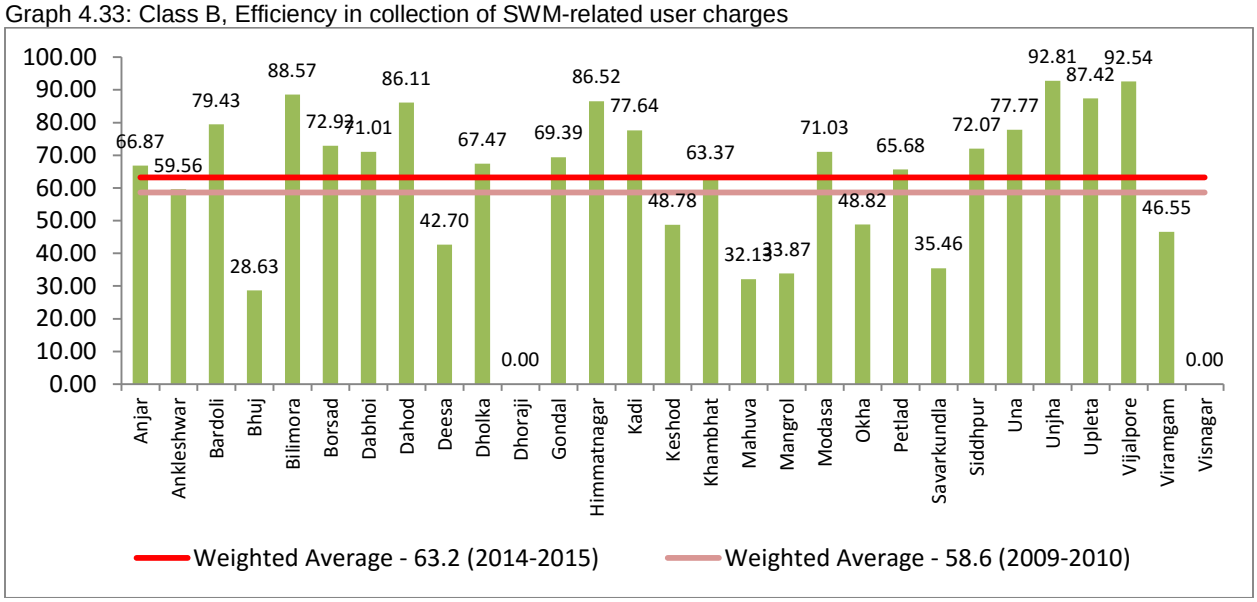
Graph 4.32: Class A, Efficiency in collection of SWM-related user charges



The weighted average of 'efficiency in collection of SWM related user charges of Class A municipalities'was a bit less in 2009-2010 (53.7%) as compared to 2014-2015 (62.5%). Cities Botad, Morbi, and Palanpurhave the lowest efficiency whereas Mehsana is at the highest with 86% efficiency.

- **Class B class**

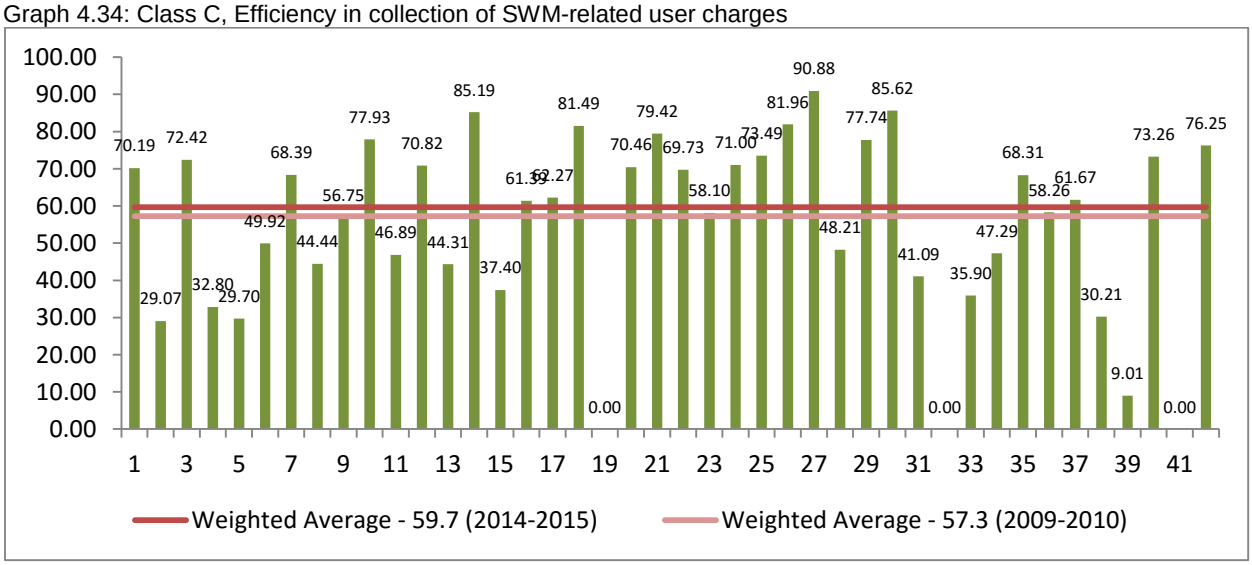
Graph 4.33: Class B, Efficiency in collection of SWM-related user charges



The weighted average of 'efficiency in collection of SWM related user charges of Class B municipalities' for 2014-2015 is 63.2% which increased from 58.6% in 2009-2010. Cities Bhuj and Mahuva have the lowest efficiency whereas Unjha is at the highest with 92.81% efficiency. Due to avoidable reasons, data could not be extracted from the cities Dhoraji and Visnagar.

- **Class C class**

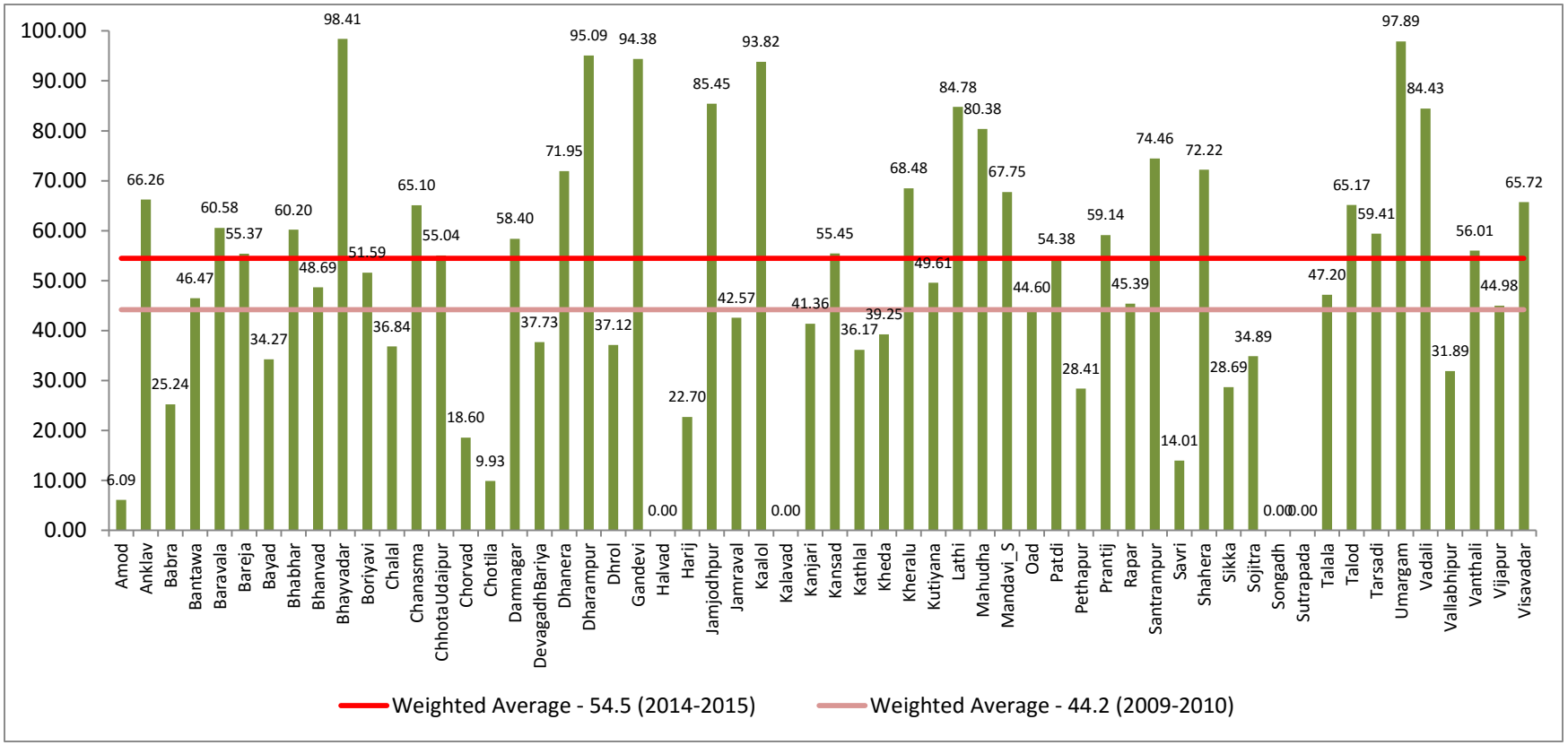
Graph 4.34: Class C, Efficiency in collection of SWM-related user charges



The weighted average of 'efficiency in collection of SWM related user charges of Class C municipalities' for 2009-2010 year (57.3%) and 2014-2015 year (59.7%) are almost the same. Vallabh-Vidyanagar has the lowest efficiency whereas Mansa is at the highest with 91% efficiency.

- **Class D class**

Graph 4.35: Class D, Efficiency in collection of SWM charges



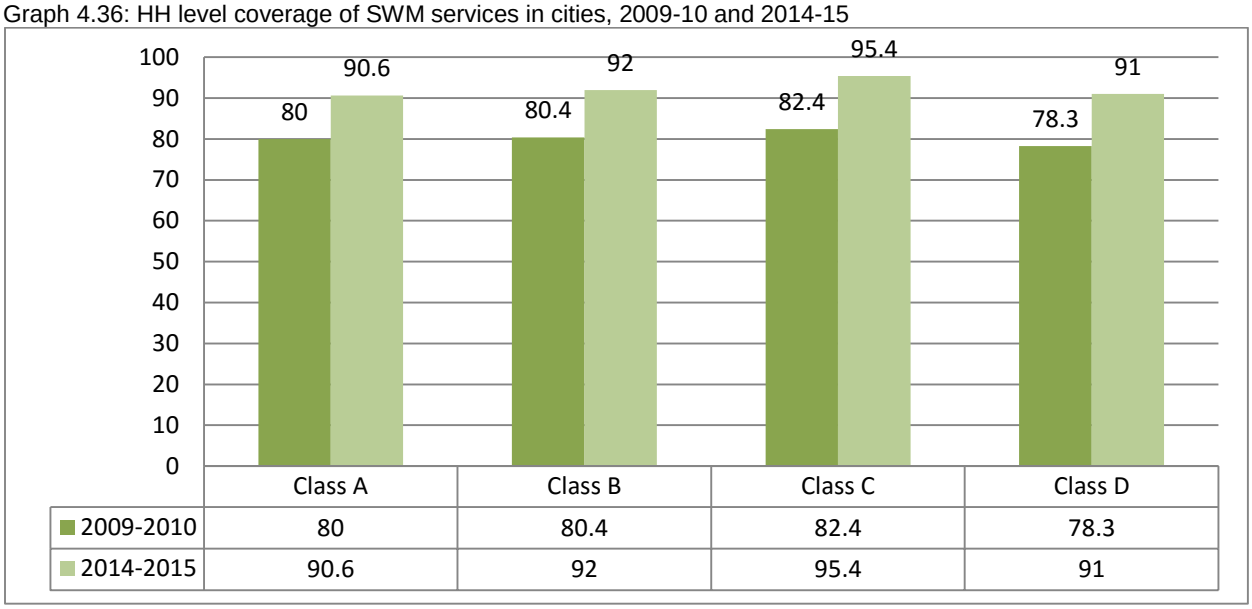
The weighted average of 'efficiency in collection of SWM related user charges of Class D municipalities' was much less in 2009-2010 (44.2%) as compared to 2014-2015 (54.5%). Cities 'Amod and Chotila' have lowest efficiency whereas Cities Bhayvadar, Dharampur, Gandevi, Kalol and Umargam have high efficiency between 93% and 98%. For cities Halvad, Kalavad, Songadh, and Sutrapada, data could not be extracted due to unavoidable reasons.

4.6 Equity

Equity in service delivery includes spatial variations in HH level coverage of SWM services (%) and HH level coverage of SWM services in 'slum settlements'.

4.6.1 Household Level Coverage of SWM services in 'Cities'

Graph 4.36: HH level coverage of SWM services in cities, 2009-10 and 2014-15

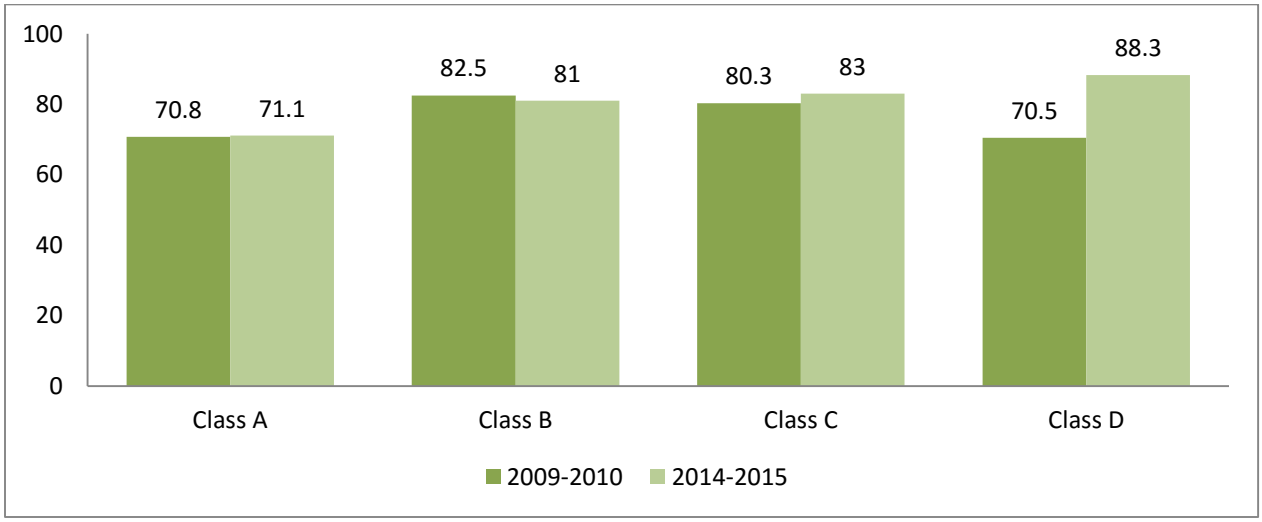


	Class A	Class B	Class C	Class D
2009-2010	80	80.4	82.4	78.3
2014-2015	90.6	92	95.4	91

In the above figure we can see the HH level coverage of SWM services in cities for 2009-10 and 2014-15 year. The coverage has increased marginally for all classes from what it was before.

4.6.2 Household Level Coverage of SWM services in 'Slum Settlements'

Graph 4.37: HH level coverage of SWM services in slum settlements, 2009-10 and 2014-15



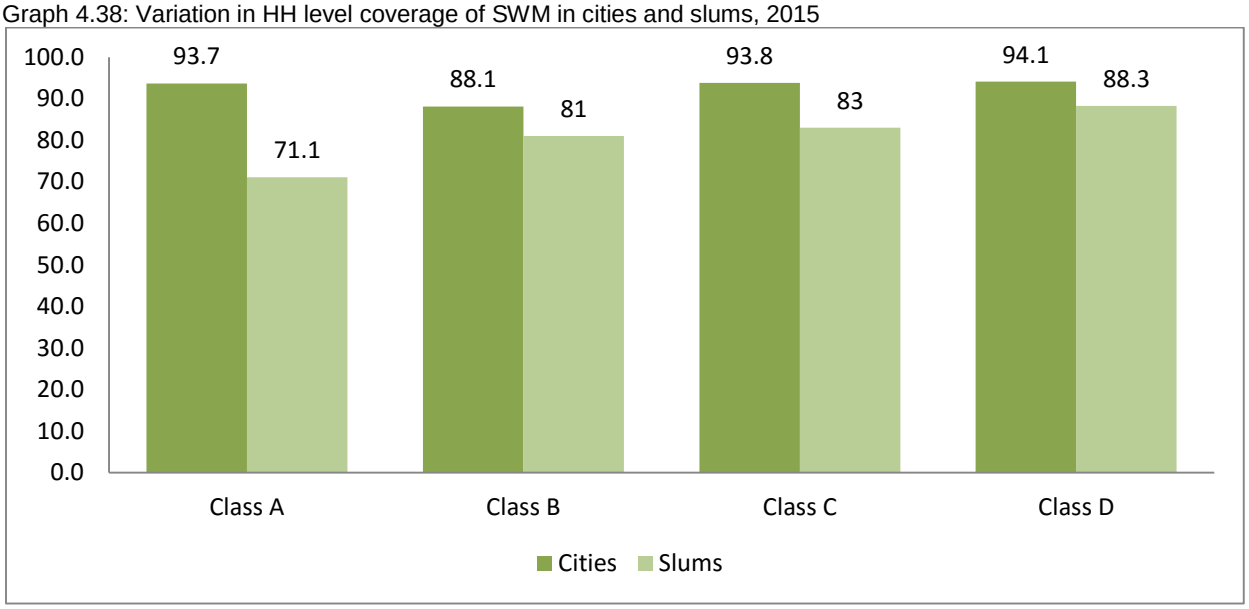
As we can see in the above figure, HH level coverage of SWM services in 'slum settlements' is more or less the same for both the years except in class D where it has increased marginally.

- **Spatial Variations in Household Level Coverage of SWM Services**

Spatial variations in HH level coverage of SWM service is defined as (standard deviation divided by mean) zonal values for 'percentage of households covered by daily door-step collection system to total number of households'.
There is no data availability for spatial variations in HH level coverage of SWM services (%) across any city and hence the indicator has not been considered for analysis.

- **Variation in HH level coverage of SWM in cities and slums**

Graph 4.38: Variation in HH level coverage of SWM in cities and slums, 2015

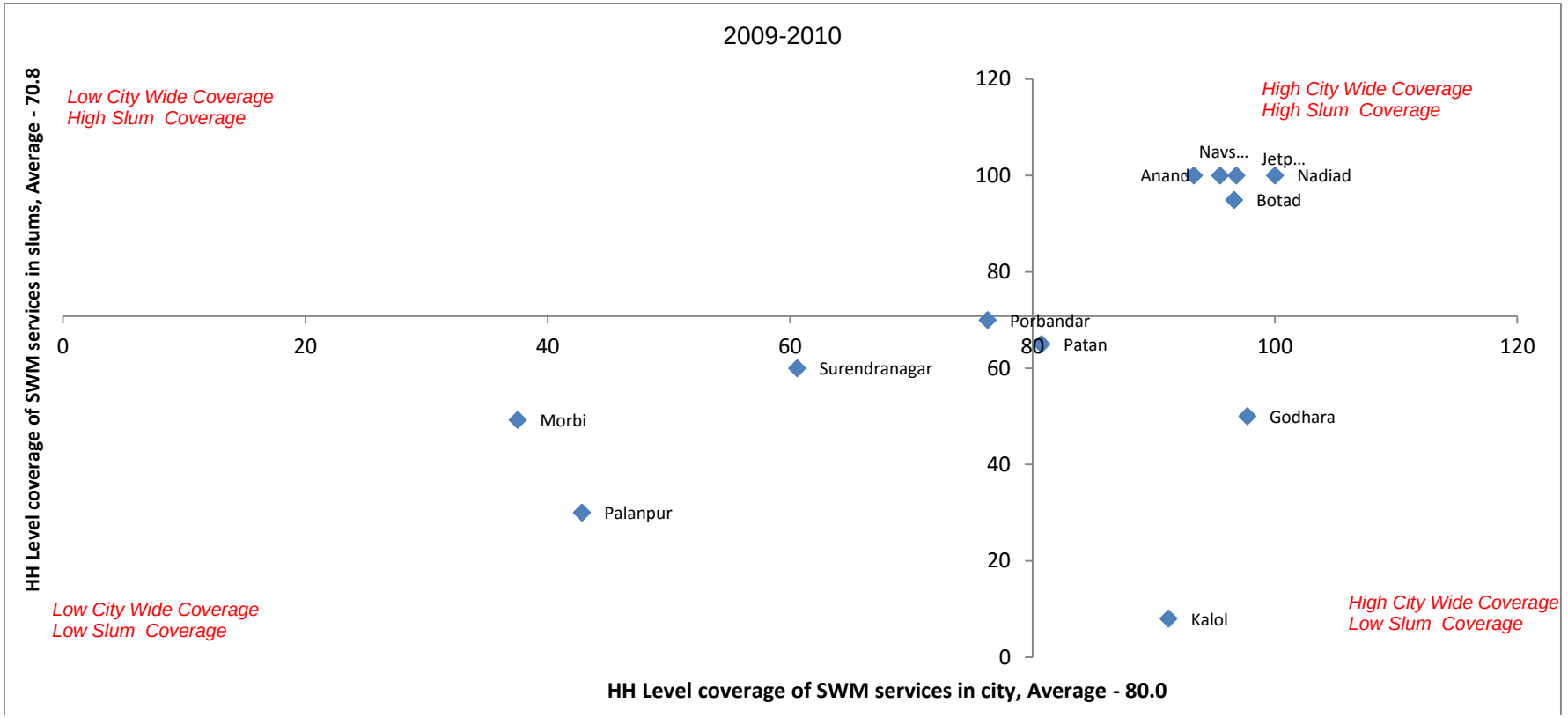


The above mentioned figure shows the HH level coverage of SWM in cities and slums. The percentage of weighted average of HH level coverage of SWM services is marginally higher in cities in comparison to slums for the current year. In the year 2009-2010, the variation between cities and slums in HH level coverage of SWM was much higher.

There could be two reasons behind less coverage of HHs in slum settlements for the year 2014-2015; firstly because of relocation of slum dwellers as per schemes applicable in the cities, many of the settlements do not exist anymore and secondly, there could be few settlements/ HHs from which data could not be extracted for the year 2014-2015.

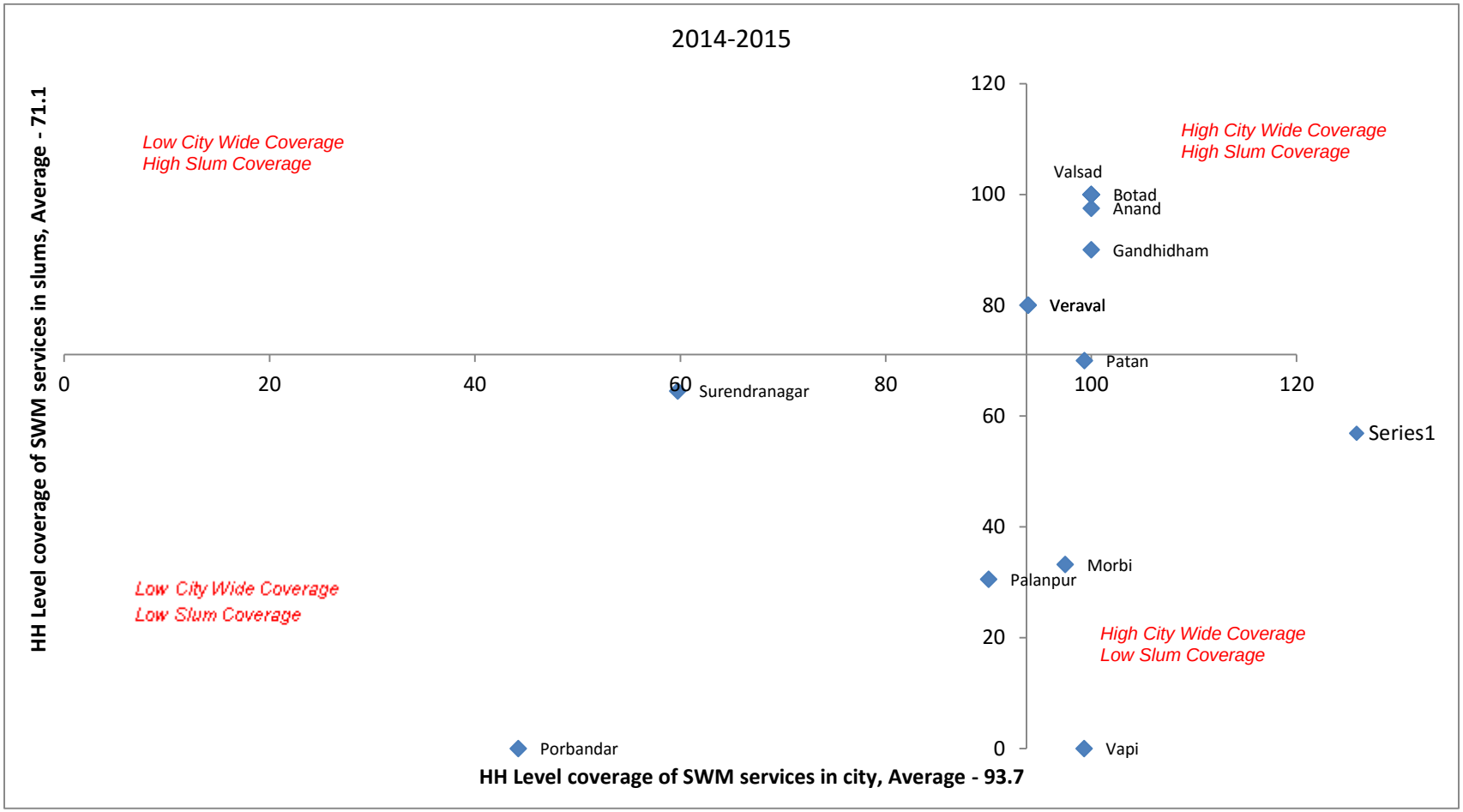
- **Class A cities**

Graph 4.39: Class A, HH level coverage of SWM services in cities and slums, 09-10



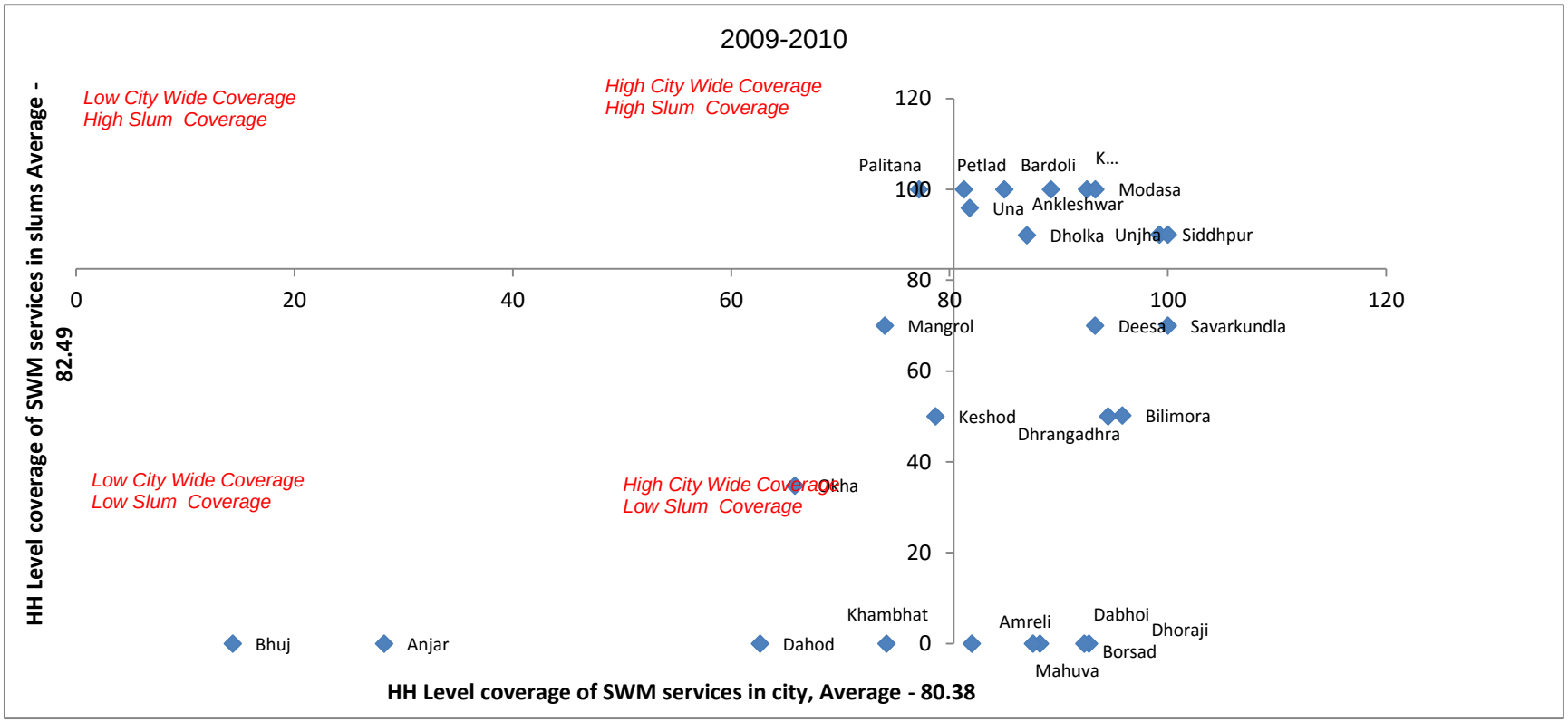
As we can observe in the above figures for Class A municipalities, most of the cities that were in low city wide - low slum coverage in 2009-2010 have moved towards high city wide - low slum and high city wide - high slum category in 2014-2015; Morbi and Palapur are amongst such cities. Porbandar has come down to low city wide – low slum coverage may be due to non – renewal of contract of SWM group responsible for door to door collection in both cities and slums.
In 2010, Gandhidham, Morbi & Palanpur were falling behind in terms of coverage. Botad and Nadiad had better coverage but in 2015, Anand, Botad, Gandhidham, Godhra, Jetpur, Kalol and Valsad have good coverage in both cities and slums.

Graph 4.40: Class A, HH level coverage of SWM services in cities and slums, 14-15



- **Class B cities**

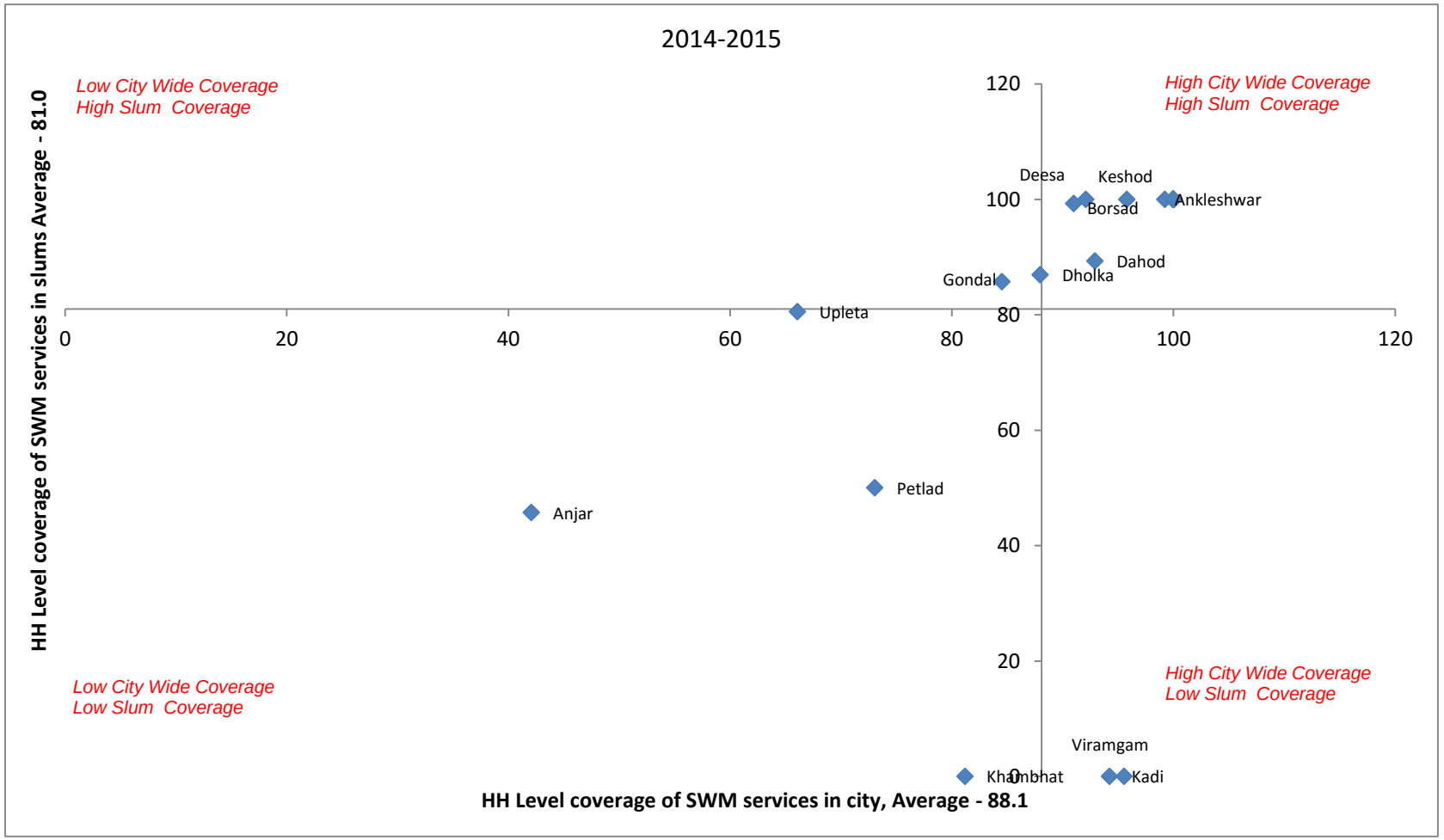
Graph 4.41: Class B, HH level coverage of SWM services in cities and slums, 09-10



As we can observe in the above figures for Class B municipalities, most of the cities that were in low city wide - low slum coverage in 2009-2010 have moved towards high city wide – high slum and low city wide - high slum category in 2014-2015; Bhuj, Anjar and Dahod are amongst such cities.Petlad has come down to low city wide – low slum coverage, maybe due to non-renewal of SWM workers responsible for door to door collection. The HH level coverage in Anjar city has improved from what it was in 2009-10 but it still remains in the low city wide-slum coverage category.

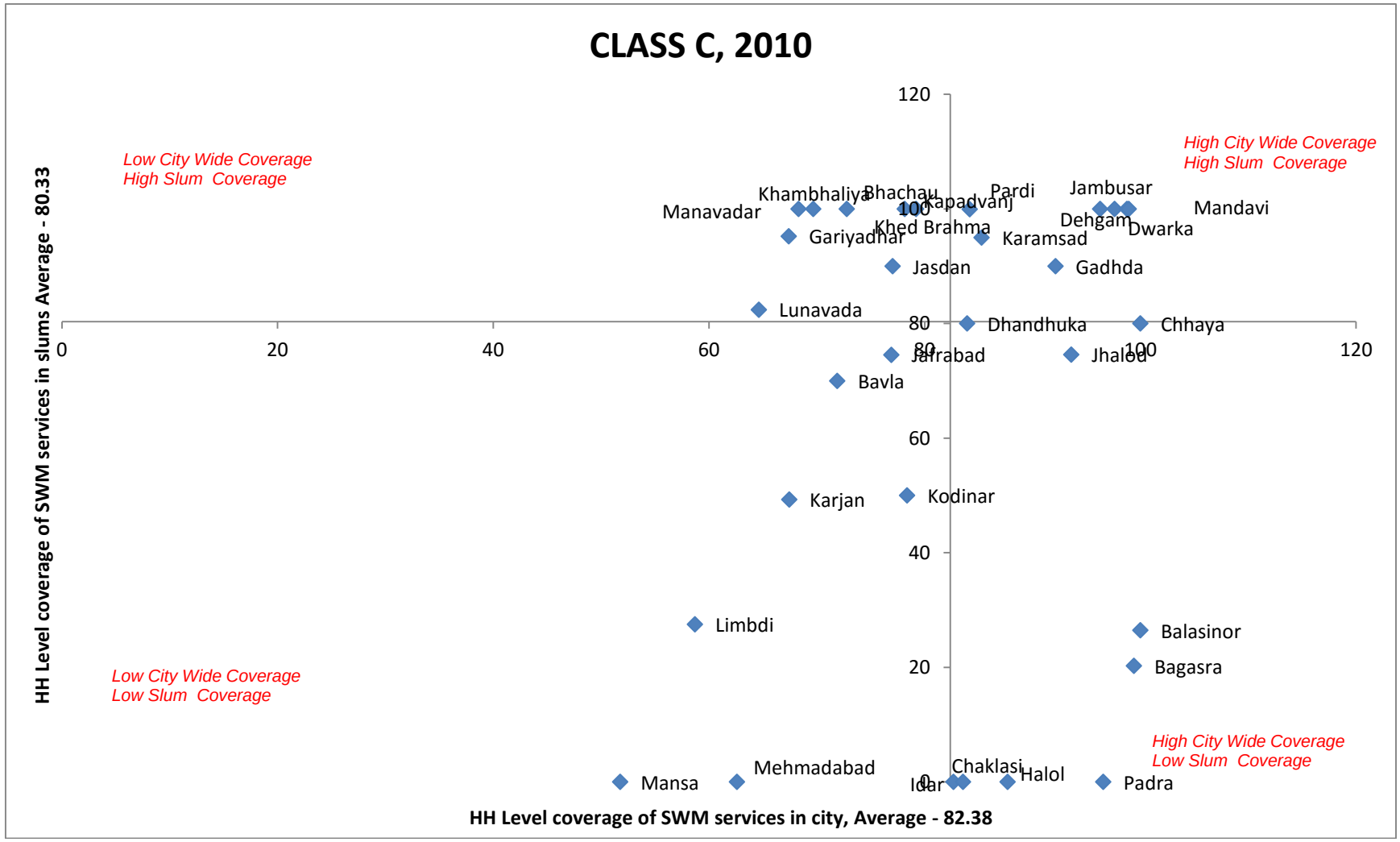
In 2010, Bilimora, Himmatnagar, Savarkundla, Siddhpur, and Unjha had better coverage and Anjar, Bhuj, and Okha were falling behind but in 2015, Ankleshwar, Bardoli, Bilimora, Dabhoi, Mangrol, Modasa, Siddhpur, Unjha, Vijalpore, and Visnagar are falling under better coverage. Anjar, Bhuj and Okha are still falling behind.

Graph 4.42: Class B, HH level coverage of SWM services in cities and slums, 14-15

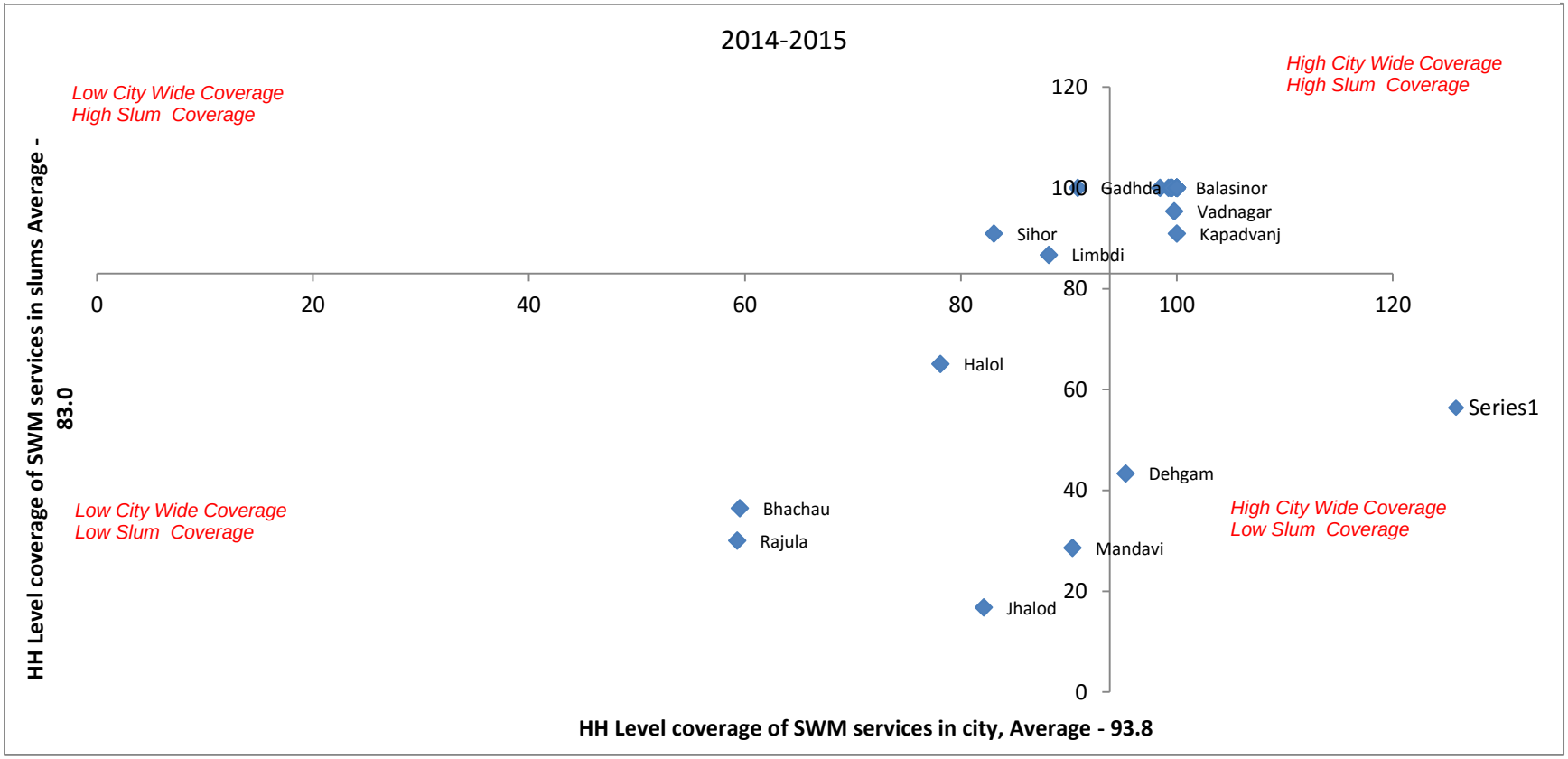


- **Class C cities**

Graph 4.43: Class C, HH level coverage of SWM services in cities and slums, 09-10



Graph 4.44: Class C, HH level coverage of SWM services in cities and slums, 14-15

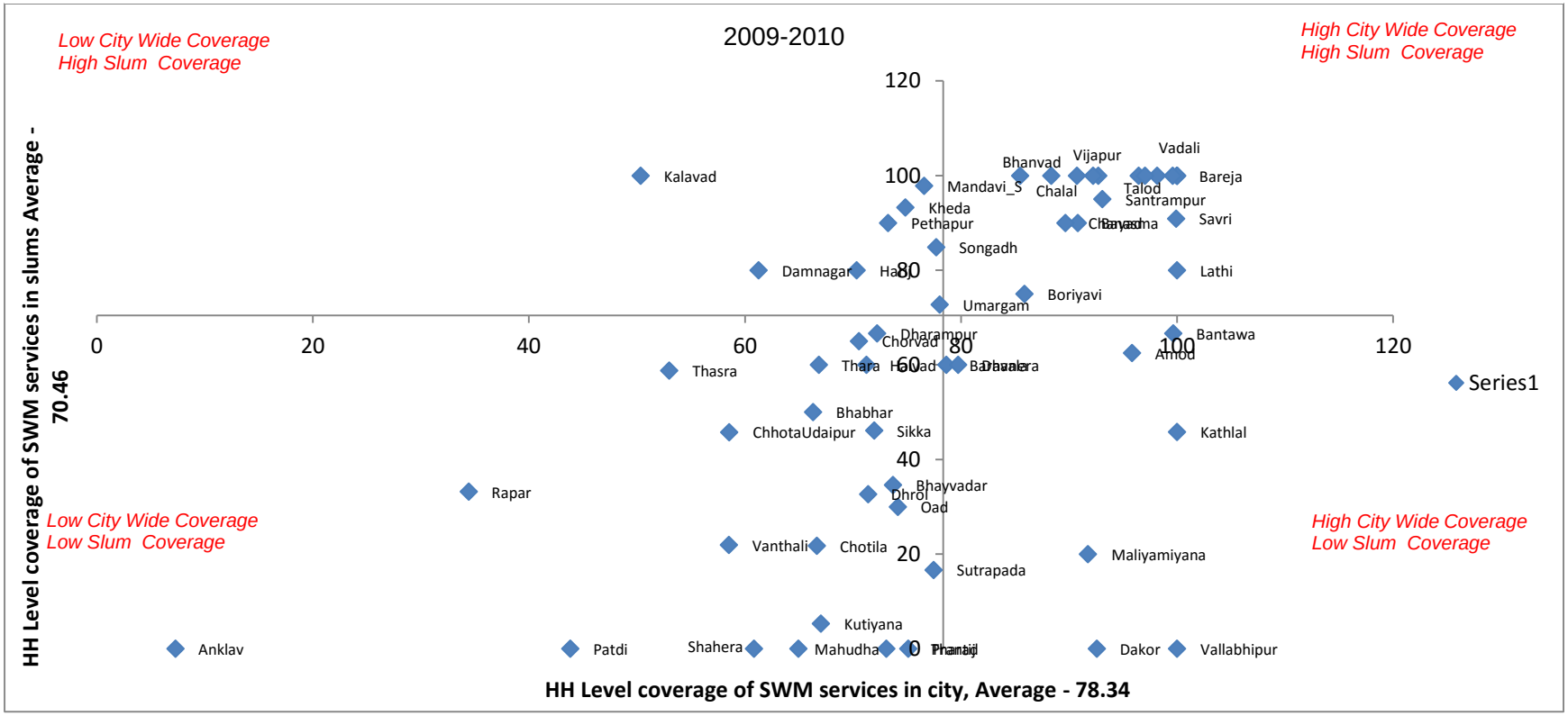


As we can observe in the above figures for Class C municipalities, most of the cities that were in low city wide - low slum coverage in 2009-2010 have moved towards the center of the quadrant and towards high city wide - high slum category in 2014-2015. Cities 'Vadnagar, Kapadvanj, and Limbdi' now fall under high city wide – high slum coverage. Cities 'Bhachau, Rajula and Jhalod' are still under low city wide – low slum coverage.

In 2010, Balasinor, Chhaya, Dwarka, Gariyadhar, idar, Jambusar, Khed Brahma, Radhanpur, Rajpipla and Sihor had better HH coverage in cities and slums and Bhachau, Karjan, Mehmadabad, and Ranavav were falling behind. In 2015, Balasinor, Bavla, Dwarka, Khambhaliya, Khed Brahma, Mehmadabad, Padra, Pardi, Talaya, Umreth, V.Vidhyanagar, Vyara, Wankaner, Rajpipla have better coverage in both cities and slums. Bachau and Rajula have low coverage.

- **Class D cities**

Graph.45: Class D, HH level coverage of SWM services in cities and slums, 09-10



For Class D cities, we can interpret from the above figures that most of the cities were coming under low city wide – low slum coverage in the year 2009-2010 but many of them moved towards high city wide – high slum coverage in the year 2014-2015. Cities Rapar, Boriyavi and Kutiyana still have low city wide – low slum coverage. The accumulation of cities were more towards the center of the quadrant in 2009-2010 but in 2014-2015 it is more inclined towards upper right side. In 2010, Bareja, Bayad, Ganderi, Jamjodhpur, JamravalKheralu, Lathi, Sojitra, Talod, Tarsadi, Vijapur, had better coverage. Chhota Udaipur, Rapar, Thasra, Vanthali were falling behind.
In 2015, Bantawa, Bareja, Bayad, Bhayvadar, Chorwad, Dhanera, Dharampur, Gandheri, Jamjodhpur, Jamravad, Kansad, Kheda, Kheralu, Patdi, Sojitra have better coverage. Boriyavi and Rapar have less coverage.

Graph 4.46: Class D, HH level coverage of SWM services in cities and slums,14-15