
Co-benefits of Integrated Solid Waste Management

Case of Indore City, India

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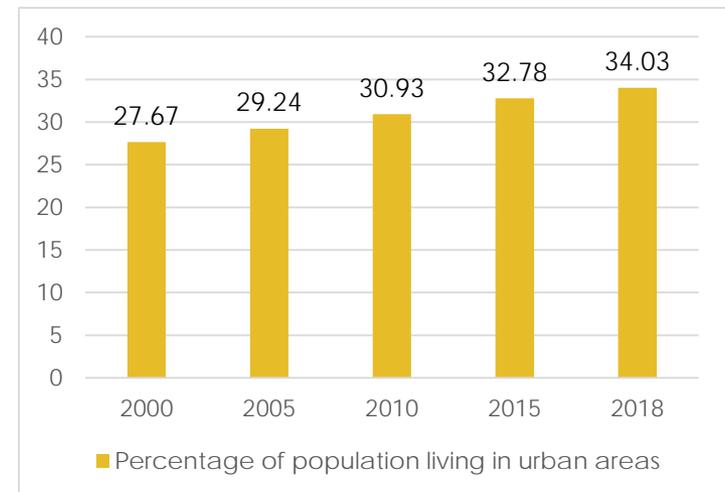
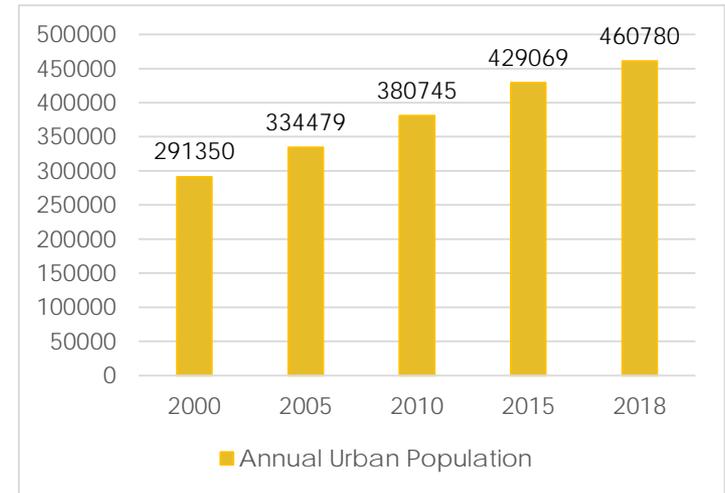
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Urbanization Trend in India

- According to the 2011 Census, the urban population grew to 377.1 million as compared to 286.1 million in 2001 census showing a growth of 2.76 percent per annum during 2001-2011.
- The level of urbanization in the country as a whole increased from 25.7 percent in 1991 to 27.82 percent in 2001 which is close to 35 % now.
- The number of statutory towns in India increased from 3,799 to 4,041 during 2001-2011 whereas the number of census towns have increased from 1,362 to 3,892 during the decade.



Source - Handbook of Urban Statistics 2019(MoHUA)



Urban Sanitation and Waste management



India loses USD 54 Billion per year due to inadequate sanitation



Poor Sanitation and Hygiene cause 100,000 child deaths every year in India



Over 12% Urban Households Defecate in the open in India



Only 21.5% of Solid Waste Generated is processed in India

Swachh Bharat Mission (Clean India Mission)

- The Swachh Bharat Mission (Clean India Mission) was launched on 2nd October 2014 by the Hon'ble PM of India Shri Narendra Modi.
- It aims at making India **free from open defecation** and achieving **100% scientific management of municipal solid waste** in the country.
- “Swachhta hi Seva” Campaign launched in 2017 to mobilize citizens to volunteer for cleanliness.
- Two domains for the Mission created for Robustness –
 - **SBM Urban** – Under Ministry of Housing and Urban Affairs.
 - **SBM Rural** – Under Ministry of Drinking Water and Sanitation.



“Cleanliness is Service”

Swachh Bharat Mission- Urban (Clean India Mission)

Objectives

Elimination of open defecation

Eradication of Manual Scavenging

Modern and Scientific Municipal Solid Waste Management

To effect behavioral change regarding healthy sanitation practices

Generate awareness about sanitation and its linkage with public health

Capacity Augmentation for ULB's

To create an enabling environment for private sector participation in Capex (capital expenditure) and Opex (operation and maintenance)

Mission

Household toilets, including conversion of insanitary latrines into pour-flush latrines

Community toilets

Public toilets

Solid waste management

IEC & Public Awareness

Capacity building and Administrative & Office Expenses (A&OE)



Swachhta Survekshan (Cleanliness Survey-2020)

- Swachhta Survekshan is conducted annually by the Ministry of Housing and Urban Affairs (MoHUA).

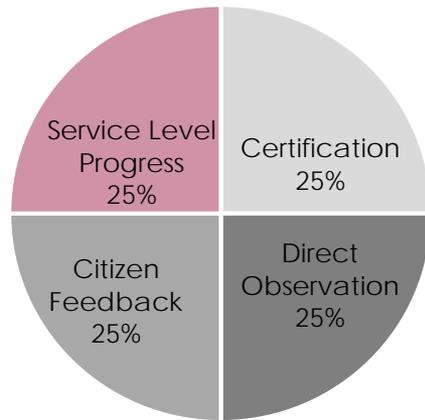


Fig. 4 – Relative weightages of survey components

Table 1– Component-wise marks for assessment

S. No.	Components	Marks
1	Service Level Progress	1500
	(i) Overall	1300
	(ii) Avg. Ranking of Quarterly Assessments	200
2	Citizen Feedback	1500
3	Direct Observation	1500
4	Certification	1500
	(i) Garbage Free City (GFC)	1000
	(ii) ODF/ODF+/ODF++	500
	Total	6000

- First Survey was conducted in 2016, covered 79 cities (53 million+ cities and all State Capitals)
- 4242 ULBs participated for 2020 survey.
- 19 million citizens participated in survey process through feedbacks.
- The certification is carried out by the Quality Council of India (Third Party).

INDORE "The Cleanest City in India" for 4 Consecutive Years



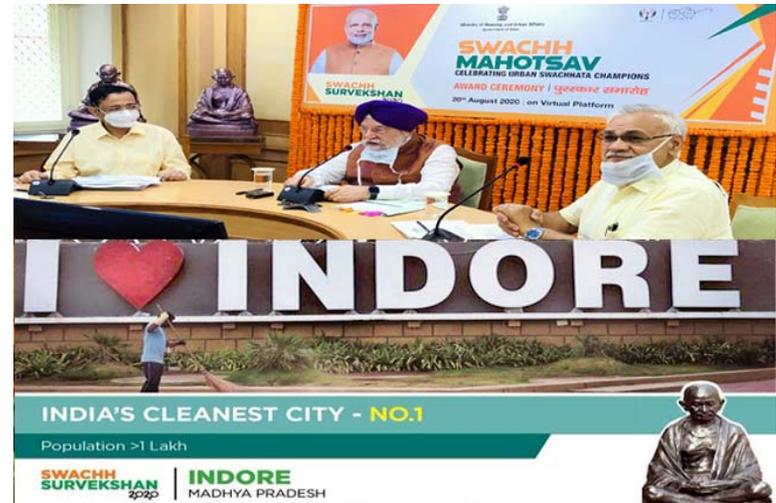
Swachhta Survekshan Awards
2017



Swachhta Survekshan Awards
2018



Swachhta Survekshan Awards
2019



Swachhta Survekshan Awards
2020

Indore City Profile, Madhya Pradesh

- Indore is a Tier 2 city and the **Commercial Capital city** of Madhya Pradesh, India.
- Population (2011) = 2.2 Million
- Population (2019) = 2.8 Million
- Floating Population = 0.3-0.5 Million/day

- No. of wards = 85
- Area = 276 sq.km.
- Population Density = 10,248 P/sq.km.
- No. of Households = 0.49 Million
- No. of Commercial Establishments = 75,198

- MSW quantity (2011): 750 MT/day
- MSW quantity (2017): 900 MT/day
- MSW quantity (2018): 1115 MT/day
- MSW quantity (2019): 1125 MT/day

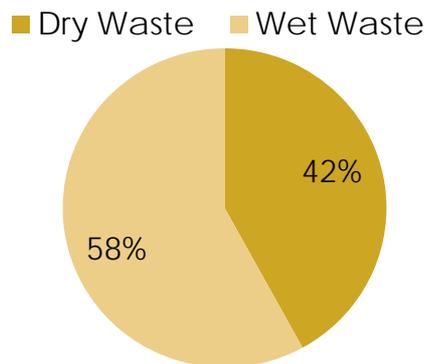


Fig. 2 - Waste Share by Category

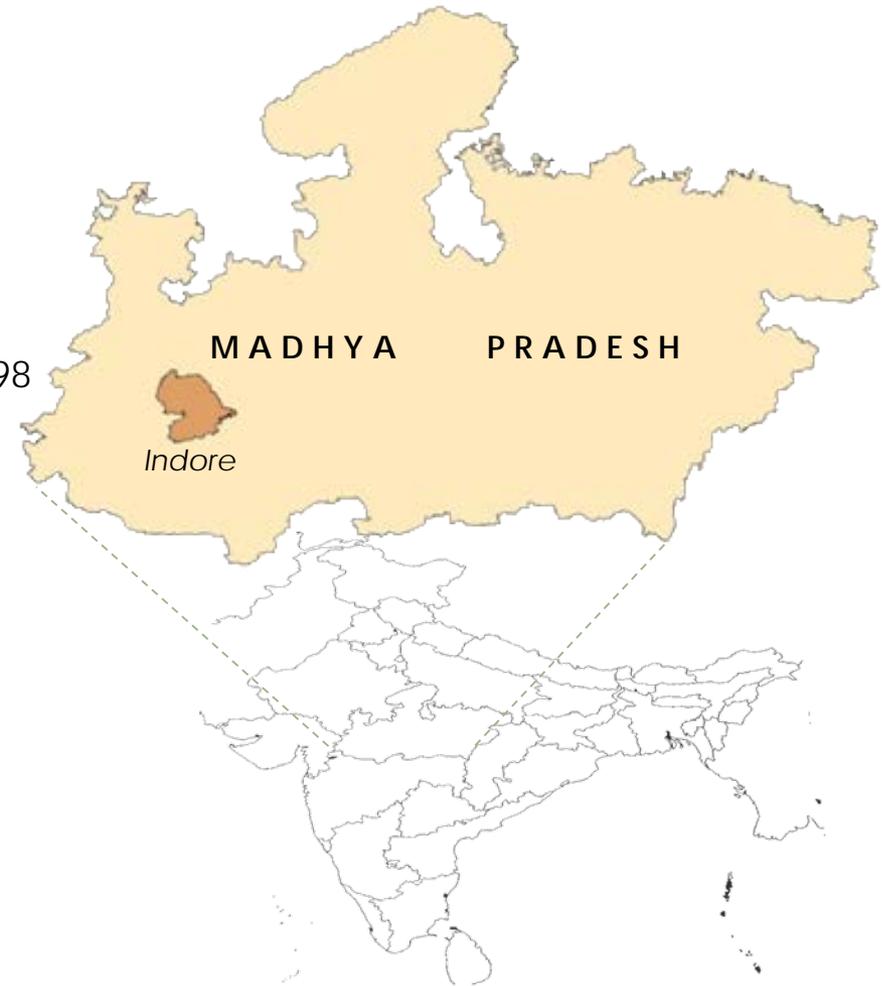


Fig.1- Location of Indore in India

Infrastructure

Waste Collection

- 19 Zones for waste collection formed from 85 wards. Each ward with avg. 6000 HHs and 600 commercial establishments.
- 10,478 staff for collection and segregation of waste (1 person per 46 HHs).
- Door-to-door collection service started as a pilot project in Jan' 2016 and 100% door to door collection was achieved by 2017.
- Dual Phase collection mechanism is adopted:
 - **Primary Collection Phase**
 - **Secondary Collection Phase**



Door to door collection via Tipper trucks



Street Sweeping

Street Sweeping

- Mechanized street sweeping 450-500 Kms per day.
- Twice a day for commercial area and once a day for residential area.

Infrastructure

Transportation and Treatment

- 10 GTS strategically distributed across the city.
- Capacity = 15 MT each (equivalent to waste transported by 15 Tippers)
- 525 Tippers for transportation of waste (5-6 per ward)
- 798 TPD Wet waste processing Capacity.
 - 01 Centralized composting unit
 - Decentralized small composting units at 10 schools, 10 marriage garden and hotels, and 03 vegetable markets.
 - Household level composting by 48,700 HHs (i.e. 1 in every 10 HHs). 58 TPD waste processed.
 - 550 TPD capacity Bio-methanation plant to be constructed this year.
- 550 TPD Dry Waste processing Capacity(300 and 250 TPD Capacity).
 - 02 Material recovery facilities
 - Waste recovered into 14 categories.



Waste compaction at the GTS



Wet Waste Transfer at the Centralized Composting Unit

Infrastructure

Transportation and Treatment

- Rag - pickers are incentivized on daily basis based on the quantum of plastic waste sorted as per fixed rates for every fraction (Rs 300-350 earned daily per person)



Waste Disposal

Rag pickers formalized in the MSWM process

- In Dec 2018, IMC managed to clear over 1.3 Million tonnes of legacy waste in just 6 months.
- 100 Acre land is reclaimed through Bio-remediation to be developed as City Forest.
- Total Inert Waste /Processed Rejects Land-filled = 48.09 TPD (4.3% of the total waste generated)
- Two Engineered landfill of 6.25 Acre each are operational for disposal of inert waste/processed rejects as and when required.

Bio-CNG from Composting

- 800 kg of gas is being generated on daily basis which is being used to run approx. 8 to 10 city buses per day for last 3 years.
- Daily 2000 km covered using the bio-CNG from this plant



Bio-methanation plant at Choitram Mandi (20 MTPD)



Bio-CNG plant at Kabitkhedi (15 MTPD)

- 600 kg of gas is being generated on daily basis through this plant. Which is being used to run approx. 6 to 8 city buses per day since 2018.
- Daily more than 1500 km covered using the bio-CNG from this plant.

Other Initiatives



Thaila Bank (Carry Bag Bank)



Bartan Bank (Utensil Bank)



Neki Ki Diwar (Wall of Kindness)



Bottle Crusher Machine at Chhappan Dukan

Co-benefits of Waste Management

- Products from processed waste.
 1. Compost
 2. Bio- CNG.
 3. Energy.
- GHG emission mitigation. (We are in the process of quantifying it.)
- Total revenue generated from the sale of products from processed waste in 2019 = Rs 6,536,826 (~88,000 USD)
- Pelletized plastic is sent to cement Kiln at Neemuch.
- New 550 TPD Composting facility could provide for the fuel demands of all city buses.
- The recycled plastic waste is being utilized in the construction of city roads by IMC.



Bio-CNG to fuel city buses

Thank You for your kind attention..

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We would like to acknowledge the help and support of the officials of Indore Municipal Corporation especially Chief City Planner Mr. Vishnu Khare in carrying out this study.