

# KAKINADA, INDIA



# Advanced Technology and Innovative Solutions for Development of Waste Management Services

Kakinada, a city in the East Godavari District renowned for its extensive mangrove forests, once faced severe pollution challenges. The city generated over 213 tonnes of municipal waste daily, much of which accumulated on the streets and in overflowing bins. This exacerbated the city's pollution problem and led to continuous complaints from residents about waste and sanitation issues to the Kakinada Municipal Corporation (KMC). At the time, waste collection services in Kakinada reached only 38% of households, with 447 personnel and 43 vehicles transporting waste to an uncontrolled disposal site. Revenues from municipal waste collection were insufficient to cover costs, placing a significant financial burden on the KMC.

The city of Kakinada decided to take decisive action by implementing a comprehensive approach to waste management and sanitation infrastructure. This multi-faceted strategy integrated advanced technologies, public participation, and sustainable practices. A detailed sanitation plan was developed with the involvement of all stakeholders, introducing innovative solutions to enhance waste collection, transportation, and processing. The concept of integrated solid waste management was adopted, emphasizing Information, Education, and Communication (IEC) campaigns citywide.

The newly designed waste management system employs a robust technological framework incorporating digital tools such as Radio Frequency Identification (RFID), Facial Recognition, GPS, and a Human Resource Management System (HRMS) to manage waste collection staff and transportation. These tools also monitor for system leakages, providing real-time data on worker attendance, specific work areas, shift replacements, and collection vehicle routes. All information and technologies are linked to the Integrated Command and Communication Centre at the city office, where a team of trained professionals ensures that waste management operations proceed as planned.

A crucial component supporting the success of the newly implemented system was citizen participation. Intensive information and sensitization campaigns helped residents understand the importance of source segregation, leading to a significant shift in behavior. As a result, source segregation increased from zero to 60% within a year.





# **IMPACTS TO ACHIEVE SDG 11.6.1**

- 1,206 sanitation workers; 184 waste management vehicles; 51 community bins; 0 waste vulnerable points.
- Household waste collection has increased from 38% to 100%.
- 60% of households are segregating waste.
- 51% of the entire MSW generated (107 tonnes) is processed daily, reducing the burden on the landfill.
- 84% of the segregated waste from households is processed.
- 72 tonnes/day of biodegradable waste is processed in two waste-tocompost plants, resulting in 18.7 tonnes of good quality compost, daily.
- 35.3 tonnes of non-biodegradable materials are sent to independent recycling facilities.
- Littering in public spaces has been significantly reduced to almost none.
- Complaints related to solid waste management services in the city have reduced substantially from 591 in June 2020 to 17 in August 2021.
- 100% presence of sanitary workers on the ground.
- In 2022, The Kakinada city has won the second place in the India Smart Cities Awards-2022 (ISCA) contest for solid waste management practices, being recognized for its successful segregation at source initiatives and the advanced technology implemented for current waste management activities.

#### INSTITUTIONAL SUSTAINABILITY

Kakinada Municipal Corporation achieved institutional sustainability by effectively combining technology, public participation, and robust management systems. This integrated approach transformed municipal solid waste into a valuable resource. By leveraging advanced technologies, engaging citizens in waste management practices, and implementing efficient operational frameworks, KMC not only improved waste processing but also ensured that the system remained sustainable and adaptable over time. This synergy of technological innovation and community involvement has enabled KMC to maintain a successful and enduring waste management system.

#### **PLANNING & MONITORING**

The city crafted a comprehensive sanitation plan defining roles for citizens, local leaders, municipal staff, corporators, NGOs etc. Key to this plan was the use of advanced technology for monitoring. Kakinada set up an Integrated Command and Communication Centre (ICCC) at the city corporation office, where a team of professionals monitors all activities and waste management operations. They track Radio Frequency Identification data to ensure collection targets are met, monitor vehicle routes for compliance, and oversee sanitation worker attendance. The system also sends SMS alerts for any issues, allowing for quick corrections. This approach has significantly reduced complaints, showcasing its effectiveness.

Segregated waste is collected and QR code is scanned



Source: National Institution for Transforming India

Waste collection vehicle equipped with sensors



Source: Kokinada Smart City





# APPROPRIATE TECHNOLOGY

- Radio Frequency Identification each household and bulk waste generator has been given a sticker with a unique QR code which is scanned during collection and information about location and date and time of collection to the Integrated Command and Communication Centre.
- GPS each waste collection vehicle has been fitted with a GPS device, allowing its movements to be monitored on the city map. The KMC ensures that vehicles follow their intended routes and schedule.
- Facial Recognition System is used to register the attendance of workers, providing an easier, centralised real-time monitoring system.
- Human Resource management System App enables authorities to identify and monitor worker activities while automating HR tasks. It has made it possible to ensure 100% attendance of sanitary workers on the ground.
- Integrated Command and Communication Centre all the implemented technologies are linked to this centralized Centre, where a team of trained professionals monitors real time activity and data to ensure waste management operations are running smoothly and as planned.

# FINANCIAL SUSTAINABILITY

Annual revenue from waste processing of segregated waste has grown to 26% (Rs 4.576 million) of the total expenditure (Rs 17.6 million). This revenue increase is attributed to improved user charge collection, effective monitoring systems, and reliable services provided to residents. With continued improvements in waste segregation and processing efficiency, revenue from waste management operations is expected to rise even further.

# STAKEHOLDER INVOLVEMENT

Stakeholder involvement has been pivotal to Kakinada's success in waste management. The KMC ran a citywide campaign led by elected representatives and key opinion makers, assigning each the responsibility of ensuring their respective wards became litter-free and began segregating waste. Recognizing the potential of this approach, KMC launched the Corporator's Emphasis on Sanitation Transformation (CREST) program. Sanitation of slum areas was prioritized, particularly through initiatives in municipal schools. Swachh school drives were conducted to raise awareness about waste segregation from a young age, encouraging students to educate their parents and communities. Additional initiatives in municipal schools included the Green Report Card, Dry & E-waste Collection Passbook, eco-brick training, and the Swachh School Rankings Assessment program. These efforts collectively fostered a robust waste segregation program, motivating residents to categorize their waste into organic, recyclable, and hazardous materials.

# d Command and Communication Centre

VEHICLES

0

111

Source: Kokinada Municipal Coorporation







### SOURCES



- Kakinada District <u>https://kakinada.ap.gov.in/documents/census/</u>
- Kakinada Smart City <u>https://www.ksccl.in/wastemanagement.php</u>
- National Institution for Transforming India <u>https://www.niti.gov.in/sites/default/files/2021-12/Waste-Wise-Cities.pdf</u>
- The Hindu <u>https://www.thehindu.com/news/national/andhra-pradesh/kakinada-wins-second-place-in-solid-waste-management-in-smart-cities/article67235774.ece</u>; <u>https://www.thehindu.com/news/national/andhra-pradesh/andhra-pradesh-kakinada-to-get-legacy-waste-management-plant/article66111465.ece</u>
- Down to Earth <u>https://www.downtoearth.org.in/waste/the-cleanest-cities-of-india-kakinada-uses-facial-recognition-gps-rfid-to-stay-clean-81095</u>; <u>https://www.youtube.com/watch?v=-jXwHisi8WM</u>
- Study IQ <u>https://www.studyiq.com/articles/innovating-waste-management-kakinada/</u>
- Deccan Chronicle <u>https://www.deccanchronicle.com/nation/in-other-news/260823/kakinada-smart-city-wins-2nd-rank-in-sanitation-category.html</u>



P.O. Box 30030, Nairobi 00100, Kenya T: +254-20-76263120 E:unhabitat-info@un.org AFRICAN CLEAN CITIES PLATFORM PLATE-FORME AFRICAME DES VILLES PROPRES Andre Dzikus, Chief Urban Basic Services Section

> accp@un.org #AfricanCleanCities



