

## Sanitation & Solid Waste Management in Indian Cities Through ICT

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**S**anitation and solid waste management are basic public services which every citizen should have access to, both for health and hygiene, and for ensuring a good quality of living. Sanitation here refers to toilet facilities, whereas solid waste management refers to the management – collection and disposal of solid waste (as opposed to liquid waste). The image of a city as being clean and free of waste, impacts its desirability for doing business by entrepreneurs and for future residents to live.

As per Census of India 2011, access to sanitation is highly inadequate in the urban areas -19 per cent of urban poor (slum) households defecate in the open; 42 per cent do not have a toilet with flush system. This imposes significant public health and environmental costs to urban areas that contribute more than 60 per cent of the country's GDP. The impacts of poor sanitation are especially significant for the urban poor (22 per cent of total urban population), women, children and the elderly. As per India's National Urban Sanitation Policy, the loss due to diseases caused by poor sanitation for children under 14 years alone in urban areas amounts to Rs 500 crores at 2001 prices (Planning Commission-United Nations

International Children Emergency Fund (UNICEF), 2006). Further, inadequate discharge of untreated domestic/municipal wastewater has resulted in contamination of 75 per cent of all surface water across India. The Millennium Development Goals (MDGs) enjoin upon the signatory nations to extend access to improved sanitation to at least half the urban population by 2015, and 100 per cent access by 2025. This implies extending coverage to households without improved sanitation, and providing proper sanitation facilities in public places to make cities open defecation-free.

The concept note on smart cities by the Government of India (GoI), defines waste management as the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes", and states that cities which are not clean do not exhibit a smart character. On the other hand, cities which are clean are perceived to be smart.

Municipalities in India are responsible for collection, sweeping, storage, transfer, treatment and final disposal of waste. A study by NIUA (2015) reports that urban areas in India generate more than 100,000 MT of waste every day, with Mumbai contributing 7000 MT, and Bangalore,

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5000 MT. While the Ministry of Urban Development has mandated several management and handling rules for solid waste, most cities and towns are finding it difficult to comply with these rules, keep their streets clean, and safely dispose the waste. An analysis of waste disposal in 22 of India's cities by the Federation of Indian Chambers of Commerce and Industry (FICCI (2009)), as pointed by Sridhar and Kumar (2013), shows that 14 out of India's 22 cities which were studied, sent more than 75 per cent of their waste to dumpsites, indicating a lack of adequate treatment and disposal facilities. Mumbai sends 100 per cent of its waste to dumpsites, while Delhi dumps 94 per cent of its waste.

Thus, the concept note on smart cities acknowledges that Indian cities are facing many issues with regard to waste management, which include:

- Absence of segregation of waste at source;
- Lack of technical expertise and appropriate institutional arrangements;
- Improper collection, inadequate segregation, transportation, treatment and disposal systems.

The concept note states that it is important for a city to offer decent living options, including sanitation and solid waste management of high quality, to every resident. It recognizes the fact that lack of sanitation causes outbreaks of epidemics, health disorders and keeps the mortality rates high in general and among the poor in particular. Further, it is also common knowledge that higher incidences of morbidity forces low income households further below the poverty line. Therefore rightly, the concept note mandates that cities should have a city wide sanitation plan for all parts of the city. Such a plan is expected to be based on a decentralized sewerage and solid waste management system. This concept necessitates that each and every household should have a toilet so that no citizen needs to defecate in the open. Further, to reinforce the requirement at the household level, the mandate is for all commercial and other public buildings to have clean and hygienic toilets.

Further, there is a need for 100 per cent recycling in the sanitation system. The idea is that waste water should not go out of the local area (the concept note provides the example of New Moti Bagh Township in New Delhi), to the extent possible, with only treated water getting into water bodies such as lakes, ponds, and rivers to avoid their further pollution.

In all the policy statements, there is an implicit assumption that open defecation is a practice which is widespread in this country, hence any shots in the dark would target the problem, and get rid of the scourge. However, we are limited in this effort, by the severe lack of relevant data to understand basic questions such as the magnitude of open defecation at the level of the household; what determines the likelihood of open defecation in typical Indian cities; what are the characteristics of Indians who engage in open defecation; and what is the impact of the scale of urbanization on the possibility of open defecation. Analogously, the problem with data on the proportion of solid waste that is collected, remains obscure, and is similar to that in sanitation. Having accepted the limitations of data, the intended results of an effort to get rid of the scourges should be a better understanding of the extent of open defecation and solid waste lying on the streets for want of better management.

There are also several policy-related questions as well which relate to the institutional arrangements with respect to tackling urban sanitation problems in India. For instance, in Bengaluru, there are several actors with respect to sanitation—the local body, the Karnataka Slum Development Board, private contractors and service providers such as Sulabh International, and the state government which has specific programmes to attack the problem. Sometimes, the problem is itself that there are too many actors which makes it difficult to quantify the magnitude of open defecation, which is a constraint for targeting the problem. The case of solid waste management is somewhat better, since it is only the local body which is involved with

this function, some parts of which are typically outsourced to private contractors.

### Objective

Given the absence of information required to respond to the menace of poor sanitation and solid waste management, how best can we use information and communication technologies (ICT) to improve the availability and accessibility of, or feedback regarding these services? That is the question this short article attempts to address, using the case of best practices nationally and internationally, and based on secondary data.

ICT is defined by (UNESCO 2002) as everything that includes communication devices and applications such as mobile phones, computers and networks -- hard ware and software, print media, radio, television, the Internet and many others.

There is no reason why Sachs (2011)'s Millennium Villages Project (MVP) which focuses on using ICT in three crucial areas – health, education and infrastructure, should not be applicable to urban areas. In fact, if ICT is applied in rural areas to solve basic problems, there is even more reason to use them to deliver basic services more effectively in urban areas. As pointed by Nyatsanza and Chaminuka (2014), the three aspects –health, education and infrastructure, come as a package, with large economies of scope and scale. Further, with the proliferation of smart phones and the internet, ICT is increasingly being viewed not as a stand-alone intervention, but also as a new way of life and community development.

Nyatsanza and Chaminuka (2014) found out that ICT was useful in empowering women in Zimbabwe, even while many community women lacked skills in the use of ICT, although they were in a position to use mobile phones. Hence, the study suggested that ICT can be used to provide and disseminate information to women regarding the use of safe practices, use of Skype to improve participation and discussion on sanitation-related issues, and installation of tracking devices at



various sanitation points.

If the goals mentioned in the concept note on smart cities of the GoI have to be met, one would need information on available sanitation facilities in the cities/towns in order to assess the demand – supply gap which can form the basis for future planning and rejuvenation of sanitation facilities. As discussed earlier, in most of India's smaller towns, the availability of data (both spatial and non-spatial) on sanitation is a formidable challenge. An initial base map of selected towns in Madhya Pradesh<sup>1</sup> was prepared by Phansalkar (2012) using GIS with the help of consultative process, involving local people/ agency; based on the data regarding various components of sanitation collected through handheld GPS, various thematic digital maps were developed which acted as a base for the planning process. As it should be readily clear, the use of GIS maps helps in continual updating of the base data, and makes the tool dynamic. Further, it enhances our use of relevant data, makes it easily accessible to all stakeholders, ensures awareness and public participation, and monitoring/evaluation of performance in sanitation.

In Nairobi, there appeared to be four main ways in which ICT innovation for improving sanitation was being discussed, as pointed out by Mann et al (2013):

1. Facilitating more frequent and informative discussion between water utilities and their customers;
2. Improving the effectiveness and efficiency of service providers' own internal operations, ranging from mobile payments to meter-reading via smart phone application.
3. Cut-out the 'human element' altogether and focus on fully-automated systems.
4. Using the rapid growth of diverse data sources to permit more effective urban planning and to develop more responsive approaches to service delivery.

In India, ICT is used for the preparation of city wide sanitation

plans. But the lack of widely used city maps is a major challenge, although it does represent an opportunity for many private actors.

Sridhar and Sridhar (2007) report the rapid proliferation of mobile phones in the developing world, which are a cost-effective way, compared with the technology and costs of deploying landline phones. Now with an urban teledensity of more than 100 per cent in India (which means that every person has access to more than one mobile phone), it is indeed possible to solicit responses to the level of the service, using micro-level surveys, for which response by text message may be enough.

The Greater Hyderabad Municipal Corporation (GHMC) has initiated an off-site real time monitoring system (OSRT) which depends on an automatic text messaging system to citizens upon registration of grievances (through mobile phone) and after redressal.<sup>2</sup>

Given the manual handling of solid waste can be quite inefficient and ineffective, a document by the Ministry of Urban Development (2010), GoI, summarizing best practices, focuses on the use of ICT tools such as GIS location & co-ordinates of bins and dumping sites; GPS enabled vehicles; automatic generation of status (bins picked/ bins unpicked) of collection, providing an online monitoring mechanism; optimizing the shortest path from the collection point to the dumping yard; optimizing the number of collection points and transport of garbage, and so forth. There are several advantages in such an automated system, as the note by the MoUD, GoI, points out:

1. Eliminates the human factor from the entire cycle of SWM process starting from collection to bill disposal;
2. Real time monitoring of the vehicle to improve per vehicle productivity and decrease non-compliance.

The above was effectively deployed by the Pimpri Chinchwad Municipal Corporation, which has reaped the benefits of such a strategy in its solid waste management.

As the case of traffic has demonstrated in Bengaluru, social media such as Facebook, Twitter, can be effectively used as tools to communicate problems regarding solid waste to the relevant organization (typically the local body) websites, which becomes aware of the imminent need to address the problem, and usually does the needful. In some instances, cities have installed CCTV cameras in dumping sites to monitor the activities of waste workers and supervisors. In cities such as Bengaluru, where segregation of waste at source (into dry, wet, hazardous, and others) is mandatory, CCTV camera can monitor those who have been dumping the solid waste in an inappropriate manner, without segregation. Social media tools can also be used as a method of crowd-sourcing ideas from the public and citizens for better sanitation and solid waste management.

As Prabhakar and Mehrotra (2015) suggest, online platforms provide options and alternatives to the user to look into reusing old stuff, instead of discarding them as waste. They also propose sensor-based waste bins for sorting, based on properties of the waste, for collection, to identify the status of waste bins (if empty or filled) so as to customize the waste collection schedule accordingly and save costs. Another long term solution proposed by these authors is Automated Waste Collection System (ACS) which has the ability to replace conventional methods like door-to-door, curb-side, block, community bins collections and transportation via chute system from high rise buildings with waste sucked through pipes; this minimizes human intervention, given the risks of managing solid waste.

## Conclusion

While due to the lack of adequate data, the multiplicity of institutional arrangements and urban finances are major causes of sparse good quality research and poor service delivery with respect to sanitation and solid waste management in Indian cities, the ICT revolution has fortunately made it possible to use several tools cost-effectively to solicit citizen feedback in a broad-based manner, which enables



service providers to address them. However, it is best to remember that ICT is only a tool, not a substitute, for addressing the substantive problems associated with sanitation and solid waste. The substantive problems are the attitudinal and behavioural approach of the citizens, which need to be modified only with increased education about the negative consequences of open defecation or littering the streets, along with better coordination across service providers, greater fiscal decentralization to local bodies, and the maintenance of more reliable data, to encourage research and make Indian cities free of these problems.

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### Endnotes

1. The four towns were Gwalior, Ashta, Raisen and Khajuraho.
2. <http://www.slideshare.net/CiscoGovernment/ict-for-effective-solid-waste-management-case-study-from-greater-hyderabad-municipal-corporation-by-mr-rajeshwara-rao>, retrieved July 24, 2015. □

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## DO YOU KNOW?

### OVER-THE-TOP (OTT) SERVICES

The term over-the-top (OTT) refers to the applications and the services which are accessible over the internet, offering easy internet access services to the users e.g. social networks, search engines, amateur video aggregation, music downloading sites and free gaming download web sites etc. They act as an alternative for the conventional service provider. The OTT providers use the Telecom Service Provider (TSPs)' infrastructure to reach out to their customers and offer them products and services. Through this, they not only make money, but also give a tough competition to the traditional services offered by TSPs. These apps also compete with brick and mortar rivals such as e-commerce sites, banking etc. Gone are the days when only desktop or laptop computers were available and used to be connected to the internet. Today, these applications are easily available on the internet and can be directly accessed by the users online from any place, at any time, through a variety of internet connected consumer devices such as a smart phones, tablets, phablets, e-books and even the internet on a smart TV for instant services.

OTT has witnessed an unprecedented growth in the recent years. The major factors for this growth have been the rising penetration of smart phones because of declining prices and unlimited range available in the market to choose from, and the up-gradation of access networks by the TSPs. Digitalization of content has become very common, leading to fall in the level of conservation and reproduction of information and its distribution costs, which in has promoted the explosive growth in the supply of online content. The broadband networks provided by incumbent TSPs are used as a platform by these OTT players for the development of their new businesses. As these OTT applications have increased the online content, there is now an increasing demand for faster broadband speed to cater to this increased data traffic, that needs huge investments in network up-gradation by these TSPs. At the global level, there is an ongoing debate amongst Governments, industry and consumers worldwide regarding the regulation of OTT services. In the wake of this debate, TRAI has also released a Consultation Paper on Regulatory Framework for Over-the-top (OTT) services, that will take account of the views of the service providers, OTT providers and various other stakeholders and related issues (including network neutrality), international experience with network neutrality and regulation of OTTs (communications and non-communications). □

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