

Transformation of Urban Sanitation in India

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Abstract

The present study aims to review the sanitary policies and analyze sanitary provisions. This study is largely based on secondary sources data across the Indian states and union territories (1991, 2001 and 2011). The percentage of households having access to toilet facilities and safe drinking water is 82 and 71 percent in 2011 respectively. In the year 2012, at the all India level, only 70 per cent solid waste was collected out of which the percentage of treated solid waste was only 17.78 per cent. The perusal of waste water treatment in 2009 reveals that at all India level only 31.04 percent waste water got treated. This means the remaining amount is discharged on land and into streams causing pollution to all sources of water. Thus wide gap exists between generation and treatment of waste water in India.

Key Words: Sanitary Facility, Toilet facility, Drinking Water Facility, Solid Waste, Waste Water Discharge.

Introduction

Sanitation is defined as the hygienic means for promoting human health through management of human excreta and domestic waste water (sewerage). In another way it is conceptualized as the provision of facilities and services for providing healthy living conditions. According to WHO (1993) sanitation covers the whole field of the controlling environment with a view to prevent diseases and promote good health. The basic objective of sanitation is hygiene promotion as such in this perspective, the study of unhygienic housing condition, solid waste and drinking water supply also becomes an integral part of the sanitation. Access to safe drinking water and sanitation is not only an important measure of the socio-economic status of the household

but is also fundamental to the health of its members. Safe drinking water is essential for child survival (Kumar Ashwani and Das K.C, 2014). It has been observed in studies that almost all residents are affected by the poor sanitation because their related effect is independent of income. However by and large urban poor, women, children and elderly are often become the victim of unhygienic conditions created by poor sanitation.

Global Overview

All over the world 2.5 billion people lack improved sanitation. About 15 percent of the world population (1.1 billion) still practice open defecation. Nevertheless one in six people still has no regular access to safe drinking water. About 100 million people

living in slums and unhygienic housing conditions around the world also need improved access to safe and healthy sanitary conditions. As much as 90 percent of waste water in developing country is discharged without treatment into rivers and streams (R.V. Verma, 2012). It has been estimated in the UN report that access to sanitation, the practice of good hygiene and a safe water supply could save 1.5 million children a year. Water borne diseases caused by unsanitary water are responsible for 80 percent of illness and deaths in the developing countries, causing death of a child every 8 seconds. The UN Millennium Development Goals (MDG) aimed to extend access to improved sanitation and safe drinking water to at least half the urban population by 2015 and achieve 100 percent access by 2025. It has been made mandatory to every signatory nation to make sincere effort to achieve the same by the stipulated period.

Population: A Challenge to Urban Sanitation

Urban environment in modern India has come under a constant threat due to increasing pressure on land and the growing population (J.R.A. Grace, 2012). India is characterised by a phenomenal high rate of population growth which is about 1.67 percent per annum against 1.4 percent for the world and 1.0 percent for China. On account of high population growth, 849.47 million people were added during 1951-2011. Akin to this, the tremendous increase from 62.44 million in 1951 to 377 million in 2011 has been recorded in urban population adding around 314.67 million people during

last 60 years period. Moreover a large proportion of population e.g. 17.30 percent (65.5 million) resides in slums which are uncondusive for leading healthy life. The pressure of population cannot be explained without describing the density scenario of the country. In 1951 there were just 117 persons per sq.km living in the country which increased to 382 persons in 2011. Against this average combined population density, urban density in 2011 has been 11 times higher (4829 persons per square km) and in 17 states/ union territories this fact is found of higher order. Population pressure in metropolitan cities is more aggravating as all the twelve major metropolises possess above 10,000 persons per sq. km. urban density and in four biggest metropolises (Mumbai, Kolkata, Chennai and Delhi) it is of much higher magnitude. The number of towns and cities has also witnessed two and half fold increase from 3029 in 1951 to 7935 in 2011. According to Pavan Kumar (2011) urban population in India would increase by 600 million in 2031. Peripheral expansion of many cities and towns (HPEC, 2011 and World Bank, 2011) is bound to occur. Future urban scenario would be more aggravating with addition of 2774 new cities and towns and 94 million slum population by 2031. The above narrated conditions will place heavier demand for additional sanitary facilities.

Objectives

In view of the stress posed by the vast population in the country in general and in urban areas in particular and compulsion forced by Millennium Development Goals, this study aims to:

- i) Review of sanitation policy of the country
- ii) Assess the status of sanitary provisions (latrine facility) and safe drinking water supply and unhygienic housing condition
- iii) Analyse the solid waste generation, collection and treatment; and waste water generation and treatment
- iv) Relate urban sanitation index to the incidence of sanitation related diseases

Data Source and Methodology

The present study is largely based on secondary data of different states and union territories derived from different sources. The various data pertaining to population, urbanization and sanitation have been taken from 2011 census and HH-14 (House Listing and Housing Census 1991, 2001 and 2011). Water supply and solid waste data are obtained from The Central Pollution Control Board (CPCB) report of August 2013. Some literary aspects related to sanitation policies are taken from National Urban Sanitation Policy Ministry of Urban Development, Government of India, 2008. Disease data pertaining to diarrhoea, typhoid, viral hepatitis and cholera & acute encephalitis have been collected from “National Health Profile” published by Central Bureau of Health Investigation, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, 2011 to 2013.

In order to show the state wise average condition of various facilities, latrine facility

index, drinking water index, bathroom facility index, unhygienic housing condition index and solid waste index have been computed by using Z-Score techniques. Finally, the combined condition of all facilities in terms of **urban sanitary index** has been computed by employing the same Z-Score technique and all the states as well as union territories are categorized into high, medium and low classes. Maps are prepared by using Arc GIS (Version-10.2) software for showing level of sanitation and inequalities among the states and union territories.

Study Area

The entire India has been chosen for this study. It is a much diverse country enjoying monsoony climate and lies between 8° 4' to 37° 6' north latitude and 68° 7' to 97° 25' east longitude. It commands a total geographical area of 3,287,263 sq.km exhibiting seventh

largest country of the world. Administratively the country is divided into 29 states and 7 union territories (Fig. 1) with its total population of 1210 million in 2011. India is the second biggest country of the world after China and as per The United Nations estimate it will overtake China by 2050. No doubt population plays a significant role in modern economic development. But high growth rate of population (1.76% during 2001-2011) coupled with high density (382 persons/ sq.km) poses great pressure on sanitary facilities required for sustainable life.



Fig. 1

Review of Sanitation Policies

The first sanitation policy in the name of integrated development of small and medium towns (**IDSMT**) was introduced in 1979-80 to fund resource for improving drinking water condition in towns having five lakh populations. After that integrated low cost sanitation scheme (**ILCS**) introduced in 1980 to convert latrines into low cost pour flush latrines. This scheme was followed by the launching of urban infrastructure development scheme for small and medium towns (**UIDSSMT**). Later on this scheme was brought under JNNURM. The comprehensive sanitation policy named as Jawaharlal Nehru National Urban Renewal Mission (**JNNURM**) introduced in 2005 and continued up to 2014 aims to increase reform in large cities and all census towns.

National Urban Sanitation Programme (**NUSP**), City Sanitation Plan (**CSP**), Rajiv Awas Yojana (**RAY**) & Slum Free City Plan (**SFCP**) was initiated under JNNURM with aim of inclusive and equitable cities in which every citizen has access to basic civic and social services and decent shelter. Sanitation

policy and schemes initiated so far were isolated, neglected, ad hoc and lacking in public awareness as well as participation and government commitment.

Swachh Bharat Mission (2014) was launched on 2nd October 2014 by Honourable Prime Minister, Narendra Modi to cover all the rural and urban areas for keeping India clean by 2019 on 150th anniversary of Mahatma Gandhi. Swachh Bharat Mission of urban areas aims to cover 404 statutory towns consisting 1.04 crore households for providing 2.6 lakhs public toilets, 2.5 lakhs community toilets and managing solid wastes in every town (Swachh Bharat Abhiyan Essay, 2015). The objectives of this programme are as follows:

- i) to eradicate the system of open defecation
- ii) to convert the insanitary toilets into pour flush toilets
- iii) to make people aware of healthy sanitation practices by bringing behavioural changes in people
- iv) to link people with the programmes of sanitation and public health in order to generate public awareness
- v) to build up the urban local bodies strong in order to design, execute and operate all systems related to cleanliness
- vi) to completely start the scientific processing, disposals, reuse and recycling the Municipal Solid Waste
- vii) to provide required environment for the private sectors to get participated in the capital expenditure for all the operations and maintenance costs related to the clean campaign

Analysis and Discussion

Latrine Facility

In 1991 on an average only 59.37 percent households have access to toilet facility which ranged from 45.35 percent in Daman & Diu to 79.20 percent in Tripura. This figure rose to 76.95 percent in 2001 marking remarkable growth in this facility. Mizoram was the privileged state with best performance. The percentage of households having access to this facility in 2011 increased to 81.36 percent. This means 19 percent people still defecate in open space. In this context the highest percentage (98.52) has been recorded in Mizoram while the lowest one (60.20 percent) in Chhattisgarh. Seven states namely Bihar, Jharkhand, Tamil Nadu, Odisha, Chhattisgarh, Madhya Pradesh and Maharashtra reveal the access below the national average and they have to move faster in sanitary provision for making their people healthy.

Another key issue of sanitation is the connection of latrine facility with piped sewerage system. In this regard the country falls much behind. On an average in Indian cities only 32.68 percent households got connected their latrines with piped sewerage system. Chandigarh with 85.95 percent households ranks number one followed by Punjab (63.75 percent), Delhi (60.45 percent), Gujarat (60.38 percent), Haryana (54.78 percent) and Karnataka (53.31 percent). Poor facility is observed in remaining states/union territories.

Waste water outlet connection is immensely important in keeping the local environment clean and healthy. Closed

drainage connection seems more important but even waste water outlet connected with open drainage may help to improve the environmental condition. At India level in 2001 the percentage of households having got connected with closed drainage system for waste water outlet was merely 32.84 percent. This figure ranged from 77.22 percent in Chandigarh to 2.87 percent in Manipur. After clubbing both systems of drainage for outlet the figure rose to 75.51 percent indicating minimum (30.89 percent) in Kerala and maximum (94.19 percent) in Sikkim. In 2011 slight improvement can be visualised by having 44.50 percent households got their waste water outlet connected with closed drainage. Manipur is found doing poorer (6.04 percent) followed by Tripura, Nagaland, Andaman & Nicobar Islands, etc. while the best position is occupied by Chandigarh (87.35 percent). If households connected with closed and open drainage systems are clubbed together, the country can breathe satisfactorily because the proportion of both systems jointly comes around 82 percent. This means still there are 18 percent households of whom latrines waste water flow openly.

On the basis of three components latrine facility index has been developed for showing average condition of this facility. The fig. 2 shows that Gujarat, Chandigarh, Punjab, Haryana, Delhi, Himachal Pradesh, Uttarakhand and Sikkim perform well whereas six backward states such as Jharkhand, Bihar, Odisha, Chhattisgarh, Dadra & Nagar Haveli and Andaman & Nicobar Islands fall in low category of latrine facilities.

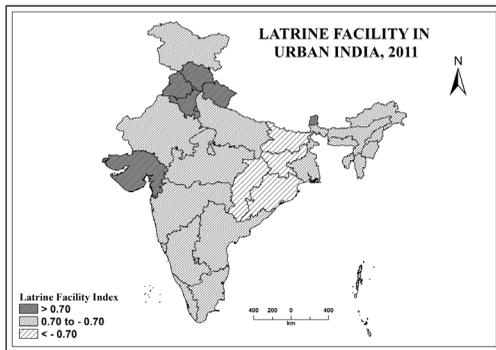


Fig. 2

Drinking water Facility

Safe drinking water supply is necessary for promoting sustainable sanitation. The water supply made by tap system is regarded safe. The percentage of households having access to safe drinking water was 65.06 percent in 1991 for the country as a whole. This figure ranged from 9.03 percent in Lakshadweep to 95.96 percent in Chandigarh. There were 16 states/union territories which had tap water supply below the national average. In this year water supply made from all sources (tap, well, tube well & hand pump) accounted for 97.00 percent. West Bengal and three North-East states namely Manipur, Mizoram and Tripura were those states which had water supply below 90 percent from the above sources. Tap water supply in 2001 showed negligible improvement e.g. by only 2.78 percent.

Presently on an average 71.00 percent households got tap water supply in India which exhibits 6.0 percent improvement in 20 years period (1991-2011). Tap water supply ranges between maximum being in Andaman-Nicobar (97.9 percent households) to minimum (16.93 percent

households) in Lakshadweep. At front of the total water supply through taps, wells, hand pumps and tube wells India has made remarkable progress (97.54 percent) in 2011. The percentage of such households varies from 99.68 percent in Puducherry to 66.34 percent in Manipur state. There are only four states of North-East India where water supply is available to less than 90 percent households.

An important aspect of water supply is the location of drinking water source. The source is within premise, near premise and away from premise. In Indian cities 71.22 percent households have it within premise in 2011 which varies from 31.76 percent in Manipur to 92.70 percent in Punjab. This means roughly 29 percent households still fetch water from some distance. 12 states/union territories possess the percentage of households having source within premise higher than the national average. The states characterised by the lower percentage of households having location within premise belong to North-East, central-eastern and southern parts of India.

If a comparison is drawn from 1991 condition, there is no substantial improvement at the front of total water supply in 2011 as it was almost same however only 6 percent improvement is seen in tap water supply during this period.

By combing source and location of water supply, drinking water index has been derived in which six small states/union territories such as Chandigarh, Pondicherry, Punjab, Himachal Pradesh, Goa and Andaman & Nicobar Islands fall in high category and three states make the

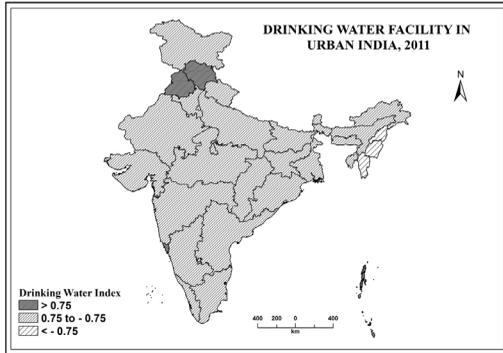


Fig. 3

low category. Maximum number of states/union territories (27) remained in medium category (fig. 3).

Bathroom Facility

In 2011 the percentage of urban households having access to bathroom facility in Indian cities and towns accounts for 77.52. This percentage varies from 96.53 in Lakshadweep to 45.73 percent in Bihar. There are 14 states/union territories which possess this proportion less than the national average that means these states/union territories are lagging behind in context of bathroom facility. Approximately 10 percent households have bathroom facility but without roof. The percentage of such households varies from maximum 22.91 percent in Bihar to minimum 1.11 percent in Lakshadweep. In comparison to 2001 there is roughly 10 percent increase in the number of households having bathroom facility within premise in 2011 i.e. from 67.71 percent to 77.50 percent.

Bathroom facility index developed for showing average condition indicates that two states Karnataka and Lakshadweep

come under high category leaving remaining states/union territories in medium and poor categories of bathroom facilities (fig. 4).

Housing Facility

The number of rooms in urban dwellings is an important indicator of hygienic urban environment. In 1991 about 39.55 percent dwellings were characterised by one room. The maximum percentage of such dwellings was found in Tripura (63.26 percent) followed by Maharashtra (60.14 percent) and Pondicherry (57.10 percent). In 2011 on an average the percentage of dwellings possessing one room accounts for 32.13 percent which varies from 6.28 percent in Kerala to 62.83 percent in Daman & Diu. Out of 36, 11 states/union territories are characterised by the higher percentage of one room dwellings than the national average. In 1991 the percentage of households with no exclusive room was merely 0.04 percent which grew to 2.64 percent in 2001 and 3.08 percent in 2011 indicating steadily deteriorating situation. If these dwellings are clubbed with one room dwellings, the percentage of such dwellings goes around 35.21 in 2011 for entire India which was

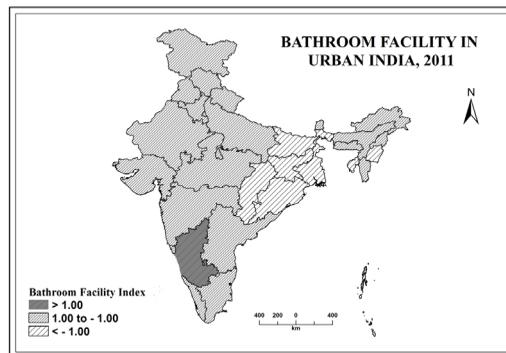


Fig. 4

40 percent in 1991. This figure ranges from maximum 66.96 percent in Daman & Diu to minimum 7.19 percent in Kerala. Almost 10 states have surpassed the country's average.

Another parameter of unhygienic environment is the number of persons residing in a house. From this perspective, the households with six and more persons are not considered conducive for health. In 2001 on an average 33.51 percent households have 6 and more persons living in the same house. The highest percentage of such dwellings was 62.01 in Chandigarh and lowest was found in Tamil Nadu (18.90 percent). For India as a whole this figure declined to 26.06 percent in 2011. 16 states/union territories are endowed with such dwellings above the national average. The comparison of this fact of 2001 and 2011 provides some satisfaction.

Unhygienic housing condition index shows that only in four states (Himachal Pradesh, Goa, Kerala and Andaman & Nicobar Islands) this condition is comparatively good where as backward states such as Uttar Pradesh, Bihar, Tripura and Daman & Diu show grimmer condition by falling low category (fig. 5).

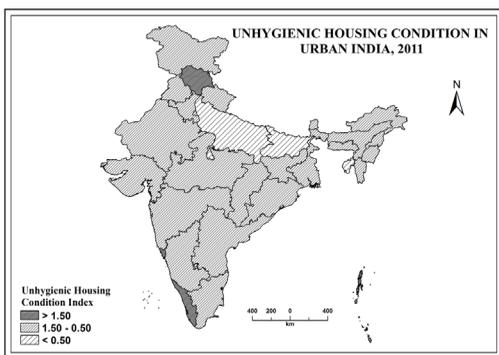


Fig. 5

Urban Solid Waste Status

Exponential population growth coupled with emergence of ambitious consumerism-oriented society especially in urban areas and industrial revolution accounted for tremendous increase in solid waste generation and its attendant problems (Singh, D.N., Singh, J., 2004). The collection and treatment of solid waste are considered important from sanitation view point.

In the year 2012 at the all India level 1, 27, 486 TPD solid waste was generated of which approximately 70 percent (89,334 TPD) was collected. But most disheartening scenario is evidenced from that the percentage of treated solid waste is merely 17.78 percent of the total collected solid waste. Thus the gap between garbage collection & treated solid waste is much wider. The saddest part of the story is that out of 36 states/ union territories, 8 states have no data of solid waste collected and 13 states have reported treated amount nil.

Across the states (26), the situation appears grimmer as three states namely Kerala, Karnataka, and West Bengal collect less than 50 percent of total solid waste generated in their urban areas. Twenty states/ union territories collect solid waste higher than the national average. In this category three states such as Bihar, Lakshadweep and Maharashtra reported 100 percent collection. There are only four states/union territories such as Chandigarh, Karnataka, Kerala and Sikkim which are doing better in terms of treatment of solid waste collected.

On the basis of solid waste collected and treated solid waste index has been computed (fig. 6). Only five states namely Himachal

Pradesh, Chandigarh, Sikkim, Karnataka and Kerala come under high index while remaining states/union territories fall in medium and low categories.

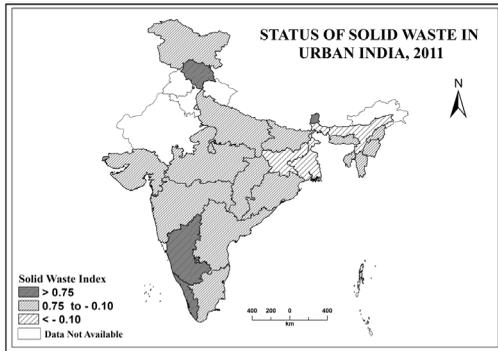


Fig. 6

Urban Waste Water Status

Urban centres in India lack infrastructure for sanitation and waste water generated therein is not managed appropriately. Inadequate treatment facilities for sewage have deteriorated the water quality of aquatic resources (Bhardwaj, R.M., 2005). According to The Central Pollution Control Board (2013) report almost 80 percent of the water supplied for domestic use comes out as waste water.

Table 1: Waste Water Generated and Treated in Class I & II Towns of India

Year	Gross Water Supply (mld) in Class I & II Towns	Gross Waste Water Generated (mld) in Class I & II towns	Percentage of Waste Water Generated to Total Water Supply in Class I & II towns	Waste Water Treated (mld) in Class I & II towns	% of Treated Waste Water in Class I & II towns
1978	10171	8233	80.95	2823	34.29
1988	16812	13428	79.87	2522	18.78
1995	22543	20532	91.08	4099	19.96
2004	32817	26254	80.00	7044	26.83
2009	48094	38255	79.54	11878	31.04

Waste water generation in Indian cities is increasing enormously. This was 8233 mld in 1978 in class I & class II cities which rose to 13428 mld in 1988, 20532 mld in 1995, 26254 mld in 2004 and 38255 in 2009 respectively. The perusal of percentage of treated waste water clearly reveals that in 1978 this percentage was 34.29 which declined drastically (18.78 percent) in 1988. After this year the magnitude of this

proportion started increasing but at much slower rate and even by 2009 the earliest percentage figure of 1978 could not be achieved.

The perusal of waste water treatment across Indian states in 2003-04 reveals that only Haryana and Delhi were able to treat more than 60 percent of the waste water. Even many cities do not treat waste water generated in their own city.

The level of treatment available in cities with existing treatment plant varies from 2.5 percent to 89.0 percent of the sewerage generated (Envis Centre on Hygiene, Sanitation, Sewage treatment systems and technology, Govt. of India). This means the remaining amount is discharged on land and into streams causing pollution to all sources of water. Thus wide gap exists between generation and treatment of waste water in India.

Urban Sanitation Index

On the basis of eight sanitary dimensions – access to latrine facility, waste water outlet connection with piped sewerage system, bathroom facility with roof, unhygienic housing condition (Households with one room dwelling), safe drinking water supply (tap water supply and drinking water source within premise), solid waste collection and solid waste treatment, **urban sanitation index** for 2011 has been computed by using Z score technique. The composite Z scores ranging between - 5.2 and 9.54 are classified into high, medium and low categories which constitute three distinct regions. Five northern states/union territories namely Chandigarh, Sikkim, Himachal Pradesh, Punjab and Delhi come under high category due to better sanitary facilities. Medium category includes 21 states/ union territories which are distributed in western, western southern, extremely northern and north-eastern parts of the country. On account of poor sanitary facilities 9 states/union territories are grouped under low category. These states are lying mostly in eastern part of the country (fig.7).

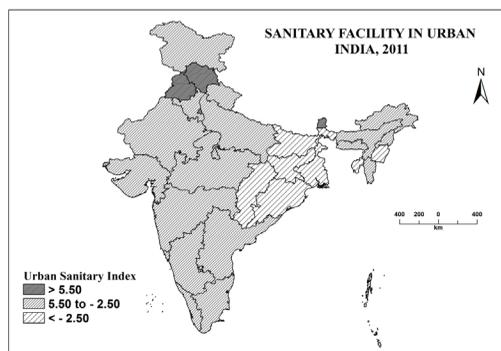


Fig. 7

Incidence of Sanitary Related Diseases

Poor sanitation causes both short and long term morbidity as well as mortality. Some of the diseases caused by poor sanitation, unsafe water supply and unhygienic conditions are diarrhea, typhoid, viral hepatitis, cholera and acute encephalitis which are bringing considerable number of people into their grip every year in the country and some of them used to die. On an average one per 100 persons got affected by the unhygienic condition in 2011. More than 5 persons per 100 persons got affected by these diseases are found in 8 states. These states are Dadra & Nagar Haveli, Sikkim, Puducherry, Lakshadweep, Daman & Diu, Andaman & Nicobar Island, Meghalaya and Jammu & Kashmir. These states/union territories are scattered all over India. 11 states are found to have between 1 to 5 persons per 100 persons getting affected by sanitary related diseases. They make a distinguished region lying mostly in southern and south-eastern parts excepting Himachal Pradesh and Chandigarh. With regards to sanitary related diseases, 17 states / union territories, lying mostly in central and western parts of the

country, reveal better sanitary condition because they are characterised by less than one person per 100 persons affected. If an attention is paid on the number of persons affected by these diseases in 2001, there seems no virtual change in that scenario in fact slight improvement is marked in 2011.

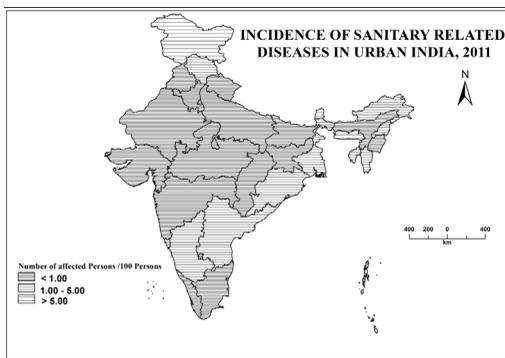


Fig. 8

Summary and Recommendations

The result of discussions about urban sanitary condition and incidence of sanitary related diseases shows notable variation across the Indian states/ union territories. At the front of access to safe drinking water to urban citizens, the country has made quite remarkable progress. But with regards to access to latrine facilities & their outlet connection to piped sewerage system, unhygienic housing condition, bathroom facility with roof, solid waste collection & treatment and waste water generation & treatment India has to accelerate pace of efforts for providing sustainable and healthy life in cities and towns. Nine states/ union territories comprising low urban sanitary index category (below – 2.50) need

be developed on priority basis in terms of sanitary facilities. The earlier policies were crippled with poor fund; infrastructures; awareness & participation; technology choices; capacity building; responsibility & integration among concerned institutions and government commitment. The recent Swacch Bharat Mission initiated by our Prime Minister seems comprehensive with focussed targets in achieving the Millennium Development Goals. However, a long term planning with great sincere effort is needed to safe disposal and treatment of human waste, solid waste and waste water in urban areas in general and countryside in particular otherwise the rise of sanitary related diseases will bound to continue posing a huge burden of expenditure on curing the ill persons and treating the precious water and soil resources of the country. Thus the comprehensive and integrated strategies along with strong political commitment are needed to overcome the problems arised out of inadequate and unsustainable sanitation.

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