

## Sanitation, a Serious Issue in Slum With Reference To Bilaspur City

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### Abstract:

*Present research work concerns a study on sanitation lacking in slum areas of Bilaspur city (Chhattisgarh, India). It is a case study research with special focus on sanitation types and sanitation lacking. Randomly sample slums were selected for field survey and cross verification of secondary data. Whole information processed and quantitatively expressed to measure intensity of the problem. It is necessary to measure intensity of a problem to properly mitigate the issue which authors completed with extensive field study over 10162 families. This paper also helps to qualitatively identify sanitation system and quantitatively express the situation which is extremely important in slum studies.*

**Key words:** - Slum, Sanitation, Open dedication, Toilet model.

**Introduction:** A slum is a heavy populated urban & informal settlement characterized by substandard housing and squalor. (What are slums and why do they exist? UN-Habitat, Kenya April-2007). Slum emergence is closely associated with unplanned urbanization. UN-Habitat (2003)'The challenges of slums Global Report on human settlement' stated that 43% of urban population in developing countries and 78% of those in the least developed countries are slum dwellers. As of 2011 census nearly one in every six urban Indian residents lives in a slum. Roughly 1.37 core households of 17.4 % of urban Indian households lived in slum (2011 census of India). National Sample Survey Organization (2008-09) survey stated that 81 % slum residents in India have inadequate access to sanitation. This lack of sanitation has far reaching effects: it imposes significant public health and environment costs on urban areas that contribute more than 60% of the country GDP. A 2006 report by the water and sanitation program estimated that the total annual impact of inadequate sanitation in India amounted a loss of 2.4 trillion rupees. Importance of this basic service motivated authors to conduct a field survey on case study basis in Bilaspur city. Bilaspur city is the second largest city in the state of Chhattisgarh. As of Rajiv Yawas Yojana there are total 134 slums among which 56 are notified. We extensively covered 30 slums sample (notified) to observe condition of sanitation in slums are of Bilaspur.

### Hypothesis of study:

- (i) There is no significant sanitation lacking in slum areas of Bilaspur.
- (ii) Sanitation lacking is a serious issue of slums.

**Review of Literature:** The term slum was familiar in the first half of 19<sup>th</sup> century in London which was used to identify the present quality housing and the most unsanitary conditions, An area with decent quality of living. The oxford English directory (1989) denoted "Slum" terminology which was popular at that time "a street, alley, court, situated in a crowded district of a town or city and inhabited by people of a low class of by the very poor; a number of these streets or courts forming a thickly populated

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neighborhood or district where the houses and the condition of life are of a squalid and wretched character". 'Tenement house', 'tenement district', 'deteriorated neighborhood' are terms of slum normally used in 20<sup>th</sup> century. In many parts of the world slum has unique name, only in India chawls / Challis (Ahmedabad, Mumbai ), ahatas (Kanpur), katras (Delhi) , Bustee (Kolkata), Zopadpattis (Maharashtra), cheris (Chennai) etc. are the terms used for slum. UN-Habited (2006). Suggests that a slum is "... a continuous settlement where the inhabitants are characterized as having inadequate housing and basic services. A slum is often not recognized and addressed by the public authorities as an integral or equal part of the city". There are several parameters which are normally used to demark slum in India, As per the Pranab Sen committee for slums report (2010) " A compact settlement of at least 20 household with a collection of poorly built tenements, mostly of temporary nature crowded together usually with inadequate sanitary and drainage water facility in unhygienic condition". Office of the registrar general of India (ORGI) used following parameter to delimitate slum (2001).

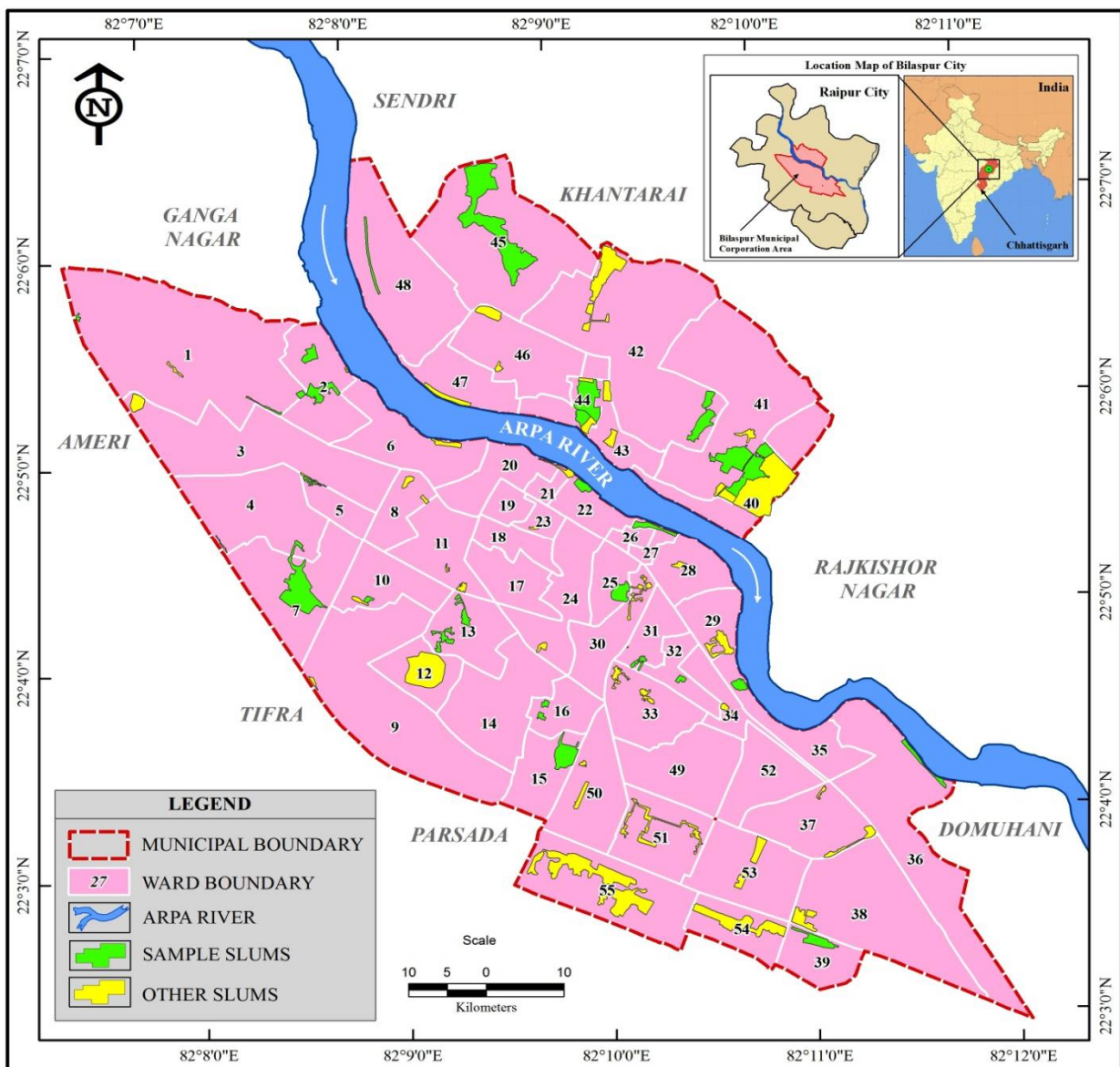
1. All specified areas in a town or city notified as ' Slum' by State/Local Government and UT Administration under any Act including a ' Slum Act ;
2. All areas recognized as ' Slum' by State/Local Government and UT Administration which may have been formally notified as slum under any act;
3. A compact area of at least 300 populations or about 60-70 households of poorly built congested tenements in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities.

It is vivid from different observations and study that slum is a adjoin part of city with poor living condition. There are numbers of research work have already being completed worldwide in respect of slum. Study of slums on spatial perspective is a new emerging field in urban Geography. Oscar Lewis's (1961) work on Jamaica referred in his book 'Man's struggles for shelter in an "urbanizing world" are some of pioneer works in slum studied. Nels Anderson, 1960 (Slums of Birmingham), califford Geertz, 1965 (Slum of java) Marshall B. Clinard (1966) are some scholars of slum studies established their work worldwide. Huq Hussain Shanaz, Islam Nazrul, Rasic Majid Ahasan (1966, 1996), have studied female migration and urban growth impact specially in Bangladesh with adjoin study of Slums, Zoining of slum (by P.N Nambir 1961), income group study (by P. Ramchandran) housing condition and mobility study (by Victor S.D Sooja 1968), basic amenities study in slum (by S.N Sen 1969), development of slum (by A.K. Desai & S. Devadas Pillair 1972) urban growth and slum growth (by S.D maurya 1985), case study on slum areas (by Ratan N. Rao) are some significant studies on different dimension of slum studies by Indian Scholars . In Bilaspur city migration and living condition assessed V .K. Tiwari & N. Guria (2013) spatial variation in sanitation condition of Burhanpur city M.P, India analyzed By M. Banerjee & M. Karmakar are some specific case study. In all the mentioned study we find that sanitation of slums may be a significant and emerging dimension in studies so case study on Bilaspur slum area with its comparative sanitation condition has been selected for observation.

**Methodology:** There are a total 56 notified slums in Bilaspur city. Among which 30 are selected for random sampling which is 53.57% of population. Random sampling has done with the reference of D.V. Lindley and J.C.P Millor's Cambridge elementary statistics table, 1955 Field survey was completed within 2012 feb to 2014 Aug with referenced to Rajiv Awas Yojana (RAY) and census of India data

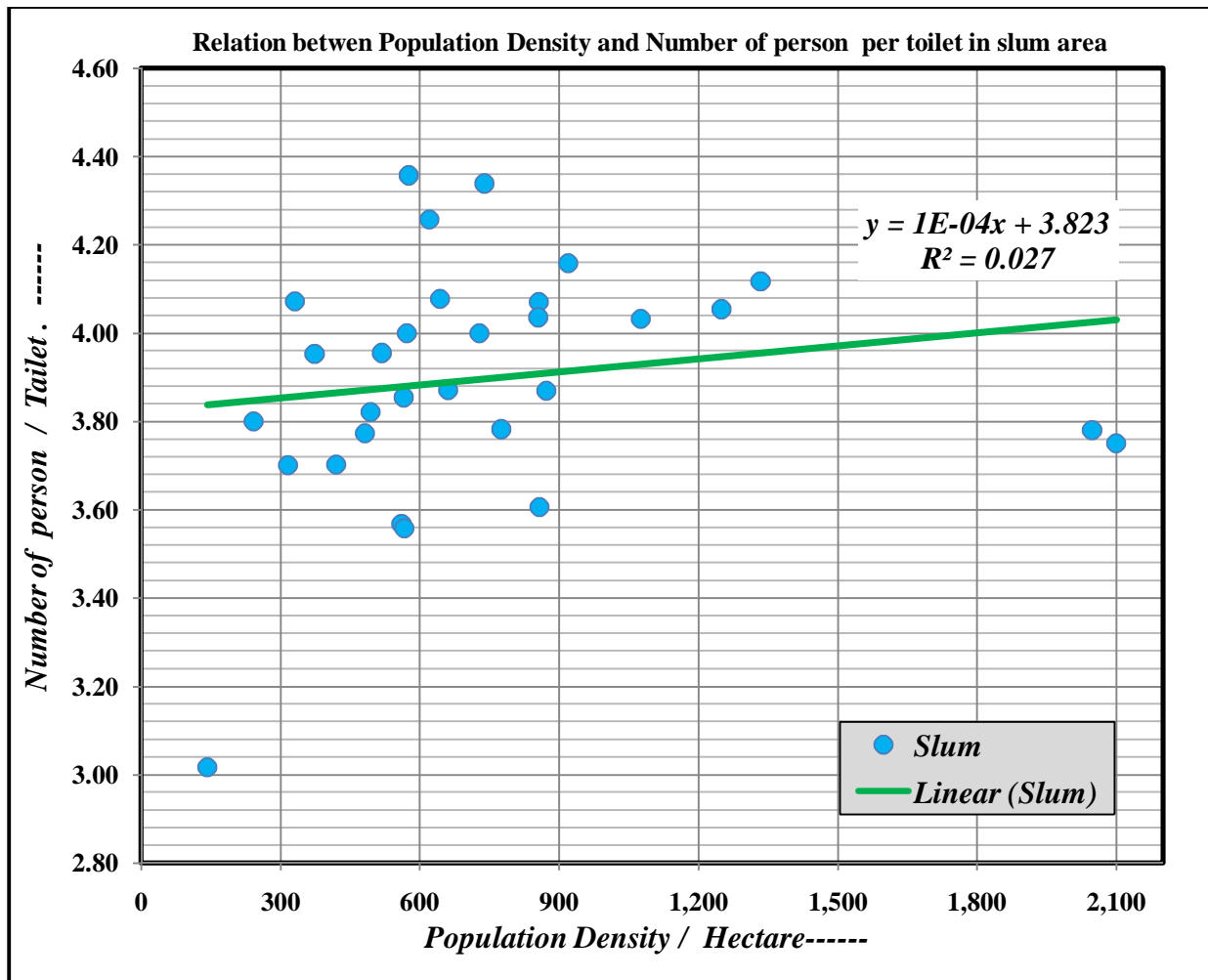
2001. Collected data is analyzed by various statistical applications like Regression equation. Standard deviation, Lorenz curve, Gini's co-efficient etc. Ultimately proposed hypothesis is tested by Z test. Microsoft Excel 2007, Arc GIS 9.3 ERDS 9.2, Topo sheet 64-3/4 (Survey of India) are used extensively for data analysis and mapping purpose.

**Case Study on Bilaspur:** Bilaspur is located at Lat  $22^{\circ} 5'21.34''N$  & Long  $82^{\circ} 9'17.42''E$  with average elevation of 264m. It is a city in Bilaspur district in the Indian state of Chhattisgarh. The city is situated on the banks of the rain-fed Arpa river which originated from the high hills of the maikal range of central India. As per the 2001 census information the city had population 294458 and slum population 110336. According to 2011 census report Bilaspur Municipal Corporation had a population near 331030. Bilaspur urban area population is estimated at 452851. Rajiv Awas Yojana in its survey report (2011-13) determined total 134 slums in the city, among which 56 are notified slums. In 2013 the scheme covered 101246 populations with some village slum population. We covered 10162 populations within 34 slums.

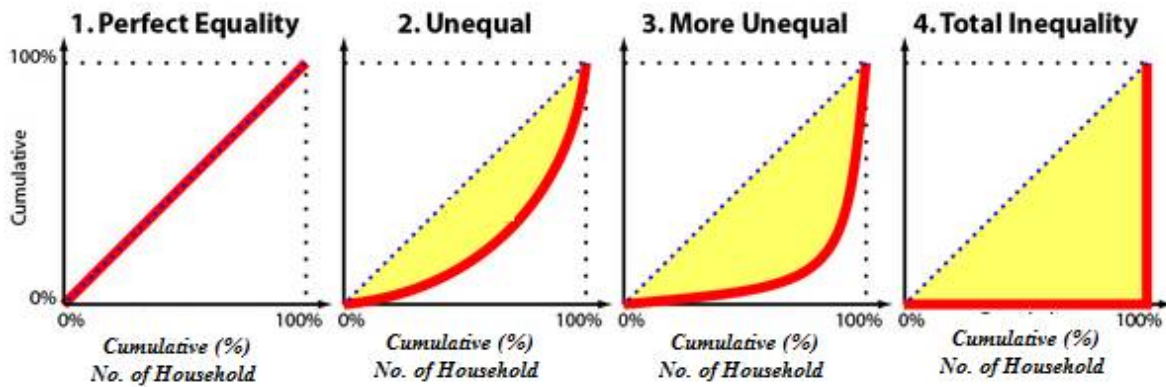
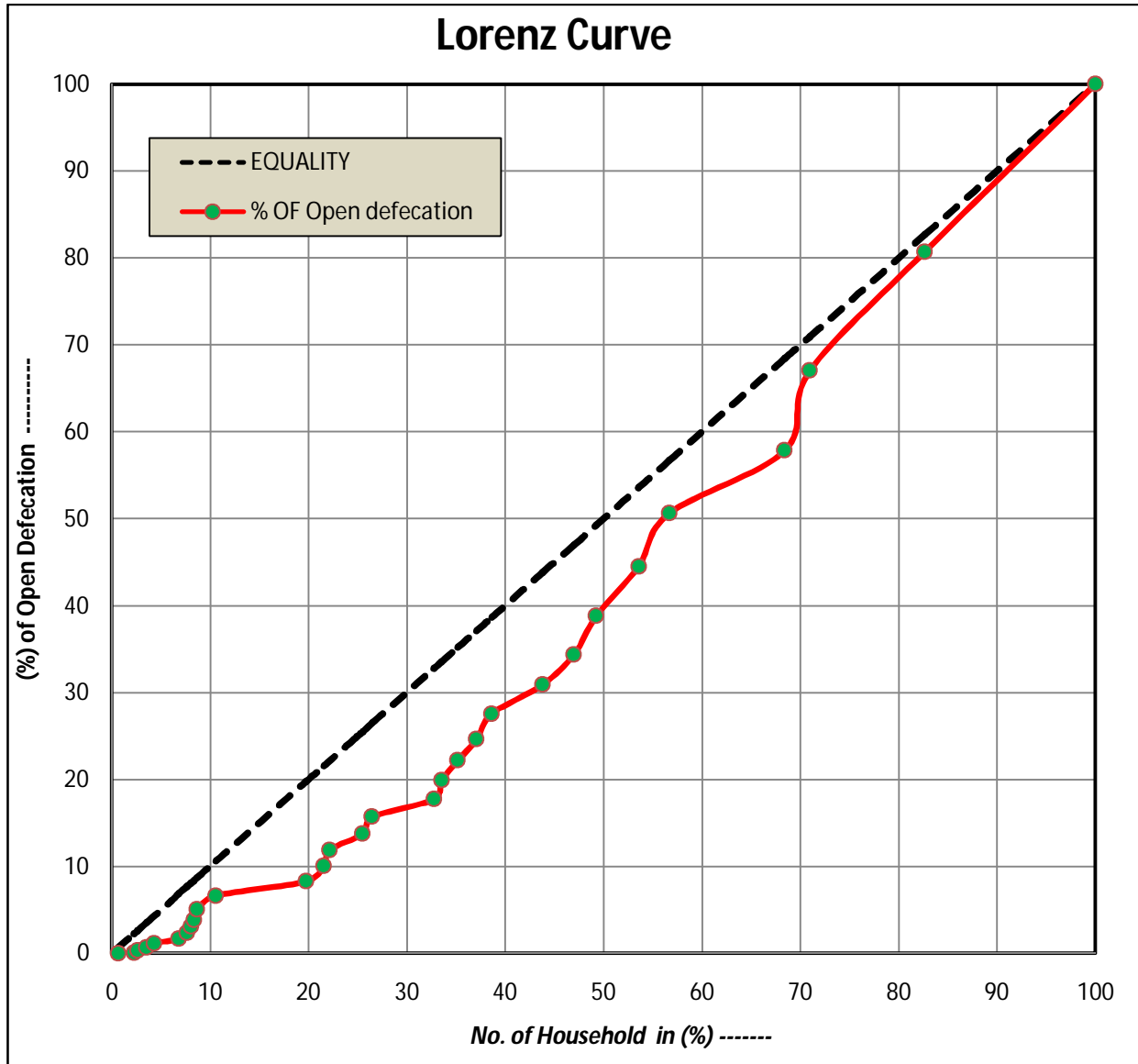


**Figure 01:** Locational map of Bilaspur Municipal Corporation (BMC)

**Survey Result and Discussion:** -There were total 56 notified slums in Bilaspur city during our survey period. 30 slums were randomly selected by random sampling. Total population of slums was 40181 and the families were 10162 including lock household. To find out nature of sanitation we made total 7 category of toilet like (1).Community dry latrine, (2). Community septic tank/flash, (3). Open defecation (4). Own dry latrine. (5). Own septic tank/flush latrine,(6). Shared dry latrine, (7). Shared septic tank / flash latrine. In these parameters we choose open defecation as a indicator of sanitation lacking. We also include some demographic question like population size, population density etc. to assess correlation between demographic features and sanitation condition. In our observation we found that there are 13 slums out of 30 dominated by open defecation, 9 slums have own septic/flash latrine, in this regard we consider modal value of latrine type. Own septic tank/flash latrine always considered as improved sanitation type. As of our study 21 slums area come under <40% own septic tank/flash latrine type or under improved sanitation. Population density and toilet ratio with person by through regression equation and scatter diagram shows a positive relation which indicates while population density increase its impose pressure of sanitation in slum areas as well as for urban environment. The disparity of sanitation lacking or open defecation has been shown by Lorenz curve and Gini co-efficient in respect of population.



**Figure 02:** Relation Between Population density and Number of person / Toilet in slum are



**Figure 03:** Showing disparity in availability of sanitation.**Gini's Co-efficient (G) – (Ref: Table 03, Appendix)**

$$\begin{aligned}
 G &= \frac{1}{100 \times 100} \left( \sum_{i=1}^n X_i Y_{i=1} - \sum_{i+1}^n Y_i X_{i+1} \right) \\
 &= \frac{1}{10000} (36468.28 \times 35069.90) \\
 &= \frac{1}{10000} \times 1398.38 \\
 &= 0.139838 \\
 &= \mathbf{0.140} \text{ (Approx)}
 \end{aligned}$$

Ultimately percentage of available sanitation type and lack of sanitation calculated in each slum to test the hypothesis. We applied z-test to check the significance.

- (i) Null hypothesis (H<sub>0</sub>): There is no significant sanitation lacking in slum areas of Bilaspur.
- (ii) Alternative hypothesis (H<sub>1</sub>): Sanitation lacking is a serious issue of slums.

**Test Statics: (Z-test) - (Ref: Table 04, Appendix)**

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

- $\bar{x}_1$  = means of first sample
- $\bar{x}_2$  = means of second sample
- $\sigma_1^2$  = standard deviation of first sample
- $\sigma_2^2$  = standard deviation of second sample
- $n_1/n_2$  = no. of sample.

$$\begin{aligned}
 Z &= \frac{68.19 - 31.81}{\sqrt{\frac{(25.09419982)^2}{30} + \frac{(25.09)^2}{30}}} \\
 &= \frac{36.38}{\sqrt{0.83647333 + 0.83633333}} \\
 &= 36.38 / 1.67280666
 \end{aligned}$$

=21.7478809

*Comment:* - Since calculation value of Z 21.7478809 which is greater than critical value 1.96: so, Ho is rejected at 5% level of significance.

**Conclusion:** Inadequate basic services is a common nature of slum area. Sanitation is such a issue which not only effect the slum area but also ravage the urban environment,. It is directly related to human health. Our prime motivation was to investigate the intense of this issue in slums: and so we completed our case study on slums of Bilaspur city. Nature and lacking of sanitation area minutely observed in our research work and sometimes correlated with demographic element. The issue of sanitation has also been qualitatively assessed and quantitatively expressed. We hope that our study will be helpful for future researchers and concern administration to mitigate the problem of sanitation. Open defecation is a serious problem in our study area this problem can be mitigated by community or public toiled project. Toilet blocks would be a solution in this regard with public, private and nonprofit involvement. Sulabah model is an example of this type, running in many parts of India. Build-operate transfer (BOT) model (running is some places of Delhi), portable toilets are some alternative solution in small scale in regard to sanitation. Rajv Awas Yojan's suggestions may be crucial force to change the situation if implemented properly (which was completed just before our field survey)

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## Appendix:-



Table No.01 : Sanitation types

S. No.	Slum Name	Ward No	Slum Unique ID	Slum Area in (Ha.)	Sanitation Types *						
					1	2	3	4	5	6	7
1	27 Kholi Chowk	01	1	0.35	00	00	19	00	08	00	03
3	Uslapur	01	3	0.17	00	01	29	00	01	00	00
4	Mitti Tila	02	4	1.22	00	02	59	17	105	04	05
5	Pump House	02	5	2.54	10	24	84	27	103	37	40
7	Jatiya Talab	04	7	0.45	03	02	52	11	06	02	01
8	Bhakt Kanwar Ram	05	8	0.12	00	01	07	02	16	09	02
10	Mini Basti	07	10	8.37	263	381	467	134	310	31	176
11	Majuwa Para	10	11	0.29	00	07	08	12	16	50	01
15	Mari Mai	13	15	1.48	08	04	38	27	43	65	11
16	Ramjani Masjid	13	16	1.09	01	02	43	42	55	39	04
17	Dipu Para	15	17	3.58	25	42	45	34	94	43	56
18	Vidya Nagar	16	18	0.3	06	01	18	03	04	08	03
19	Indira Colony	16	19	0.31	30	08	56	23	18	26	07
20	Gond Para Harijan Mohalla	22	20	0.99	00	50	71	09	19	03	06
22	Sant Ravidas Nagar	25	22	1.73	59	48	12	71	57	00	07
23	Juna Bilas Pur	27	23	1.25	23	61	01	06	21	02	48
27	Mochi Mohalla Mama Bhanjha Talab	31	27	0.59	00	16	00	02	11	14	24
28	Sonkar Mohlla Tikra Para	32	28	0.38	23	02	12	17	16	03	05
29	Tikra Para	32	29	0.15	28	02	16	15	14	03	06
32	Dayal Band Jagmal Chowk	35	32	0.97	48	34	107	09	16	15	02
33	Torba Pump House	36	33	1.26	01	03	45	05	04	00	02
37	Chuhchuhiya Para	39	37	2.79	25	07	138	55	104	54	58
40	Rekando	41	40	1.17	02	17	222	06	09	02	01
43	Chingraj Para	41	43	4.39	158	79	40	152	421	28	53
44	Kabir Chowk	41	44	4.88	143	60	49	83	209	44	53
45	Dabri Para	42	45	3.59	57	28	81	50	102	148	58
49	Sanjay Nagar	44	49	1.18	74	14	148	01	13	61	04
50	Irani Mohalla/ Chowk	44	50	5.28	403	10	175	97	194	240	72
52	Bandhwa Para	45	52	18.6	15	07	331	185	483	95	73
56	Lodhi Para	48	56	1.19	00	02	47	14	06	27	01
<b>Total</b>				<b>70.66</b>	<b>1405</b>	<b>915</b>	<b>2420</b>	<b>1109</b>	<b>2478</b>	<b>1053</b>	<b>782</b>

Source: Computed from primary household survey data based on field visit-2012-2013

\*

1. Community dry latrine.

2. Community septic tank/flush latrine.

3. Open defecation.

4. Own dry latrine.

5. Own septic tank/flush latrine.

6. Shared septic tank/flush latrine.

Table No.02 : Sanitation Types and Demographic Parameter

Table No.02 : Sanitation Types and Demographic Parameter												
Slum Basic Information				Slum Household Information					Calculated data			
S.No.	Slum Name	Ward No	Slum Unique ID	Slum Area in (Ha.)	Different types of Sanitation	Total No. of Household (Excluding Lock House hold)	Total Population	No. of Open Defecation	Household Density/ Ha.	Population Density/Ha.	Ration= Population/ Toilet	Open Defecation in (%)
1	27 Kholi Chowk	01	1	0.35	11	30	111	19	85.71	317	3.70	63.33
3	Uslapur	01	3	0.17	02	31	124	29	182.35	729	4.00	93.55
4	Mitti Tila	02	4	1.22	133	192	685	59	157.38	561	3.57	30.73
5	Pump House	02	5	2.54	241	325	1226	84	127.95	483	3.77	25.85
7	Jatiya Talab	04	7	0.45	25	77	298	52	171.11	662	3.87	67.53
8	Bhakt Kanwar Ram	05	8	0.12	30	37	150	07	308.33	1250	4.05	18.92
10	Mini Basti	07	10	8.37	1295	1762	7171	467	210.51	857	4.07	26.50
11	Majuwa Para	10	11	0.29	86	94	387	08	324.14	1334	4.12	8.51
15	Mari Mai	13	15	1.48	158	196	854	38	132.43	577	4.36	19.39
16	Ramjani Masjid	13	16	1.09	143	186	807	43	170.64	740	4.34	23.12
17	Dipu Para	15	17	3.58	294	339	1340	45	94.69	374	3.95	13.27
18	Vidya Nagar	16	18	0.3	25	43	172	18	143.33	573	4.00	41.86
19	Indira Colony	16	19	0.31	112	168	635	56	541.94	2048	3.78	33.33
20	Gond Para Harijan Mohalla	22	20	0.99	87	158	562	71	159.60	568	3.56	44.94
22	Sant Ravidas Nagar	25	22	1.73	242	254	979	12	146.82	566	3.85	4.72
23	Juna Bilas Pur	27	23	1.25	161	162	619	01	129.60	495	3.82	0.62
27	Mochi Mohalla Mama Bhanjha Talab	31	27	0.59	67	67	248	00	113.56	420	3.70	0.00
28	Sonkar Mohlla Tikra Para	32	28	0.38	66	78	295	12	205.26	776	3.78	15.38
29	Tikra Para	32	29	0.15	68	84	315	16	560.00	2100	3.75	19.05
32	Dayal Band Jagmal Chowk	35	32	0.97	124	231	833	107	238.14	859	3.61	46.32
33	Torba Pump House	36	33	1.26	15	60	181	45	47.62	144	3.02	75.00
37	Chuhchuhiya Para	39	37	2.79	303	441	1798	138	158.06	644	4.08	31.29
40	Rekando	41	40	1.17	37	259	1077	222	221.37	921	4.16	85.71
43	Chingraj Para	41	43	4.39	891	931	3757	40	212.07	856	4.04	4.30
44	Kabir Chowk	41	44	4.88	592	641	2535	49	131.35	519	3.95	7.64
45	Dabri Para	42	45	3.59	443	524	2231	81	145.96	621	4.26	15.46
49	Sanjay Nagar	44	49	1.18	167	315	1270	148	266.95	1076	4.03	46.98

50	Irani Mohalla/ Chowk	44	50	5.28	1016	1191	4608	175	225.57	873	3.87	14.69
52	Bandhwa Para	45	52	18.6	858	1189	4518	331	63.92	243	3.80	27.84
56	Lodhi Para	48	56	1.19	50	97	395	47	81.51	332	4.07	48.45
<b>Total</b>		<b>70.66</b>	<b>7742</b>	<b>10162</b>	<b>40181</b>	<b>2420</b>	<b>191.9</b>	<b>750.7</b>	<b>3.9</b>	<b>31.81</b>		

*Source: Computed from primary household survey data based on field visit-2012-2013*

**Table 03: Calculation for Drawing Lorenz Curve & Gini's Co-efficient**

Slum Unique ID	Total No. of Household (Excluding Lock House hold) (X)	No. of Open Defecation (Y)	No. of Household (X)	No. of Open Defecation (Y)	% of X (In order to % of Y)	% of Y (Ascending Order)	Cumulative Percentage		Gini's Co-efficient	
							(X)	(Y)	X <sub>i</sub> Y <sub>i+1</sub>	Y <sub>i</sub> X <sub>i+1</sub>
1	30	19	0.30	0.79	0.66	0.00	0.66	0.00	0.03	0.00
3	31	29	0.31	1.20	1.59	0.04	2.25	0.04	0.74	0.11
4	37	7	0.36	0.29	0.36	0.29	2.62	0.33	1.73	1.17
5	43	18	0.42	0.74	0.93	0.33	3.54	0.66	4.10	2.85
7	60	45	0.59	1.86	0.77	0.50	4.31	1.16	7.12	7.88
8	67	0	0.66	0.00	2.50	0.50	6.81	1.65	15.76	12.62
10	77	52	0.76	2.15	0.83	0.66	7.64	2.31	23.35	18.65
11	78	12	0.77	0.50	0.42	0.74	8.06	3.06	30.97	25.55
15	84	16	0.83	0.66	0.30	0.79	8.35	3.84	42.12	33.28
16	94	8	0.93	0.33	0.31	1.20	8.66	5.04	57.25	53.38
17	97	47	0.95	1.94	1.93	1.57	10.59	6.61	87.51	130.58
18	158	71	1.55	2.93	9.16	1.65	19.75	8.26	198.32	178.35
19	162	1	1.59	0.04	1.83	1.78	21.58	10.04	256.82	222.62
20	168	56	1.65	2.31	0.59	1.86	22.17	11.90	305.08	303.55
22	186	43	1.83	1.78	3.34	1.86	25.51	13.76	400.52	364.12
23	192	59	1.89	2.44	0.95	1.94	26.46	15.70	469.09	514.56
27	196	38	1.93	1.57	6.31	2.02	32.77	17.73	651.32	594.34
28	231	107	2.27	4.42	0.76	2.15	33.53	19.88	743.96	699.24
29	254	12	2.50	0.50	1.65	2.31	35.18	22.19	866.42	822.57
32	259	222	2.55	9.17	1.89	2.44	37.07	24.63	1,021.71	951.24
33	315	148	3.10	6.12	1.55	2.93	38.62	27.56	1,193.84	1,206.68
37	325	84	3.20	3.47	5.16	3.35	43.78	30.91	1,505.19	1,452.08
40	339	45	3.34	1.86	3.20	3.47	46.98	34.38	1,822.86	1,693.30
43	441	138	4.34	5.70	2.27	4.42	49.25	38.80	2,191.92	2,079.45
44	524	81	5.16	3.35	4.34	5.70	53.59	44.50	2,712.81	2,523.01
45	641	49	6.31	2.02	3.10	6.12	56.69	50.62	3,279.68	3,462.99
49	931	40	9.16	1.65	11.72	7.23	68.41	57.85	4,585.28	4,105.15
50	1189	331	11.70	13.68	2.55	9.17	70.96	67.02	5,726.68	5,540.33
52	1191	175	11.72	7.23	11.70	13.68	82.66	80.70	8,266.09	8,070.25

56	1762	467	17.34	19.30	17.34	19.30	100.00	100.00		
<b>Total</b>	<b>10,162</b>	<b>2,420</b>							<b>Σ36,468.28</b>	<b>Σ35,069.90</b>

Source: Computed from primary household survey data based on field visit-2012-2013

Table No. 04 Calculation for Z Test					
Slum Unique ID	Available sanitation in (%)	Open Defecation in (%)	Slum Unique ID	Available sanitation in (%)	Open Defecation in (%)
1	36.67	63.33	23	99.38	0.62
3	6.45	93.55	27	100.00	0.00
4	69.27	30.73	28	84.62	15.38
5	74.15	25.85	29	80.95	19.05
7	32.47	67.53	32	53.68	46.32
8	81.08	18.92	33	25.00	75.00
10	73.50	26.50	37	68.71	31.29
11	91.49	8.51	40	14.29	85.71
15	80.61	19.39	43	95.70	4.30
16	76.88	23.12	44	92.36	7.64
17	86.73	13.27	45	84.54	15.46
18	58.14	41.86	49	53.02	46.98
19	66.67	33.33	50	85.31	14.69
20	55.06	44.94	52	72.16	27.84
22	95.28	4.72	56	51.55	48.45
<b>Mean</b>				$\bar{X}_1 = 68.19$	$\bar{X}_2 = 31.81$
<b>Standard Deviation (SD)</b>				$\sigma_1^2 = 25.09$	$\sigma_2^2 = 25.09$
Source: Computed from primary household survey data based on field visit-2012-2013					