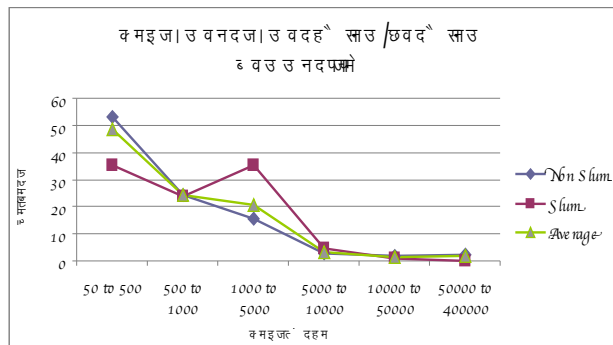




The State of Water, Sanitation and Solid waste Management



Doddaballapur
2009





Svaraj
Society for Voluntary Action
Revitalization and Justice



Foreword

Doddaballapur, a peri urban town 40 Km from Bangalore City, is a historical city with rich cultural heritage. Alongside, the town serves as a commercial and industrial area of rural Karnataka, India. Over the years, the town has been subject to rapid and unchecked growth as well as facing the impact from the growth of Bangalore city in terms of use of its natural resources – land use, water use, and human resource.

A population of 95000 and growing, the availability, accessibility and affordability of water; adequate sanitation and solid waste management remain key concerns for citizens of Doddaballapur and the Municipality. There is already a 50 per cent deficit in the town's water requirement and ground water is depleted to depths of nearly 800 ft. Although 85 per cent have a private toilet, and open defecation is practiced by 8 per cent, this fact masks the stark reality for those living in slums. 14 per cent of slum dwellers have access to domestic water connections and less than half have access to toilets. With no treatment of the sewage, no drainage, other than open drains along the door steps, much of the raw sewage drains out into the open spaces. The town generates 38 tons of waste per day, the issue of disposal of waste, maintaining and sustaining clean environment is a challenge. Most of the waste is left on the streets, dumped in tanks and in water sanctums. No doubt the result is lowering the quality of life and consequently the state of environment of the town which is adversely affected. The symptoms of strain on the environmental quality are evinced in several parts of the towns and its people.

Svaraj's in-depth study on "The state of **Water, sanitation and waste management in Doddaballapur Town**" is to help identify and better understand the development of basic civic amenities for the citizens of Doddaballapur; the environment condition of the town and the aspirations of its citizens for a better, well planned and inclusive town.

Based on the survey data analysis, discussions and observations made during the study and at meetings, the measures for accessibility, availability and affordability for water and sanitation; conservation, protection of water and water bodies as well as prevention of further exploitation of the nature resource is recognized. Given that there is 100% dependency on ground water, no underground drainage and exponential growth in solid waste production, the town has little option but to consider and explore alternate source of water, protect existing water sources from pollution; consider various options for adequate sanitation; actively encourage economic and ethical practices of its waste management to meet the basic needs of all its citizens as well as visitors to the town.

By taking advantage of the understanding and best practice in India on water conservation, water harvesting techniques, and regulatory framework, Doddaballapur citizens and Municipality can do much to secure their water, sanitation and safe environment requirements. Building on traditional knowledge and structures already in existence with small effort and investment in rejuvenation and protection of local water bodies, constructing roof top rain water harvesting systems, decentralised sewage drainage and treatment systems and environmentally friendly sanitation, the citizens and Municipality can strengthen and secure their accessibility, availability and affordability of water and sanitation for all and ensure a safe and healthy environment to live in.

We hope this report will be useful for the regulatory authorities, policy makers, town planners; citizen and other agencies concerned with the water and sanitarians environment management of and other similar growing towns and cities of the country.

I am grateful to my colleagues Ms. Meghana, Sanitation and Waste Management Officer; Mr Padmanav Nayak, Project Co-ordinator; Mr Kantanna, Field Officer; Ms Lakshmi, Programme Associate; Mr Raj Kumar, Program Officer; Mr. Shivaramaiah, Svaraj fellow; Mr Mohan Prabhu, Deputy Director, for their excellent efforts in guiding, directing and in the preparation of this final report. The cooperation extended by the citizens of Doddaballapur; voluntary organisation and municipality members is gratefully acknowledged.

Bharti Patel
Director Svaraj

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Acknowledgement

The Watsan Survey was undertaken to understand the water and sanitation situation of Doddaballapur, and includes solid waste management, roof top rainwater harvesting and health. This survey was possible due to the efforts put in by many people, who have contributed at different stages of the survey.

Svaraj is grateful to all those who have provided data for this study. Secondary data about the town was obtained from the CMC. Local information was also obtained from other local organizations and groups including AKNPS (Arkavathi Kumudvathi Nadi Punaschetana Samithi), Mass (Mahila Abhivrudhi Swachata Sangha), Mythri, Nagadala, Parisara Pragna Kendra, Roof top Rain Water Harvesting Group. Special words of thanks to Samvada, who have helped identify people/students for data collection and data entry. The students have diligently done data collection as well as data entry in the stipulated time.

We are immensely grateful to the households who have participated in the survey and for having spent time with students in providing information.

We thank Mr. K. Venkatesh (Chief Sub Editor, Times of India), for supporting in translating this report from English to Kannada, and making it reach a wider audience.

The effort put in by the team - staff of Svaraj at Doddaballapur as well as Bangalore head office is acknowledged for.

Abbreviations

CMC	City Municipal Council
HH	Household
CI/E	Cottage Industry/Enterprise
LPCD	Litres Per Capita per Day
MLD	Million Liters per Day
OBC	Other Backward Caste
ppm	parts per million
Rt RWH	Roof top Rain Water Harvesting
SC	Scheduled Caste
ST	Scheduled Tribe
TDS	Total Dissolved Solids
UGD	Underground Drainage

Introduction

“We never know the worth of water till the well is dry” – Thomas Fuller

Water and Sanitation are an integral part of development of a nation, the health of its citizens and the nation's environment. And yet 34 per cent rural population and 9 per cent urban population of India does not have access to adequate drinking water¹; Seven hundred million people have no access to toilets with proper waste disposal systems. This is despite the fact that the legal right to water in India has been interpreted by the courts from the constitutional right to life as without which life is not possible and despite governments move towards total sanitation programme in India since 1999.

At the beginning of the new millennium, the UN community members set themselves eight key Millennium Development Goals (MDG's) to address concerns over poverty and lack of basic amenities for citizens. Water and sanitation is highlighted as important issues and targets adopted.

On access to water the targets include:

1. Halve, by the year 2015, the proportion of people who are unable to reach, or to afford, safe drinking water.
2. Stop the unsustainable exploitation of water resources, by developing water management strategies at the regional, national and local levels, which promote both equitable access and adequate supply.

As part of ensuring environmental sustainability (MDG 7), integrating the [principles of sustainable development](#) the targets include:

1. To achieve [by 2010, a significant reduction in the rate of loss of proportion of total water resources used.](#)
2. [By 2020 increase in the proportion of population using an improved sanitation facility and achieve significant improvement in lives of at least 100 million slum dwellers.](#)

India's national water policy 2002 recognises *“water as part of a larger ecological system. Realising the importance and scarcity attached to the fresh water, it has to be treated as an essential environment for sustaining all life forms.”* The Government of Karnataka in its water policy 2002 document, states

the requirements for drinking water at the rate of 55 litres per person per day in the rural areas, 70 litres per person per day in towns and 100 litres per person per day in the city municipal council areas and 135 litres per person per day in city corporation areas. And in the State of Karnataka, 22 per cent procure water from unprotected sources during difficult times, 20 per cent access water from sources outside their homes, and in rural areas, 72 per cent defecate in the open, according to the latest water and sanitation study conducted by Arghyam in 2008-09.

The UNDP in its Human development report December 2006 argues there is more than enough water in the world for domestic purposes, for agriculture and for industry. The problem is that of mismanagement and some people – “notably the poor are systematically excluded from access by their poverty, by their limited legal rights or by public policies. Concluding that ***scarcity of water at the heart of the global water crisis is rooted in power, poverty and equality, not in physical availability***”

As per the 74th Constitutional Amendment Act, 1992, the responsibility of provision of basic services such as water, sanitation, waste management, provision of roads, planning and so on, lies with the urban local bodies such as the municipality. Good governance is required, for a progressive state, which requires the government to carry out its functions effectively, with involvement of all sectors - civil society and the private sector, and citizens -

Recognizing the importance of accessibility, affordability and availability of water and sanitation for all in our day to day living, Water and Sanitation situation of Doddaballapur was studied to collect and collate the much needed vital data to deepen our understanding and help decision makers and enforcers of legal provision on water, sanitation and environment to make the right decision. With this background, it becomes absolutely imperative for the town to govern its basic amenities services in a planned and sustainable way giving due importance to ensure equitable distribution of resources, ensuring social justice and creating an inclusive town.

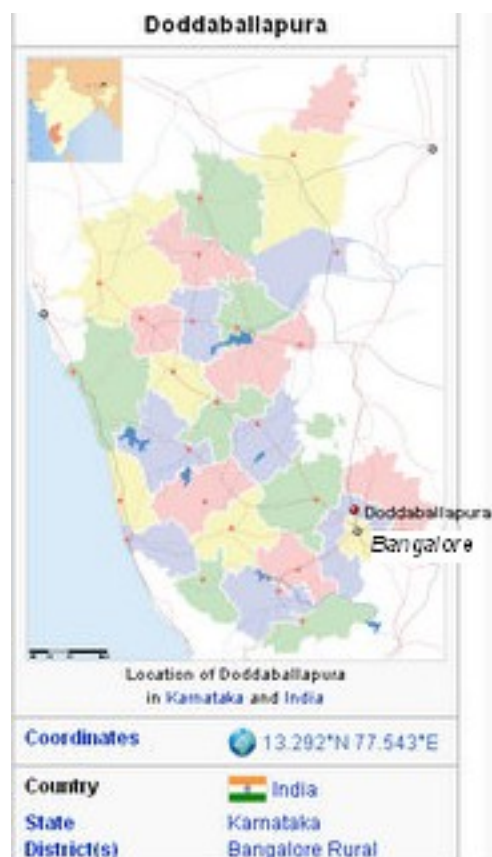
¹ Right to Water and Sanitation, Indira Khurana and Richard Mahapatra, March 2009, Water Aid India; http://www.indiaenvironmentportal.org.in/files/Righttowaterandsanitation_march252009_draft.pdf

Doddaballapur

Doddaballapur city is located 40 km north east of Bangalore city (13°18'0"N 77°31'11"E)² and belongs to Bangalore Rural District. The town covers an area of 15.5 sq. km, with a population of 95000 (as of 2006). The town has a percent decadal growth rate of 30.9 percent (Action Plan for Solid Waste Management, 2006), which is close to that of Bangalore Urban District i.e 34.8 percent in 1991-2001 (Reproductive and Child Health, 2002-04). Hence there has been rapid urbanization of this peri urban town, which may be attributed to its proximity to Bangalore city.

Consisting of 31 wards, it has 18064 households. Of these, 17.5% (3169) are slum households and 82.5% (14895) are non slum. At present there are 13 slums, 11 declared³ and 2 undeclared / identified⁴. The total slum population is approximately 13919, 22% of the total population.

The city is referred to as the silk city, and one of the main employment generating activities is manufacturing of silk cloth by power looms. In 2005, The Karnataka Industrial Area Development Board has established an Apparel Park which has helped to boost the economy of the city⁵.



Location of Doddaballapur in Karnataka
<http://en.wikipedia.org/wiki/Doddaballapur>

The largest surface water body present in town is the 'Nagara kere', one of the key tanks of the cascading tank system of River Arkavati, a tributary of River Cauvery, originates at Nandi Hills and flows for a distance of 190 kms.

The last two decades has seen a massive, rapid and unplanned growth which has resulted in changes in land use pattern, encroachment and exploitation along the path of the river affecting the water flow. Other than the Nagara kere tank, there are 8 kalyanis⁶ and a few wells in Doddaballapur Town. The command area of the tank was 60 hectares with storage capacity of 2.27 million cubic metre (Mcum) of water. But the tank is silted to the extent of over 30 per cent, with present capacity of 1.6 Mcum.⁷

² http://wikimapia.org/country/India/Karnataka/Dod_Ballapur/

³ An area which is a likely source of danger to health or safety of public of that area or of its neighbourhood, by reason of the area being low-lying, insanitary, squalid, over-crowded or otherwise; or the buildings are unfit for habitation, may be declared to be a slum area. These areas are subject to improvement in terms of structural alteration, sanitation. - The Karnataka Slum Areas (Improvement and Clearance) Act, 1973 ; [http://dpal.kar.nic.in/%5C33%20of%201974%20\(E\).pdf](http://dpal.kar.nic.in/%5C33%20of%201974%20(E).pdf)

⁴ An area which has conditions similar to that of a slum, by not identified/considered as a slum. This would mean that they are not entitled for basic services or for any improvement. Such areas arise when existing slums grow, but the boundaries are not updated or when such areas are located on public land. - The Pune Slum Census: Creating a Socio-Economic and Spatial Information base on a GIS for integrated and inclusive city development ; http://www.gisdevelopment.net/proceedings/gisdeco/sessions/s1_sena.htm

⁵ <http://timesofindia.indiatimes.com/articleshow/396970.cms>

⁶ Small water tanks which are historical structures for water storage

⁷ Improvement and Beautification of Doddaballapur Naagarakere Tank, DPR, Government of Karnataka, Water Resources Department, Minor Irrigation

Along with the town's open wells and water sanctums, Nagara kere served the town dwellers with both drinking water and water for irrigation and helped with recharge of ground water. But sadly the tank and wells are now totally encroached and used as waste disposal units, with the town's raw sewage flowing directly into Nagara kere. The town does not obtain its water from any of the surface water bodies and is now entirely dependent on groundwater for its water requirement extracted from a depth of 500 to 800 feet. And yet the town currently is only receiving 50% of its water requirement as per the recommendation of the State Water Policy.

Doddaballapur is considered as one of the 57 Nirmal Nagar towns in the state (Action Plan for Solid Waste Management, 2006), in which seven schemes including urban cleanliness, access to toilets for urban poor and rain water harvesting should be promoted⁸. In spite of this, the situation is alarming.

Eighty five per cent of the population having access to private toilets, the town lacks proper sanitation facilities with raw sewage flowing into open spaces on the outskirts of the town. There is no underground drainage system. The sewage (black water) from individual sanitation practices is discharged to open drains in front of the homes providing excellent breeding sites for flies, mosquitoes, or they are connected to soakage pits, resulting in pollution of surrounding surface water as well as groundwater. Though there are community toilets present, open defecation is in practice in certain parts of the town.

In case of garbage disposal, one of the key aspects of sanitation, the practice in the town is to dispose waste in open places and dustbins. In a few wards door to door collection is practiced. But more often, the garbage gets disposed in drains and water sanctums, further clogging them resulting in stagnation and unhygienic conditions.

The study and report involved questionnaire based household survey of 10 per cent of the households in Doddaballapur town, representing slum dwellers as well as non-slum dwellers. Analysis of the data, supported with secondary data was discussed with key members of Doddaballapur Town, highlighting key analysis.

The authors make recommendation for an integrated approach to accessibility, availability and affordability of - both quantity and quality of water, its use, the waste and its treatment and to reduce, recycle and reuse resource as well as the governance to include on the roles and responsibilities of the key actors in delivering these vital services to its people for the economic, social and environmental well being of the town and the nation.

⁸ Nirmala Nagara, Directorate of Municipal Administration, Bangalore, <http://municipaladm.kar.nic.in/NNe.htm>

The “Watsan” Study

Scope of the Study

The purpose of the study is to help better understand and explore:

1. The water, sanitation and other waste disposal (from household, cottage industries and enterprises) situation of Doddaballapur town.
2. Health of people from improper water and sanitation practices.
3. Alternative practices such as roof top rainwater water harvesting and eco – sanitation.

The broad objectives of the study include:

1. A comprehensive evidence based understanding of the water and sanitation situation of Doddaballapur as well as the community health status
2. An assessment of the community awareness and acceptability on water harvesting and conservation, eco-sanitation, waste disposal and implications of unhygienic environment on health

Specific objectives of the study include:

A. Water and sanitation situation

- **Water** - Understand potable and non potable water usage in terms of sources of water, quantity of usage and perception of quality
- **Sanitation** - Assess the type of drainage system, grey and black water discharge and toilet accessibility in town. In case of households which do not have private toilets, reasons for the same.
- **Waste Management at household and cottage industries/enterprise** - Identify the methods adopted by the community for disposal of household waste. In case of cottage industries/enterprise, to understand the type of waste generated, and method of disposal.

- **Health Status of the Community** - Obtain health status of people in terms of prominent diseases present in town and the average health expenditure of households.

B. Awareness and acceptability of the community regarding practices related to roof top rain water harvesting, eco-sanitation, garbage disposal and implications of unhygienic environment on health

- **Water** - explore the extent of awareness regarding roof top rainwater harvesting and to understand why people are not interested in Rt RWH.
- **Sanitation** - Assess the acceptability of Eco-sanitation toilet model among households
- **Waste Management in households and cottage industries/enterprises** - Understand peoples’ perception on the types of waste generated by them and to assess the acceptability of door to door collection as well as segregation of waste
- **Health Status of the Community** - assess the awareness of people regarding implications of unhygienic environment on health

Outcome

1. A baseline data on water use and sanitation, waste generation and its disposal by residents of Doddaballapur town.
2. Dissemination of findings among key groups to include community, government and organizations.
3. Recommendations on water, sanitation and waste disposal as well as its governance on an integrated manner to help improve water and sanitation system of the town.

The Methodology

Study Design

- A quantitative study which also includes qualitative data pertaining to peoples' perception of cleanliness, reason for spread of diseases and so on.
- Secondary data such as town ward details, sanitation situation, were obtained from the CMC. Town data was also obtained from local organizations.
- Primary data was obtained from households in the form of structured interviews (Refer Annexure 1 for Questionnaire). Each interview schedule contained 38 questions with sub – questions, covering all the themes.

Sampling

Doddaballapur has a population of 95000 with 18064 households spread over 31 wards. 17.5% are slum households and 82.5% are non slum households. The study covered 10% of the households - 1800 in all the 31 wards, which is representative of the population, where the proportion of non slum households and slum households in each ward is proportionate to the actual population/households (Refer Annexure – 2 for sampling details). 18.5% (333) Slum households and 81.5% (1467) non-slum households were covered.

Data collection was done over a period of 3 weeks in the month of July, 2009 by 16 students, majority of them from Samvada (an organization in Doddaballapur). An orientation was given to the students about the questionnaire as well as the organization. Each student was allotted a ward and information such as characteristics of the ward along with the number of slum and non slum households to survey were given. In each ward, households were chosen randomly.

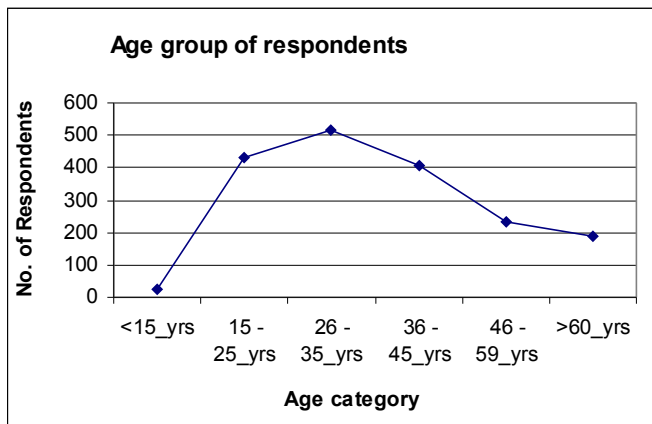
Data entry was done by four students during the month of September, 2009. Data was entered in excel, which contained 79 fields/variables. Certain variables such as 'ward number', 'house ownership', 'educational qualification', 'toilet discharge' and so on had validation fields, to prevent invalid entries. Analysis was done using basic tools such as pivot tables in excel, to obtain percentages for the respective variables.

Triangulation

The findings of the study were shared with the other stakeholders – citizens of Doddaballapur town, community based organizations, municipal staff, councilors, former councilors and media representatives. A workshop for the purpose facilitated critical comments, reflections and perspectives from these stakeholders, in a spirit of participation. The process helped triangulate the findings and provided a basis for making specific recommendations.

Profile of Respondents

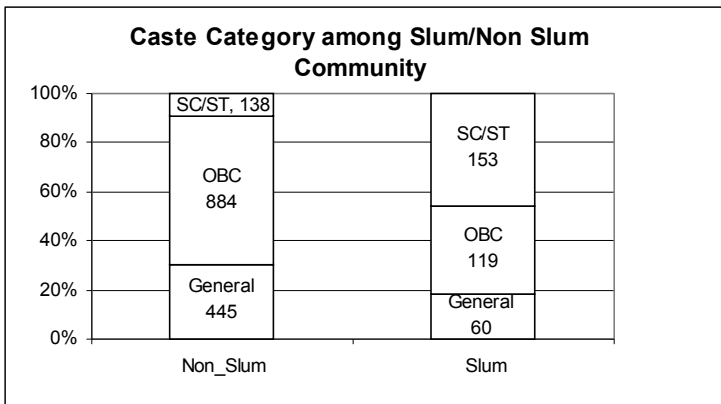
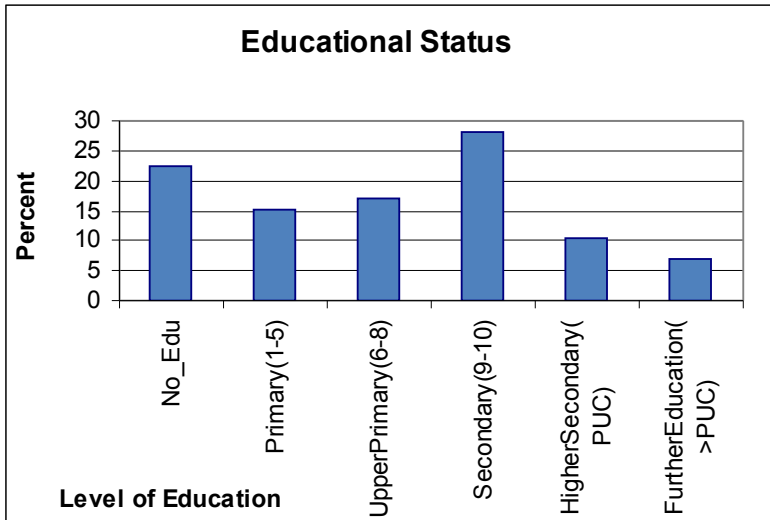
Characteristic	Sub-Characteristic	Percent (Number)
Household Type	Slum	18.5 (333)
	Non Slum	81.5 (1467)
Age Category	15 to 25 yrs	24
	26 to 35 yrs	29
	36 to 45 yrs	23
Gender ⁹	Female	64
	Male	36
Marital Status	Married	86
	Single	14
Religion	Hindu	92
	Muslim	8
	Christian/Jain	Negligible
Caste	General	28
	OBC	56
	SC/ST	16
Education	No Education	23
	Primary (1-5)	15
	Upper Primary (6-8)	17
	Secondary (9-10)	28
	Higher Secondary (12th)	10
	Further Education (>12 th)	7
Card Holders	BPL	70
	APL	7
	No Card	23



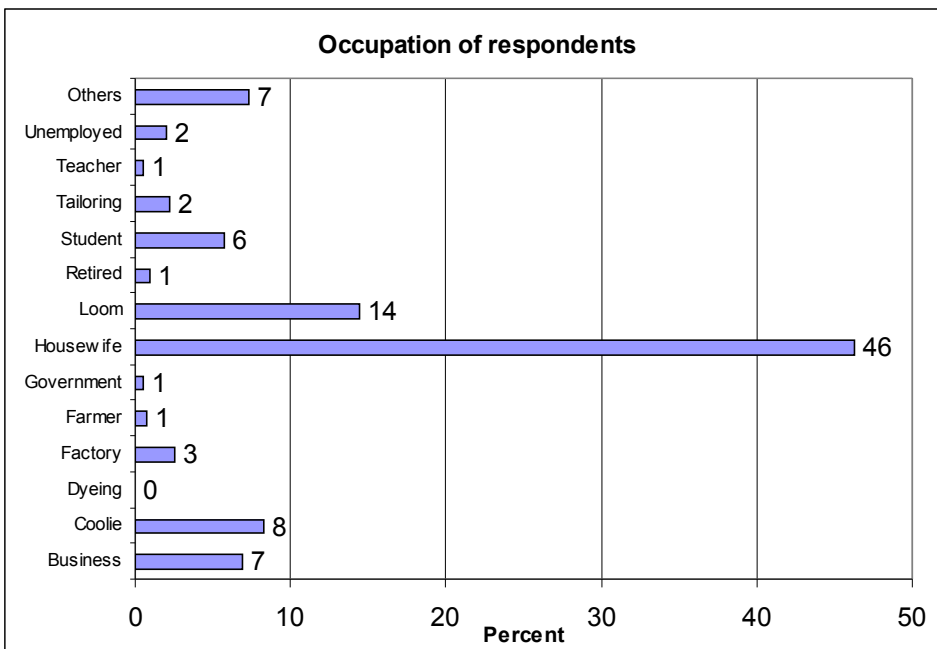
Most of the respondents belong to the age group 15 to 45 yrs.

- Average household size is 4 (36%) to 5 (21%) members
- Percent of respondents staying in rented homes is 34 per cent

⁹ Since data was collected from households, most of the respondents (64%) were female.



The slum community has a higher percent of SC/ST population (46%) when compared to that of the non slum community (9%). (Refer Annexure 3 for caste category)



Findings

A. Water, Sanitation and Waste situation

Water

Water supply



As per the Karnataka State Water Policy 2002, Doddaballapur should have a supply of 100 LPCD of water since it falls under city municipal council area. With a population of ninety five thousand, its water requirement stands at 9.5 MLD.

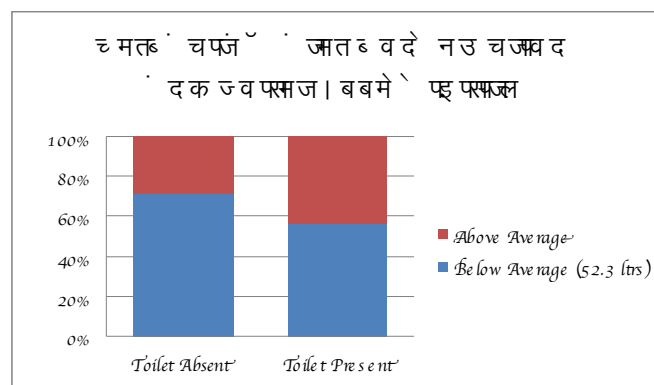
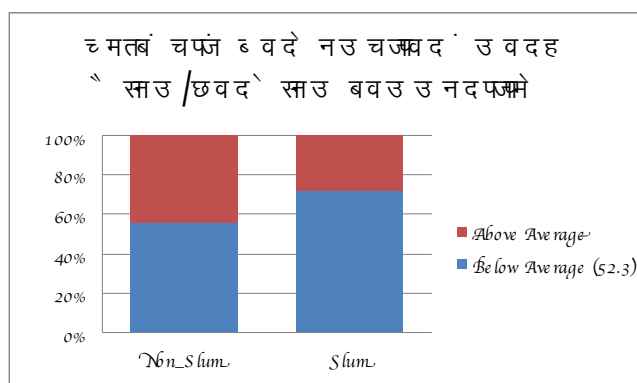
The municipal supplies 4.84 MLD¹⁰, 51% of the actual requirement.

Private players supply approximately 1.5 MLD through tankers. Even after considering the supply from private players, there is a shortage of 33%.

Water consumption

- Per capita consumption of water is 52 ltrs per day, of which is 9 ltrs of potable water and 43 ltrs of non potable water.
- Consumption of water in non slum communities is higher than slum communities
 - Average consumption among non slum community is 55 LPCD, and 44% of them consume more than the average consumption of 52 LPCD.
 - Average consumption among slum community is 44 LPCD, with 28% consuming more than the average consumption of 52 LPCD.

As seen in the chart, water consumption increases with the presence of toilets at homes. Among those who have toilets, 44% consume more than the average of 52 LPCD, while among those who do not have toilets, only 29% consume more than the average of 52 LPCD



¹⁰ Interaction with Water Department official at CMC, Doddaballapur

Source of Water

There is 100 per cent dependency on groundwater, with the municipal and private players supplying water from borewells drawing from depths of 500 to 800 ft below ground and declining.

➤ Ground water reaches people through taps (2135 public taps, 8295 domestic connections and 296 commercial connections), borewells (private and 10 hand pumps), wells (Own and Public), Tanker and Bottled/Can water (Private suppliers).

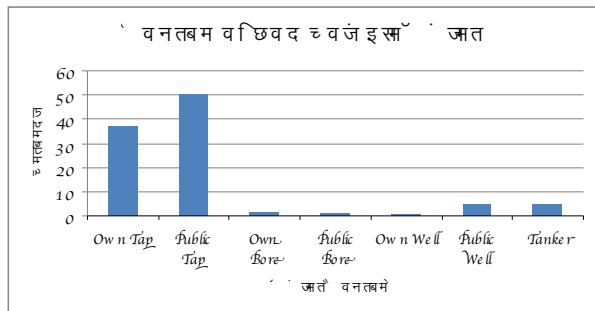
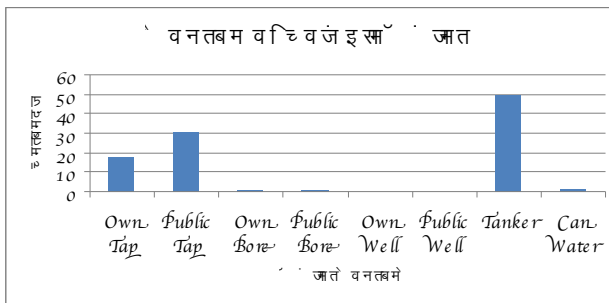
➤ 14.5% (261) respondents harvest rain water (traditional and systematic water harvesting system), of which only 16% use it for potable purpose.



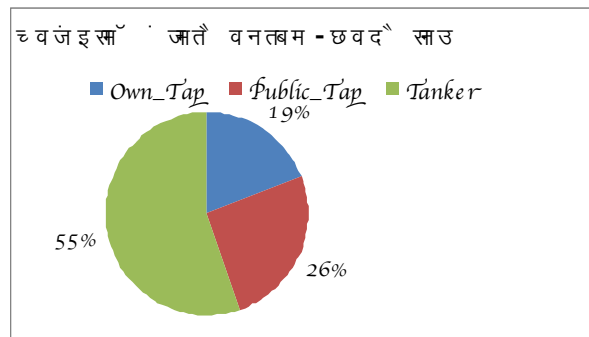
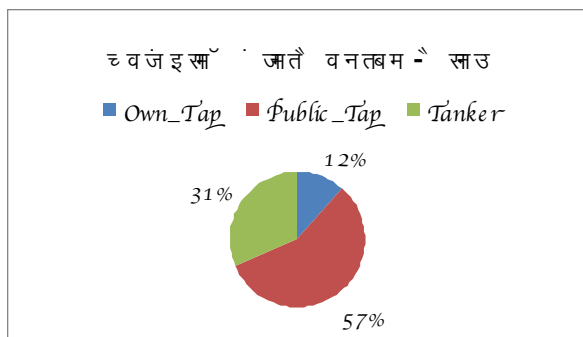
➤ The major source of potable water is tanker (50%) and municipal water (47%), with 30% accessing water from more than one source.

➤ The major source of non potable water is municipal water (50% public tap and 37% private tap).

But there exists a stark difference among the slum and non slum community.



Source of Potable Water among Slum/Non Slum Community



More than half of the slum community (57%) get potable water from public taps (municipal supply)

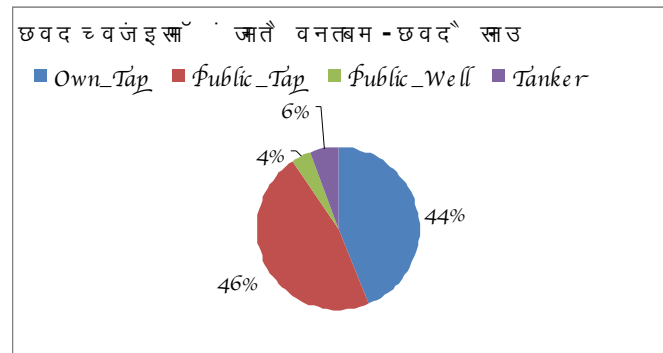
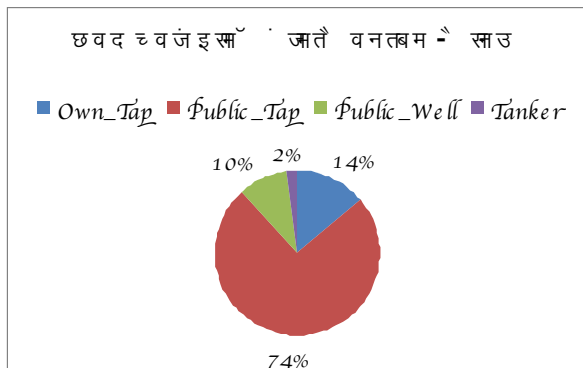
➤ More than half of the non slum community (55%) buy water for potable purpose from tankers.

It is to be noted that tanker water is available at the rate of Rs 1.50/- to Rs 2/- for one pot (approximately 15 ltrs/pot) of water.

➤ The average expenditure of households on tanker water is Rs. 4.50/- per day.

➤ Tanker water is also purchased (approx. 3000 ltrs) by some residents for non potable purpose at a rate of Rs 250/- per load

Source of Non Potable Water among Slum/Non Slum Community



➤ Only 14% of the slum communities have access to domestic connections, whilst for the non slum communities it is 44%.

Water availability and storage

“We get water from the public tank, but there is lots of fighting for it.”

➤ Municipality water is available once in four to five days

➤ Tankers are available more frequently, where those who buy tanker water do so every alternate day. During summer when water availability is less, the demand for tanker water increases due to increase in consumption.

➤ Potable water is stored in vessels or pots

➤ Non potable water is stored in – Pots, ‘Thotti’ (a tank inside a house); overhead tank or a sump.

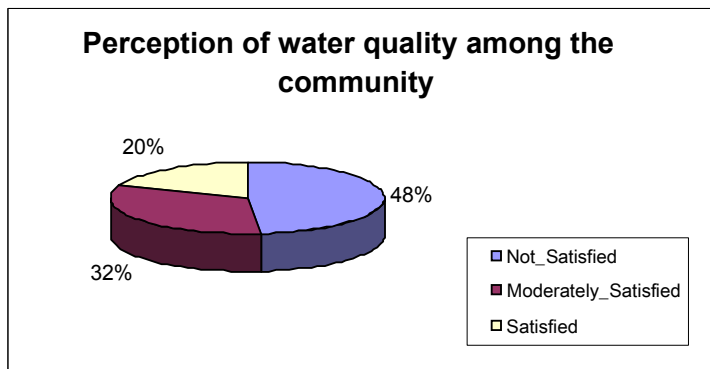
➤ Quarter of the population in town have access to storage facilities such as sump and overhead tank.

➤ Among the non slum community 30% have sump/overhead tank, and only 5% of Slum community have sump/overhead tank.

Quality of Potable Water

“Water is not good. But we have no option so we use it.”

- Nearly half of the community (48%) is not satisfied with the water, as it has a high salt content.
- 32% are moderately satisfied, wherein their responses included ‘Ok’, ‘We filter the water’.
- Only 20% are satisfied with the water.



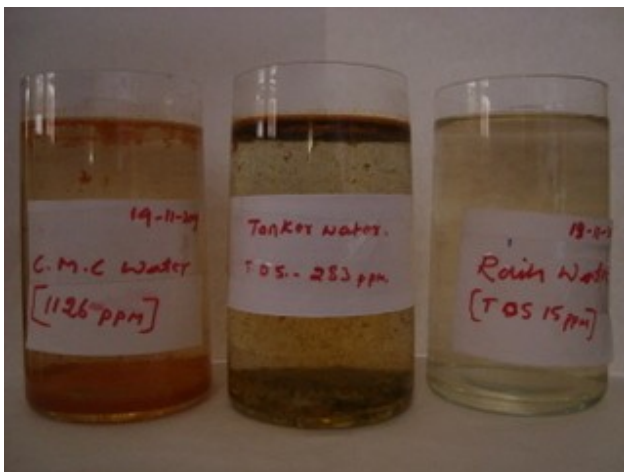
“Sometimes the water is very bad that we cannot drink it. It gets mixed with drain water. Salt and sweet water is mixed.”

“Water is ok, we can drink it. It contains dust particles.”

Perception of good quality water is generally based on taste, odour, clearness of water, due to which people may report high satisfaction levels though water contains more than desirable levels of fluoride, nitrate and bacteriological contaminants (Ashwas, 2008-09). Even in the case of Doddaballapur, the perception of water quality was largely based on taste (salt content), which need not reflect the true quality of water.

Though the ground water status of Bangalore Rural District is critical, with 58% of sources having more than desirable limits of fluoride level (standard limit 1 ppm) (Ashwas, 2008-09), there has been no water quality tests done by the municipality.

Water Testing (TDS) – after electrolysis



- Tests for ‘Total Dissolved Solids’ (TDS) of water sources in Doddaballapur shows that municipal water has nearly 4 times TDS than tanker water.¹¹

Municipal water	1126 ppm
Tanker water	283 ppm
Rain water	15 ppm

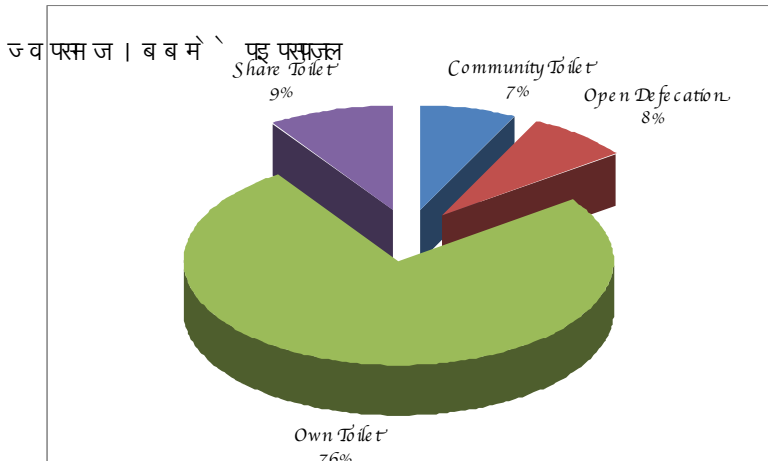
“The water stinks. Salt and sweet water will be mixed.”

¹¹ As per IS 10500-1991 standards, maximum desirable TDS is 500 mg/L and the maximum permissible level in the absence of a better source of water is 2000 mg/L. For water, mg/L is equivalent to ppm.

Sanitation

Toilet Accessibility

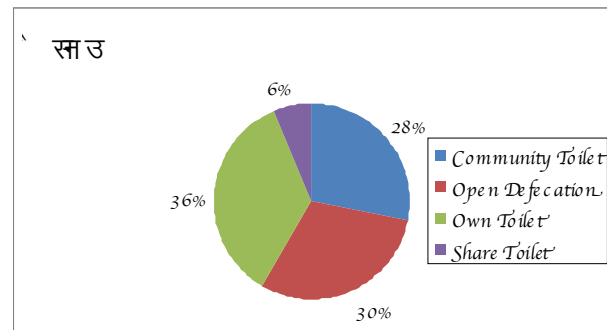
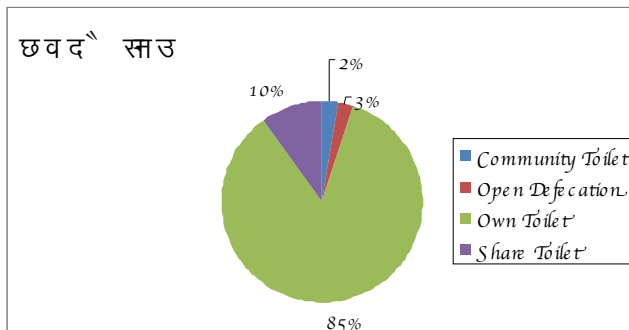
- 85% of the population has access to private toilets: 76% own toilet and 9% shared toilet
- 15% of the population does not have access to private toilets: 7% community toilet, 8% open defecation



“In the morning we go to the community toilet. If we need to wait for too long, then we go out in the open”

Although this is in line with the statistics presented in the National Urban Sanitation Policy (NUSP), where the data for open defecation is in 7.87% households, 8.13% households use community latrines and 19.49% households use shared latrines¹², it does mask the stark reality and inequity for those living in slums of Doddaballapur town.

Toilet accessibility among slum/non slum community and across castes



The difference in toilet accessibility among slum and non slum community is clearly visible

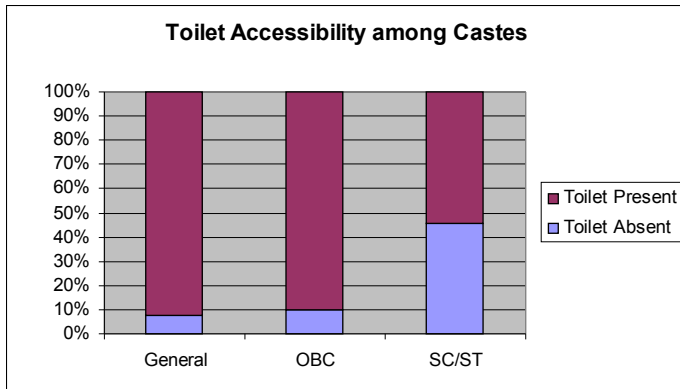
- 42% of Slum households have access to private toilets
- More than 1 in 3 use open space and/or community toilets (30% and 36% respectively), much higher than that of the non slum community (3% and 2%)

There are 26 public toilets in town, with 14 of them in slums¹³. But their condition is bad, with most of the public toilets not in working condition.

As stated in the profile of respondents, the slum community has a higher percent of SC/ST population (46%) than the non slum community (9%).

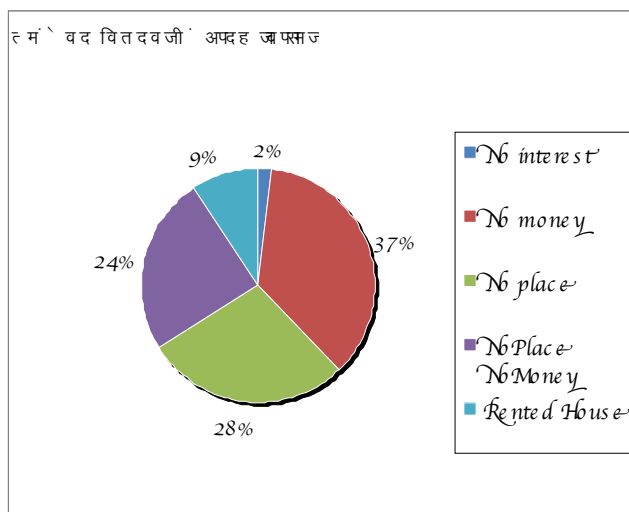
¹²As per National Urban Sanitation Policy

¹³ Conversation with Environmental Engineer, CMC, Doddaballapur



Inequality in toilet accessibility is seen across caste also, where only half (54%) of the SC/ST community have toilets while it is 90% for general category and backward castes.

Reason for not having a toilet



Financial constraint (61%) and space (65%) were the major reasons why respondents said they did not own a toilet.

The same was reflected for Bangalore Rural District, where financial constraints (38%) and space (41%) were the major factors. While 18% of low income groups had access to private toilets, it was 60% among the high income group (Ashwas, 2008-09).

Water from soak pits may reach groundwater or flow to nearby open spaces leading to pollution. In case of Doddaballapur, many of these sewage outflows are near bore wells with chances of water contamination being high (A decentralized approach to wastewater management for Doddaballapur city, 2009).

other waste water (i.e grey water) is discharged.

- In case of grey water, 85% households let grey water to drains while 15% allow the water to drain into open spaces.

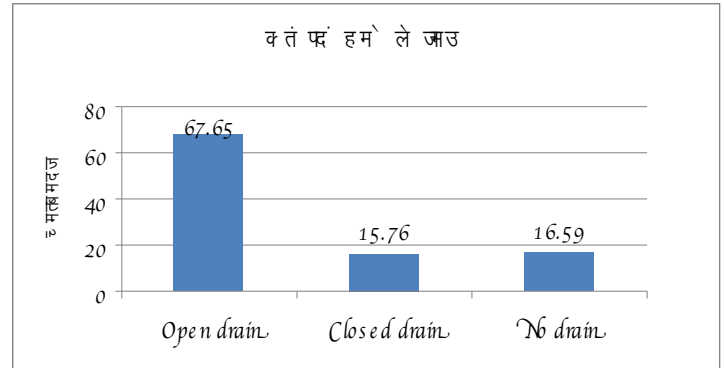
Disposal of Black water and Grey water



The town generates approximately 3.4 MLD of sewage (A decentralized approach to wastewater management for Doddaballapur city, 2009), and does not have an underground drainage system. All this sewage flows in drains along with storm water to three major sewage outlets of the town, all of which flow to fields in the outskirts¹⁴.

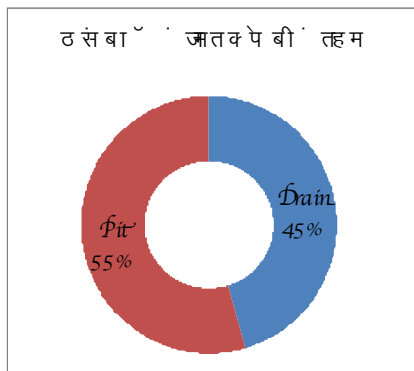
As of 2005, 16.5% of toilets were connected to drains. There is an increasing trend of connecting toilets to drains, which has increased by 28.5% over the span of 4 years and this trend is set to continue.

Discharge of untreated domestic/municipal wastewater has resulted in contamination of 75 percent of all surface water across India (NUSP).



- Nearly half of the town discharges black water to drains, yet only 16% of households have closed drains; 68% households have open drains and 17% households do not have drains at all.

- 55% of households have toilets connected to pits, out of which 41% clean the pits once in 3 to 5 years, 22% clean it once in 6 to 10 years.



- 45% of toilets directly discharge its waste to drains, which do not have a constant flow. Hence the waste moves slowly as and when

Water from soak pits may reach groundwater or flow to nearby open spaces leading to pollution. In case of Doddaballapur, many of these sewage outflows are near bore wells with chances of water contamination being high (A decentralized approach to wastewater management for Doddaballapur city, 2009).

¹⁴ Conversation with Environmental Engineer, CMC, Doddaballapur

Waste Management in Households and Cottage Industries/Enterprise

Household Waste

According to Action Plan for Solid Waste Management, 2006, CMC, Doddaballapur

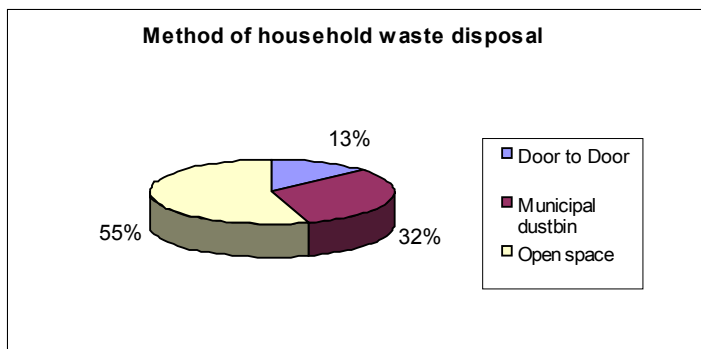
- The total waste generated in town is 38 tons/day, of which 22 tons gets transported to the landfill site, leaving 16 tons of waste undisposed.
- Waste generated by households is 20 tons/day, where each house generates approximately 1 kg of waste.
- The non slum households generate 1.2 kgs/day/household and slum households generate 0.8 kgs/day/household. Thus the slum community generates 33% less waste than the non slum community.

The study showed that on average household waste generation is 680 gms per day, 710 gms by non slum community and 650 gms by slum households. The difference in estimates may be due to the underestimation made by households on waste generated by them.

Waste thrown in kalyanis



Disposal methods adopted by households.



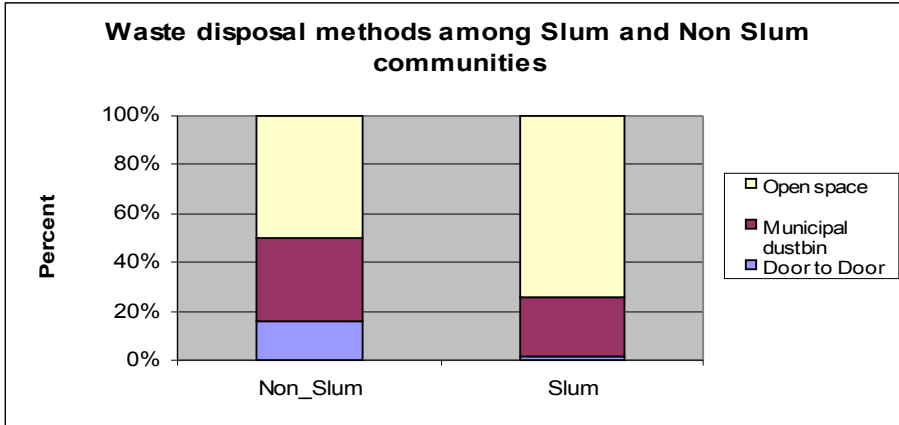
“We throw waste in open space. When there is excess we throw it in the dustbin”

“Where ever there is waste, we throw over there”

Disposal of waste in open spaces

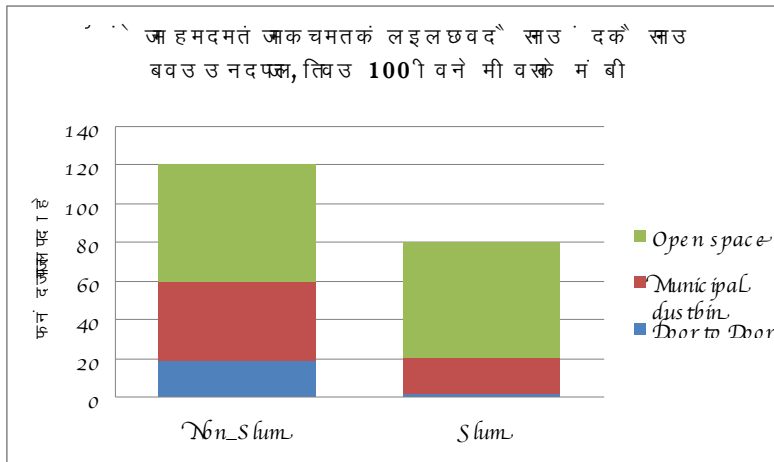


- Half of the respondents (55%) throw their waste in open space(vacant place, drains)
- 32% throw waste in municipal dustbins
- Only 13% give it for door to door collection, of which 2% is in slum community and 16% in non-slum community



“We throw waste in the 'Thippe' from which we get compost which is used in the fields”

Nearly 3/4th of the slum community throws its waste in open space, while it is nearly half in case of the non slum community. **But given that the slum community generates 33% less waste than the non slum community, both the communities will be disposing equal quantities¹⁵ of waste in open spaces.**

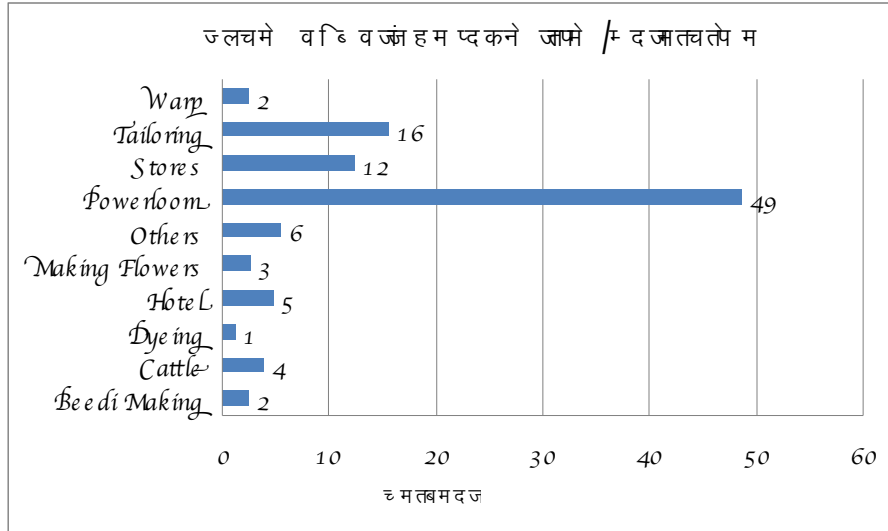


“When we throw waste in another persons' property, they fight with us. But still we throw there.”

¹⁵ 60 kgs per day for 100 households each of slum and non slum community

Cottage Industries/Enterprise (CI/E) and its Waste

- Cottage industries/enterprises were present in 25% (452) of households surveyed, with nearly half of them (49%) being power looms.
- Tailoring units formed 16% while 12% had stores (vegetables/condiments).
- 'Others' include - laundry, Barber shop, bangle selling and so on.

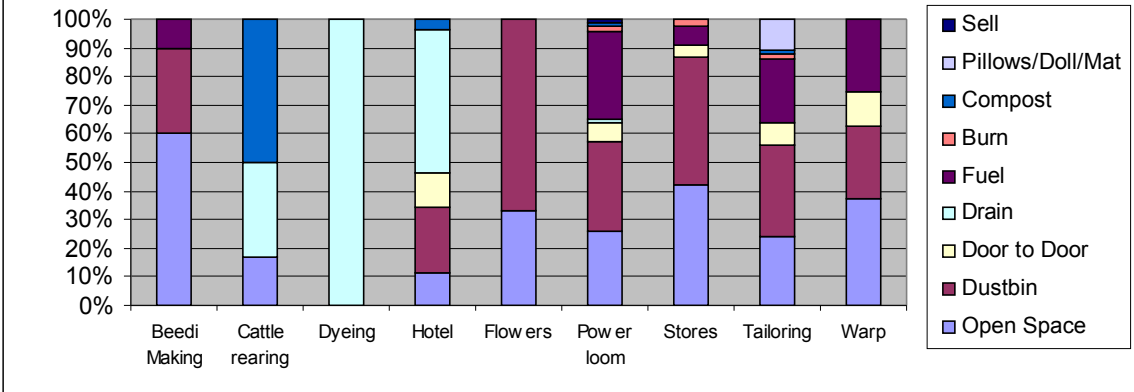


The table below shows types of waste generated by CI/E.

- Certain industries generate only solid waste (beedi making, flower making, power loom, stores, tailoring and warp), while industries/enterprises such as cattle rearing, dyeing and hotels generate solid as well as liquid waste.
- Most of the waste generated is biodegradable, except for plastic cups/sheet generated by stores, hotels.
- The only other waste which should be treated before disposal is the colored water released by dyeing units. The number of dyeing units in town have declined from approximately 80 to 50, over the years.

Type of CI/E	Waste generated
Beedi Making	Tobacco leaves, stick, thread
Cattle rearing	Cow dung, water, food, hay
Dyeing	Paper, Color water, Coal, thread, Rust
Hotel	Water, Banana leaf, thread, vegetables, food, paper, plastic cup/sheet
Flowers	Flower, thread, paper
Power loom	paper, thread, cloth, (silk), Rust
Stores	thread, paper, plastic cover, vegetable waste
Tailoring	cloth, thread, paper
Warp	paper, thread, plastic, rust

Waste disposal methods of Cottage Industries/Enterprise



There exists no system for disposal of waste from cottage industries/enterprises.

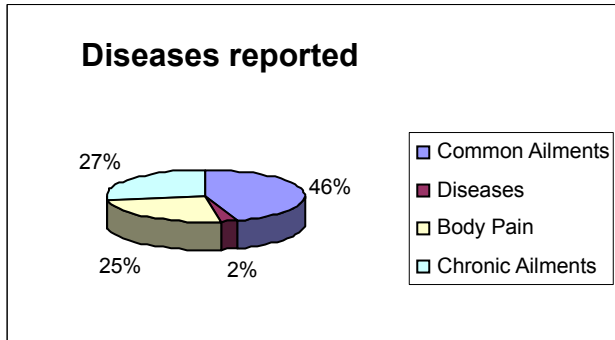
- Most of the CI/E's dispose their waste in open space, and dustbins, along with household waste.
- Composting is practiced mostly by cattle rearers.

- The industries which make use of water (cattle rearing, dyeing, hotel), let their water into the drains, especially in the case of dyeing units, which release untreated colored water.
- Those who use some of their waste as source of fuel include beedi making, power loom, stores, tailoring and warp.

Health Status of the Community

There was some hesitance by respondents to disclose information related to their health status as well as health expenditure. Of those that responded:

- 56% of households reported diseases, of which 3/4th reported only for adults, 17% reported only for children and 7% reported for both children and adults.

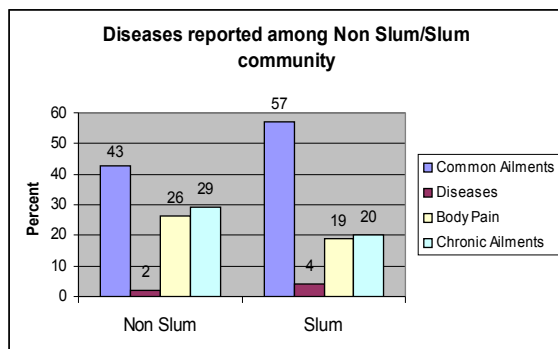


Common ailments - fever, cold, cough, dysentery, headache

Diseases – chikungunya, jaundice

Body pain – joint pain, knee pain

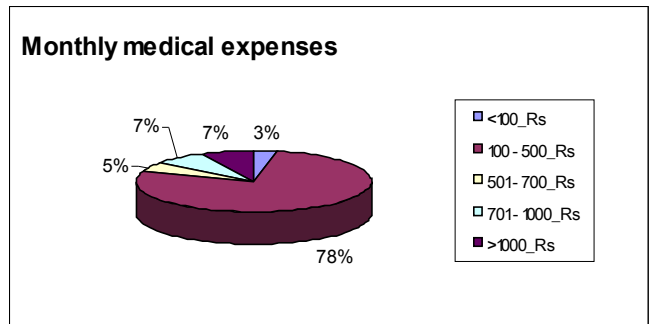
Chronic ailments - BP, Sugar, Heart Problem, Asthma, Eye sight



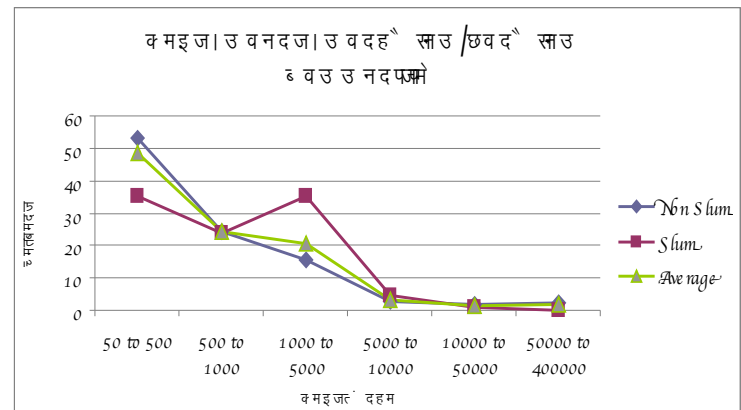
- The percent of common ailments¹⁶ was more among the slum community (57%) than non slum community (43%).
- 26% of non slum community reported body pain and it was 19% among slum community.

¹⁶ Some of the common ailments and diseases reported can be prevented by maintaining hygienic environmental conditions

Medical Expenses



- 78% of the households had monthly medical expenses between Rs. 100/- to 500/-



- 31% (509) of respondents borrowed money for medical expenses, out of which 48% borrowed Rs. 50 to 500/-, 24% borrowed 500 to 1000 and 21% borrowed 1000 to 5000/-.
- While 28% of non slum community borrows money, it is 40% among the slum community.
- In the range of Rs. 1000/- to Rs. 5000/-, percent who borrow for medical expenses, is more among the slum community

Medical expenses and poverty are linked, where yearly, across the globe, 150 million people spend half of their income on medical expenses, while another 100 million are said to slide into poverty due to medical expenses¹⁷.

¹⁷ World Health Organization, Medical costs push millions of people into poverty across the globe, 5th December 2005, <http://www.who.int/mediacentre/news/releases/2005/pr65/en/index.html>

B. Awareness and acceptability of the community regarding practices related to roof top rain water harvesting, eco-sanitation, garbage disposal and implications of unhygienic environment on health

Roof top Rain Water Harvesting (Rt RWH)

As noted earlier, Doddaballapur Town is entirely dependent on ground water and with increase in population, the sustainability of this dependency on ground water is questionable. The town receives on average, an annual rainfall of 800 mm, with harvestable capacity of 178400 liters of water over 40X60 area (A R Shivkumar, 2006). If 80% of households harvest rain water and 80% of rain water is harvested, 506.6 million liters of rain water can be harvested per year contributing 1.3 MLD. ***With the potable water requirement of 0.9 MLD (10 LPCD for a population of 95000), Rt RWH has the potential to meet the potable water requirement of the town and have some to spare.***

Roof top rain water harvesting at Doddaballapur



It is also worth noting that rain water is qualitatively better than deep ground water, as it is relatively free from impurities. It is slightly acidic and very low in dissolved minerals. Although high microbial concentrations are generally found in the first flush of rainwater, this reduces in subsequent flushes of rain water collected. Well designed rainwater harvesting systems can offer drinking water with very low health risk.¹⁸

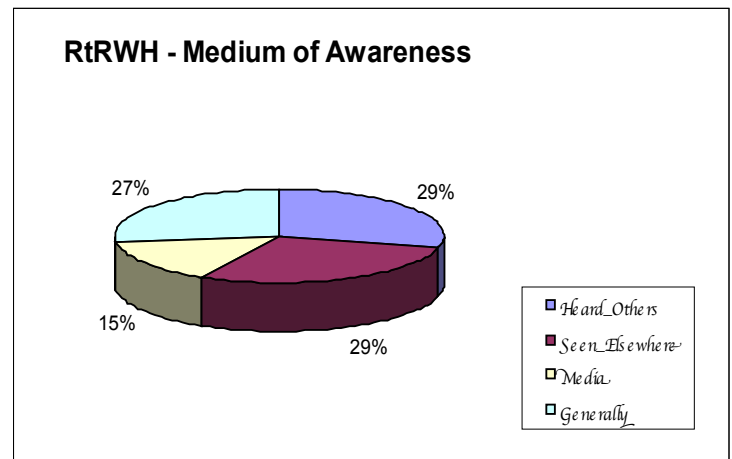
Awareness about Rt RWH

¹⁸ http://www.who.int/water_sanitation_health/gdwqrevis ion/rainwater.pdf ; World Health Organization

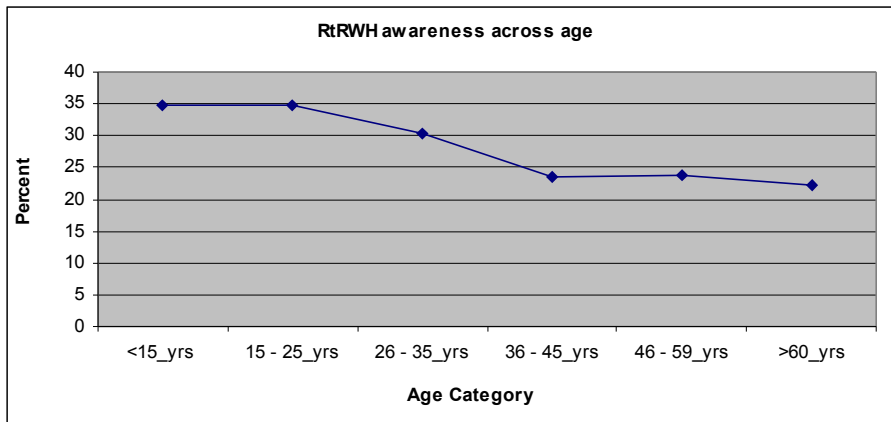
➤ Three in four (72%) of the respondents were not aware about Rooftop Rain Water Harvesting.

➤ Awareness was nearly the same among male (29%) and female (28%) respondents, but it varied across age and education level.

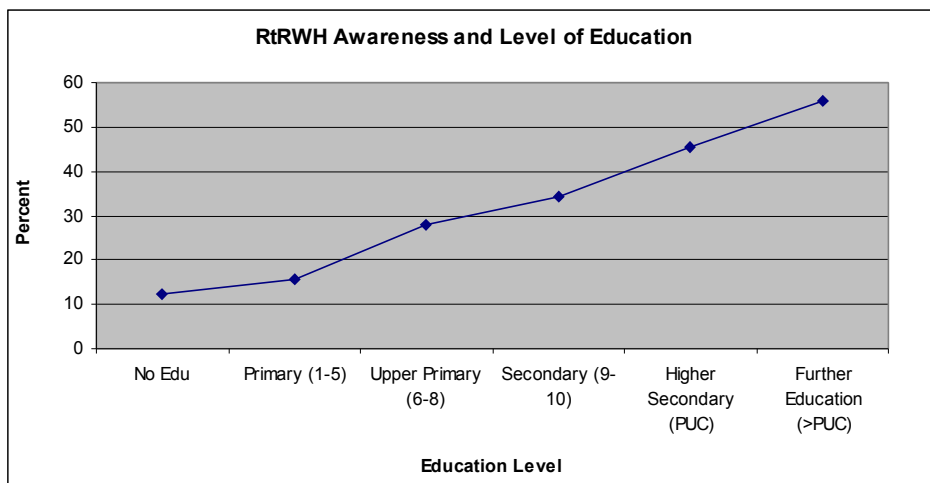
Medium of Awareness



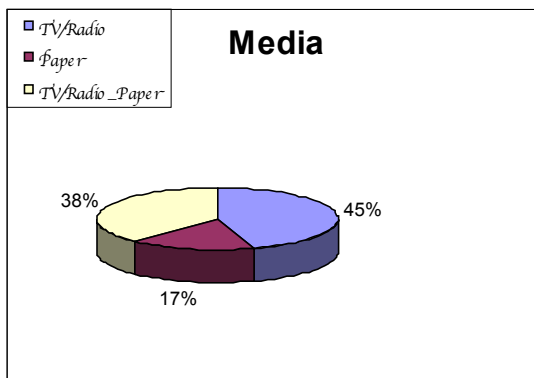
➤ Media accounts for only 15% of the awareness, while visual examples and word of mouth account for 29% each. 27% feel that Rt RWH is general knowledge.



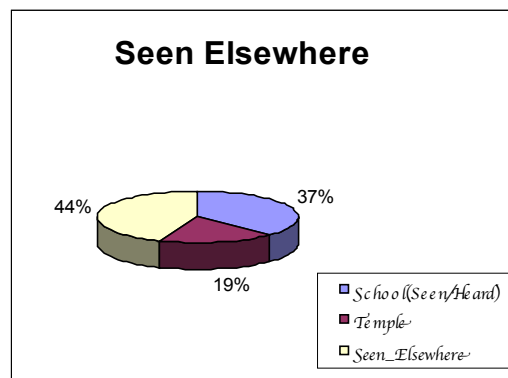
Percent of population who are aware about Rt RWH decreases as the age (category) increases



As the education level increases, the percent of population who are aware about Rt RWH also increases



In case of media, electronic media has a larger share (83%) than print media (62%).

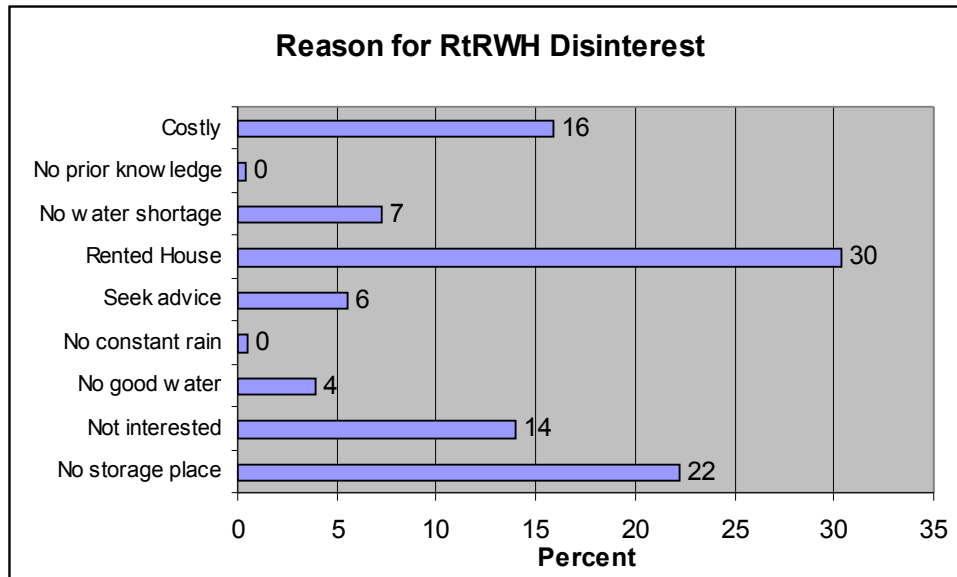


For visual examples, schools and temples serve as means of spreading awareness.

Interest / Disinterest in implementing Rt RWH

- A total of 430 (23.8%) respondents were interested in Rt RWH

Reasons why respondents were not interested in Rt RWH is depicted in the chart below:



- Majority of the respondents (30%) gave 'rented house' as a reason for not wanting Rt RWH structures. This was also reflected in the fact that there were more owners (17%) who had Rt RWH structures than tenants (11%).
- Owners were more interested (32%) in Rt RWH than tenants (12%).
- As seen in the chart above, storage space accounted for 22%, whilst 16% felt it would be expensive and 14% were just not interested.

Ecological Sanitation

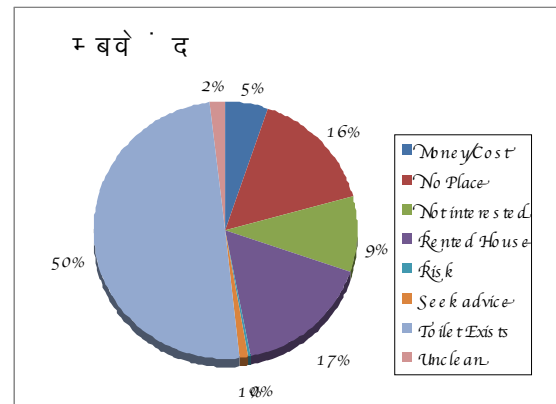
Ecological sanitation systems, are sustainable systems for disposal of human excreta and waste water, by way of which nutrients are recovered from excreta and waste water for reuse in agriculture. This helps to preserve soil fertility and safeguard long-term food security. Waste is not discharged in water bodies or surrounding environment, thus minimizing pollution of water resources¹⁹. Also, such systems require less water for maintenance and can be implemented in areas irrespective of high water tables, hard rock below the ground or any other conditions which prevent the construction of regular toilets²⁰.

Given the water scare situation of Doddaballapur, and the unhygienic disposal of waste, this model can help in not only addressing the problem of water scarcity but also that of safe disposal of waste, recovering the much needed valuable nutrients to be recycled in soil enrichment.

Eco sanitation model at Doddaballapur

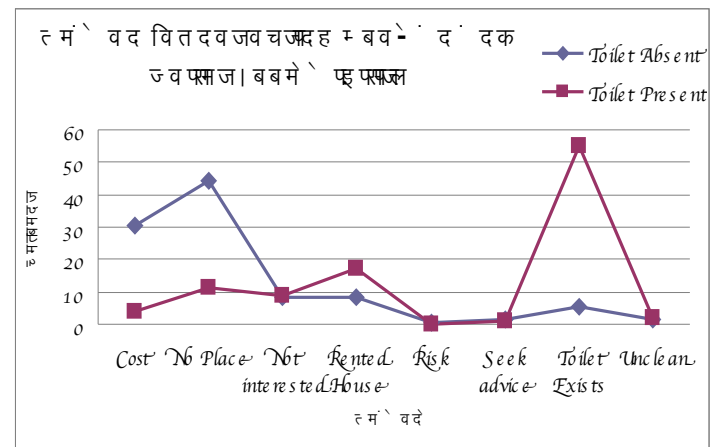


The town has four eco - san models implemented at schools, colleges and a community toilet. The study made attempts to seek communities acceptability of Eco-san. Students involved in data collection were oriented on Eco san model, who were then able to explain the concept to respondents (pamphlets were used) before taking their opinion.



➤ Though 15% of the respondents liked the concept of an eco – sanitation, 38% of them cited reasons as to why they would not adopt one. The reasons cited were similar to those who did not want to adopt eco – sanitation i.e they already have toilets.

➤ Half of the respondents did not want eco-sanitation as they already had toilets.



➤ Among those who have toilets, 55% did not want eco – sanitation as they already have toilets, while 11% said they had no place.

➤ Among those who do not have toilets, 44% said they had no place and 31% cited cost as the reason for not wanting to adopt eco-sanitation.

¹⁹ GTZ, Introduction to ecosan;

<http://www.gtz.de/en/themen/umwelt-infrastruktur/wasser/8524.htm>

²⁰ Composting Toilets – The Future of Sanitation;

<http://www.rainwaterclub.org/docs/composttoilet.pdf>

Waste management

Acceptance of Door to Door system

Doddaballapur municipality has introduced and implemented door to door system of waste collection in 15 wards, with a compulsion on households to pay Rs 10/- to Rs 15/- per month to waste collectors. But not all households accept this system nor do they approve of the payment. We used the survey to measure communities' acceptance of the door to door collection.

- Of those who do not follow the door to door system (1544), 80% are willing to pay money in the range of Rs 10/- to Rs 15/- per month. The same trend exists among the slum and non slum community as well.
- 70% of the respondents are willing to segregate their waste (25% among slum community).

Whilst there was a positive response on the willingness to pay as well as to segregate waste among the community, it remains to be seen how many will actually pay when they are asked. Even in wards where it is already in practice, not all households comply. Some of the reasons given by respondents for not adhering to this practice include:

“Earlier they (door to door garbage collectors) used to come for collection, but no one would give waste to them, as they would come late only after 7 o clock”

“We go to work at 6am, so we will not be there when they come to collect waste.”

“The door to door people also throw waste in the dustbin.”

Households not willing to pay money or segregate waste (256 respondents), were asked why they did not accept the system. The reasons given for not paying for the door to door system and some comments:

- ‘Dustbin is close by’ (28%)
- “Financial constraints” (20%)
- ‘We throw waste in open space’ (10%)

“Dust bin is close by and we throw it there. So why should we pay them.”

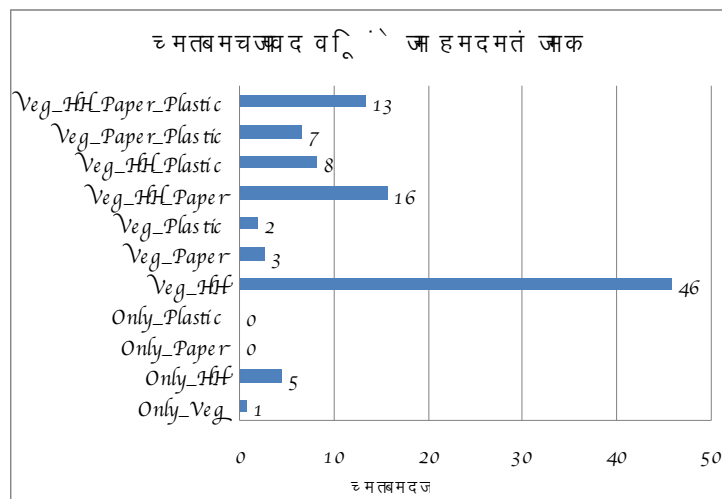
“We are poor people. We cant give money.”

“The municipality workers (drain cleaners) are doing that work for free. So why should we give money for door to door collectors”

Peoples' perception of types of waste generated

Source segregation is important for solid waste management, to optimize the availability of waste for composting or recycling. Hence peoples' perception of types of waste they generate will serve as an indication to the extent of awareness needed among the community regarding waste. People were asked 'what were the types/kind of waste generated by them', for which the response was:

- Nearly half of the households (46%) said their waste generated includes vegetable and household waste²¹.
- 16% said they generate vegetable, household and paper waste.
- 13% said they generate all types - vegetable, household, paper and plastic waste.
- Overall, only 30% of the respondents said their waste contained plastic and 39% of the respondents said their waste contained paper.



²¹ Household waste refers to dust obtained while sweeping

There appears to be a lack of consciousness amongst households on paper waste and non-biodegradable plastic waste, electronic waste, and bio-medical waste generated. Not only is the awareness of plastic generation less, its implications on environment is not known. Only few respondents mentioned not using plastic as a way of keeping the surroundings clean, with many considering burning plastic and other waste as a way of keeping the surroundings clean. *"We burn waste paper and plastic, pull out weeds"* commented a respondent.

Reasons for not willing to segregate:

- Lack of time to segregate - 56%
- Not interested - 20%
- Segregation is impossible - 7%

There exists a wrong assumption that waste segregation is time consuming.

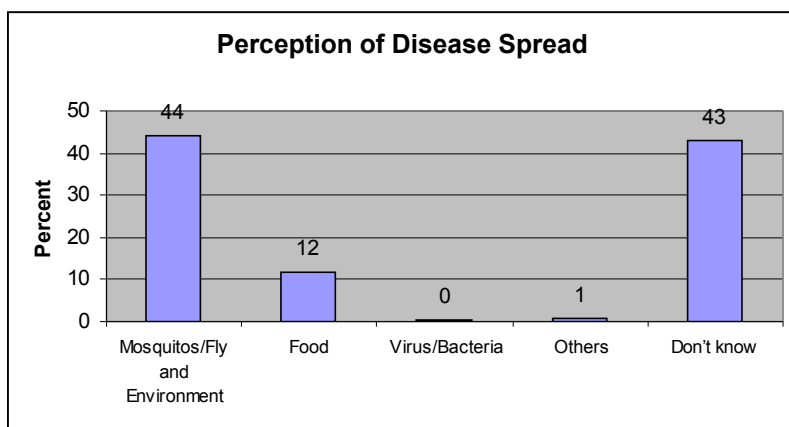
"I don't have time to segregate waste as I have to go for work"

"Not interested. We throw it in the drain and it flows along with the water."

Peoples' perception of implications of unhygienic environment on health

The perception of people regarding spread of diseases, was grouped under 4 categories as shown in the table below.

Category	Perception of People
Mosquitoes/Fly and Environment	mosquitoes, fly, polluted environment, drains, drinking contaminated water, improper waste disposal, absence of toilets
Food	having excess food, oily food, turmeric, contaminated food, non-vegetarian food
Virus/Bacteria	Virus/Bacteria
Others	change of weather, no vaccination for children, body heat



"Drain in front of the house causes mosquitoes and fly to increase, which spread diseases"

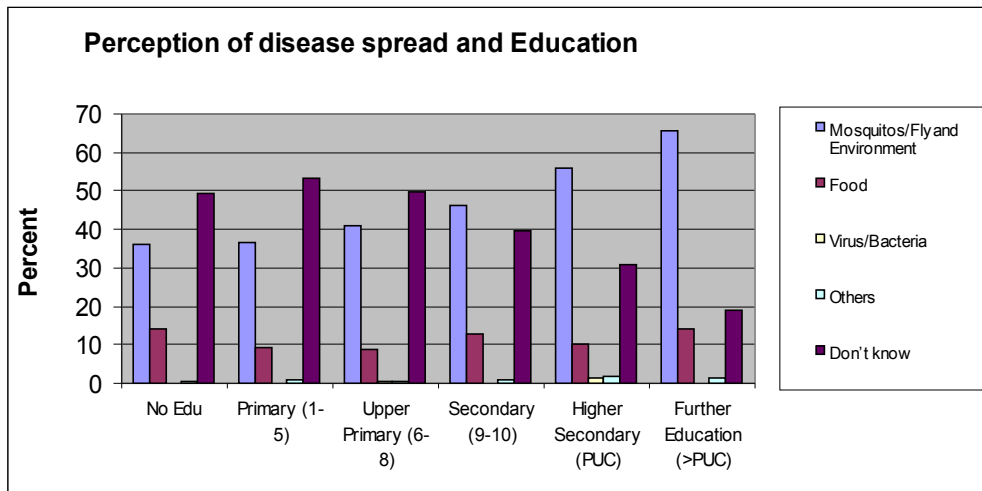
"Eating fried food and non-veg"

➤ While 44% thought diseases spread because of mosquitoes and environment, 43% did not know the reason, and 12% related it to food.

➤ Some had wrong assumptions such as having excess of turmeric in food or eating

excess non vegetarian food was the cause for jaundice.

➤ As the level of education increases, the percentage who relate diseases to mosquitoes/fly and environment increases while the percent who do not know the reason for spread decreases.



“Excess turmeric in food causes jaundice”

“When water stagnates in the drain, mosquitoes increase and we get diseases”

Though half of the respondents did not relate environment and health, most of them had taken up sweeping and growing plants as steps for keeping surroundings clean.

- Some removed parthenium/weeds, cleaned drains with water (and bleaching powder) to prevent stagnation, did not throw waste in front of homes (but threw it at places away from their homes irrespective of whether it is open space or dustbin)

Though households were hesitant to pay for door to door system of waste collection, there were few households who were ready to pay drain cleaners for getting their drains and surroundings clean.

All of the above activities are **indicative** steps taken to keep only immediate surroundings clean, without considering the environment in **its** entirety. This view was expressed only by few people, where they said that keeping the surroundings clean was not an individuals' effort, but it had to be a combined effort by the community.

“We don't clean because if we clean, others pollute the place”.

“That is municipality's job, that's not our job”

While some respondents said they did not have time to keep their surroundings clean, others strongly believed that the municipality was responsible for cleanliness.

Conclusion and Recommendations

Doddaballapur, a growing peri-urban town with a population of 95000 and growing, availability and accessibility of water; adequate sanitation and solid waste management remains key concerns for citizens and the Municipality, despite their efforts under various central government schemes including National Project for Repair, Renovation and Restoration of Water Bodies (NPRRR), Total sanitation campaign and the CMC's planned piped water supply project to bring water from Jakkala Madagu reservoir, near Chikkaballapur.

A 50 per cent deficit in the towns' water requirement and ground water depleted to depths of nearly 800 ft; 85 per cent of households with toilet facility, the town lacks a proper sanitation system. Open defecation is common particularly among slum dwellers. Raw sewage is left in storm drains on the door steps or drains out into the open spaces. The town generates 38 tons of solid waste per day, 42 per cent dumped in the towns open spaces and traditional water sanctums.

The issue of inequity continues with wide disparity in provision of basic facilities and health concerns between the slum and non slum community in: availability and accessibility to potable water (twice as likely not to have access to domestic connections than non slum dwellers), consumption of water, sanitation facility (less than half - 42% percent have access to private toilets), waste collection (despite generating 33 per cent less waste only 2 percent have door to door collection).

In the face of such facts, the problem is acute. The town has little option but to consider and explore alternate sources of water, and protect existing water sources to help meet current needs and ensure future sustainability. Ensuring the rights of all citizens to water, sanitation and clean environment is a challenge and requires an integrated approach based on rights and responsibilities of the public, the private, citizens, voluntary/community based organizations and the governance of its delivery.

With the growing understanding in India on water conservation, water harvesting techniques, and regulatory framework, Doddaballapur citizens and Municipality can do much in securing their rights and responsibilities. Building on traditional knowledge and structures already in existence, with small effort and investment in rejuvenation and protecting local water bodies such as tanks wells and sanctums, as well as constructing roof top rain

water harvesting systems, the citizens and Municipality can strengthen and secure accessibility, availability and affordability of water for all.

Discussion on water and sanitation situation of the town with key players to include municipal staff, councilors, ex-councilors, community representatives, media and community based organizations, confirmed and reinstated the reports findings on the water, sanitation and waste situation in Doddaballapur Town. The quantity and quality of water were discussed, rain water harvesting as an alternate source and solid waste management were linked to a broad consensus that actions needs to be taken to strengthen water and environment security in the town.

The triangulation with a cross section of the community and elected representatives, current government policy formulations and thinking and drawing inferences from experiences of towns and cities elsewhere in India have helped formulate recommendations that should help provide comprehensive, participative, scientific and cost effective solutions to the challenges faced. It is hoped that these recommendations of the study would enable the CMC (the key stakeholder vested with the responsibility of governance pertaining to civic services of water supply, sanitation, solid waste management) in collaborating with the community and civil society organizations in providing sustainable solutions to the issues of drinking water, sanitation and solid waste management.

Key recommendations

Water Supply Management Vision

1. Develop a long term comprehensive policy and plan to meet the water needs of the town factoring in:
 - a. the capacity of water sources – surface water, ground water, rainwater and treated water
 - b. Current availability and reliability from these sources as well as their original potential/designed capacities.
 - c. Desirability of relying on surface water and rainwater harvesting as a midterm to long term solution.

- d. Proactive and preventive conservation and protective measures implemented to prevent further deterioration and help reclaim, revitalize, protect and maintain both existing defunct sources and harness new sources.

Protecting and revitalizing water sources

The State Water Policy, 2002 section 6.16 and 6.19 states, **“A River, Stream and Tank Bed Authority will be established to remove and prevent encroachments and prevent the occurrence of man made floods; “Periodical reassessment of the groundwater potential on a scientific basis will be undertaken. Exploitation of groundwater resources will be regulated so as not to exceed the recharge capabilities. Ground water recharge project will be formulated and implemented”.**

2. Take Immediate steps to identify, survey, clear encroachments, restore and protect (fence off) the Nagarkere tank and the surviving 8 Kalyanis (Water Sanctums) to enable these traditional water bodies to revert to its original role in significantly helping recharge ground water.
3. The Nagarakere tank should be revitalized and developed for multiple purposes to include:
 - a. Recreational purpose – park, walking, jogging, to meet a vital need of the current generation and importantly help build citizens and municipality ownership and responsibility in the care and maintenance of the tank.
 - b. Provide for a Tank Maintenance Committee, comprising of citizens, councilors and CMC staff, vested with the authority to oversee its care and maintenance.
 - c. Citizens/Users to be educated on responsible usage and maintenance of cleanliness through billboards with messages at strategic places in the park.
4. Declare all remaining Kalyanis as protected water body sites and consider regulation to enforce its continued protection with adequate budgetary allocation.
5. Educate and raise awareness on the historical and cultural value of town's Kalyanis (and

motivate communities to take responsibilities for its restoration, protection and maintenance).

6. Local Citizens Groups should be enabled (on the lines of the Tank Maintenance Committee above) with recognition, authority and resources to take care of its maintenance.
7. As a proactive measure to enable recharge of ground water:
 - a. All existing public bore wells should be provided with point recharge structures on priority with protection from waste disposal and surface contamination of the ground water aquifer.
 - b. Any new bore wells should have a point recharge and protection package with suitable budgetary provisions.
 - c. Monitor regularly ground water levels and water quality and take proactive measures for regulating water use.
 - d. Enforce The Karnataka Ground Water (Regulation For Protection of Sources of Drinking Water) Act, 1999, to monitor ground water usage in terms of bore well being used/dug by private parties such as tankers and households, to prevent exploitation of ground water.
8. The town has the advantage of being close to the River Arkavathi with Nagarkere tank being directly fed by the cascading tank system upstream. Considering that rainwater harvested in surface water bodies and river systems is a long term sustainable solution for water supply to Doddaballapur town, it is important that CMC, Minor Irrigation Department and the Lake Development Authority work in tandem to rejuvenate Arkavathi River with participation of communities in and around town, these upstream and downstream villages.

Alternative water sources

The State Water Policy, 2002 section 6.21 states. **“Rainwater harvesting and water conservation will be encouraged. Conservation consciousness will be promoted through education, regulation incentives and disincentives”** The draft rainwater policy further states that: “RWH shall be made mandatory and will be introduced in phases in all areas covering the

Municipal and Planning boundaries”; the Urban Development Department shall facilitate the formation of a State level Advisory Committee, which will monitor the entire process of RWH implementation at the State level, the Svaraj Watsan study has clearly highlighted the potential of rainwater harvested from rooftops to meet the drinking water needs of the town population, with potable quality.

9. Using the policy framework guidelines and incentives (e.g suitable rebate on annual property tax) actively promote awareness and encourage households individually or collectively to opt for rooftop rainwater harvesting as a necessary solution, to meet drinking water needs.
10. CMC should consider providing tax rebate on materials used in rooftop rainwater harvesting through pre designated suppliers, similar to the recent proposal made by Bangalore Water Supply and Sewerage Board (BWSSB) for relaxation of Value Added Tax (VAT) for RWH filters, a key component used in the installation of the RWH structures. The cost incurred in tax revenue lost, sales tax /octroi rebate and awareness programs can be potentially recovered in the reduced investment in the bigger capacity piped water supply system.
11. CMC should collaborate with Non Government Organizations/ Voluntary Organizations proactively in effectively promoting awareness covering the entire town.
12. Publish accessible information on government schemes, best practice and impact and disseminate to every household. Awards and recognitions could be used to encourage take up.
13. Recognize existing trained groups in installing roof top rainwater units in the town and utilize their professional services in future roof top rain water harvesting structures in the town.
14. As a long term solution, plans for treated water should be supplied through separate pipelines for the purpose of washing/cleaning, gardening in households and cottage industries. Citizens should be involved in discussions on the suitability of the method before finalizing action plans. Experiences and lessons from towns/cities who have adopted similar approach should be used and visits undertaken for first hand study and replication.

Water quality

The Indian drinking water standards are as per IS 10500: 1991, which states the desirable and maximum permissible limits for certain parameters such as Nitrate (desirable 50 mg/l), Fluoride (desirable: 1 mg/L; maximum permissible: 1.5 mg/l), total dissolved solids (desirable: 500mg/l; maximum permissible: 2000 mg/l).

The Karnataka Urban Drinking Water and Sanitation Policy, 2002 states that Urban Local Bodies (ULBs) are responsible for water supply and sewerage services, wherein The Government of Karnataka, will have the responsibility to monitor that ULBs provide quality services in accordance with the standards prescribed at the State level. The city municipal council admits to not being able to provide potable water of required standards, often mixing potable water which meets the standards with that which does not meet the required standards. It is therefore recommended that:

15. Periodic water testing of municipal water supply and sources for all essential parameters (mineral and bacteriological) be carried out and the results displayed for public knowledge and reference.
16. Quality regime and norms covering all essential parameters (mineral and bacteriological) and frequency of testing, display of results on tankers, should be stated and strictly enforced in private water tankers.
17. Preventive measures to address contamination at sources from open defecation, sewage disposal, solid waste disposal, industrial effluents, by way of an integrated policy approach and plans involving water, sanitation and solid waste management should be developed and implemented as a priority. Learning from best practices and adopt accordingly.

Sanitation

18. Proper maintenance of community toilets should be prioritized to encourage its use; prevent further health risks and open defecation.
19. Ensure the planned underground drainage system has wide coverage and adequate water supply to drain the sewage and if need be carry

out a feasibility study to critically analyse its workability given water scarcity in town.

20. Alternate methods for sewage treatment such as the decentralized sewage treatment could also be explored
 - a. The 1st phase of a underground drainage (UGD) with centralized sewage treatment and disposal system planned for Doddaballapur town should be integrated with adequate water supply and supplemented with other low cost 'DEWAT' based systems, learning from experiences of towns and cities in neighboring states (Maharashtra and Tamil Nadu) who have successfully adapted 'DEWAT' systems.
21. At household level, tests for ground water contamination from "soakage pits" should be carried to check the standard of this practice is hygienic given the space and the density.
22. Eco sanitation should be considered as key alternative model (in schools and offices) to help address water scarcity and soil contamination concerns in the town.
23. Encourage broader adoption of /switching to eco-san through education, awareness and incentives addressing the challenges of cost, space, availability of trained masons.

Solid Waste Management

The Municipal Solid Wastes (Management and Handling) Rules, 2000 (Schedule II) specifies house to house collection of municipal waste along with segregation to be practiced by CMCs/Municipalities for effective waste management; that waste should be processed before disposal, where biodegradable waste should be composted and mixed waste containing recoverable resources recycled, reducing the burden on landfill sites.

24. At **household level** strengthen and expand the existing door to door collection system to include:
 - a. Enforcing the Municipal Solid Wastes (Management and Handling) Rules, 2000 in spirit and in practice to include house to house collection, segregation and management and scale up the practice. The CMC should immediately facilitate meetings among the different players and

resolve issues which hinder the implementation of this system.

- b. Raising awareness through education on the types of waste generated and importance of adequate waste management and disposal as well as reducing and recycling as much waste as possible.
 - c. Explaining the role and responsibility on the governance of waste management in the town as per regulations.
25. At cottage industries/enterprises **(CI/E) level**
- a. Extend door to door collection along with segregation of waste.
 - b. Ensure treatment of colored water from the dyeing units before disposing.
 - c. Study and understand the impact of waste water from dyeing units on the planned sewage treatment plant in the town.
26. At **town level**

- a. Develop and implement effective awareness programmes to raise citizens consciousness on their responsibility for waste management leading to behavioral changes in reducing and recycling the waste.
- b. Reduce and or ban the use of polythene covers as per Plastics (Manufacture, Usage and Waste Management) Rules, 2009 Draft Notification.
- c. Promote and support (financial, infrastructure and technical) for socio-micro enterprise on solid waste management run and managed by Self Help Groups enabling local women's livelihood opportunities. Learn from practices in Vellore in Tamil Nadu and other villages in handling waste; Waste management groups like 'MASS' in Doddaballapur town with the help and support of Svaraj and CMC have successfully demonstrated the potential and efficacy of the approach of producing vermicompost from decomposable wet waste on a pilot basis. It is important that the CMC recognize, encourage and actively

promote this concept to cover the entire town.

- d. Encourage handling of waste at source (households, hostels, community halls) composting and providing incentives for the same. "Yes in my back yard"
- e. Ensure waste gets dumped at the designated locations, and prevent waste getting dumped at places close to water sources, to prevent pollution of the water sources.
- f. Adopt innovative and environment friendly technologies for handling waste generated at the town level.
- g. Monitor water quality and air quality in the vicinity of the landfill and adopt required measures at the landfill to prevent pollution, as per Schedule III (22 to 29) of Municipal Solid Wastes (Management and Handling) Rules, 2000.
- h. The CMC should implement and enforce Municipal Solid Wastes (Management and Handling) Rules, 2000 with participation of the community. Impose penalties on those who do not follow the system by fines or other appropriate means.

Environment, Health and Awareness

27. Maintain a hygienic environment for citizens and visitors to prevent spread of common ailments and diseases such as chikungunya and jaundice which account for half of the town's health problems.
28. Develop strategies to educate and raise awareness on the need for a clean environment, clean water and safe food for a healthy life in schools and colleges along with practical sessions related to environment, which will have long term implications in creation of responsible citizens.
29. Develop strategies and provide adequate support (monetary and technical) for building capacities of the community, community based organizations and institutions to help raise awareness, training, etc.

Issues of Equity

30. Ensure adequate provision (quantity and quality) for water, sanitation and waste collection for all irrespective of their dwelling.
31. Educate and raise awareness on dangers on health and local water supply from open defecation, along with daily maintenance of community toilets.
32. Explore and understand the real causes behind the poor maintenance of community toilets resulting in poor usage and ensure a body/cell takes responsibility to enforce maintenance providing the necessary capacity to deliver the services. Can be in collaboration with voluntary organisations.
33. Strategies for management of community toilets such as 'pay and use', mobile toilets or alternate methods to be developed.
34. Proper waste collection and disposal methods such as door to door system of collection or alternate arrangements such as placing dustbins at appropriate locations and daily disposal of waste should be made.

Planning and Governance

The stakeholder meeting clearly brought out the distance between government and community where government officials expressed lack of public co-operation as the reason for the "unsuccessful" implementation of schemes. The community and community based organizations felt there was lack of sharing of information and co-operation from government officials.

35. Take immediate steps to bridge the distance with more regular interaction between the municipality and community where the discussions should go beyond promises and blaming, and result in action plans being formulated and acted upon.
36. A three tier structure of governance, which brings together different players such as officials, experts, community and local organizations, focusing on development issues of the town in an integrated manner, should be formed to include:

a. A Steering committee at the town level, subcommittees at departmental level and ward committees at ward level to be formed with clearly defined roles and responsibilities of all members and holding regular meetings.

- **Ward committees** of community representatives, councilors, local organizations with a brief to ensure active community participation in addressing water, sanitation needs, waste management, as well as monitoring of water quality and quantity, protecting water bodies.
- **Department wise sub-committees** consists of CMC officials, independent experts from various fields, community representatives, ward committee representatives and local organizations, reporting to the steering committee and working in consultation with the community, through ward committees will provide advice and strategic planning implementation, monitoring, and evaluation of respective activities in the town.
- **Steering committee** consisting of members – CMC official, community/ward representative and an organization, from each subcommittee - to consider activities of the subcommittees in an integrated approach, and ensure timely support and co-operation among subcommittees.

b. Collective responsibility of the functioning of this committee to be taken up by a group of elected members of the steering committee.

37. Development plans for water, sanitation and other programmes to be made in consultation with the community, shared with the community with clarity on roles/responsibilities, incentives available and feedback obtained to ensure better participation and support for successful and sustainable programmes. The

subcommittees can play an important role in this.

38. Work towards the formation of '**Integrated Water Management**' cell within the local municipality with specific delegated responsibility for policy, plans budget and implementation of program; An **Interdepartmental government approach** to decision-making, combining different authorities with responsibility for managing the water resource and environment and operation of the supply of basic amenities for citizens of Doddaballapur to include:

- **Supply optimization**, including assessments of surface and groundwater supplies, water balances and wastewater reuse.
- **Demand management**, water use efficiency technologies, and decentralized water management authority.
- **Equitable access** to water resources through participatory and transparent management, including support for effective water users association, involvement of marginalized groups, and consideration of gender issues.
- **Improved policy, regulatory and institutional frameworks**, such as the enforcement of government policies on drinking water and adequate sanitation for community, implementation of pollution regulations, water quality norms and standards.

The intended impact should be a comprehensive model of 'Integrated Water Management' to assure safe, adequate and affordable drinking water for all; increase in surface water and ground water recharge; safe and adequate sanitation system for all; waste management with income generating enterprise managed by local self help groups. **Leading to a model that provides for efficient, equitable and sustainable development (economic, social and environmental) and management of basic amenities - water, sanitation and healthy environment, dealing with competing demands of a growing town like Doddaballapur.**

Water

	Potable Water	Non Potable Water (Washing vessels, clothes, bathroom)
14. Source of Water	Tap – Private / Public Bore well - Private / Public Well - Private / Public Tanker Others: _____	Tap – Private / Public Bore well - Private / Public Well - Private / Public Tanker Others: _____
15. Frequency of Collecting Water (in Days)		
16. Quantity of water consumed in a day		
17. Storage of Water	Vessels / Pots / Thotti Overhead Tank Sump Others: _____	Vessels / Pots / Thotti Overhead Tank Sump Others: _____

18. If drinking water is collected using pots:

Cost of one pot: _____
No. of pots collected per filling: _____

19. What is your perception of quality of drinking water:

20. Have you heard about rain water harvesting? Yes / No

If Yes,

Medium through which information was gathered: _____

Do you have rain water harvesting structure installed Yes / No

If Yes,

Since when has it been in use _____

What was the cost of installation _____

Has this made any difference to water availability or water quality?

Are there any difficulties in maintaining it?

If they do not have RtRWH,

Will you be willing to adopt this as an alternative water source for your house? Yes / No

If Yes,

Approximate Roof Size: _____

Contact No: _____
If no, reason for not being interested

Sanitation

21. Type of drain outside the house: Open drain
Closed drain
No drain

22. Toilet facility: Private
Shared
Community
Open defecation

If they do not have private toilet,
Reason for not having one:

(Explain concept of Eco-sanitation with help of handouts)

Are you willing to adopt Eco-sanitation as an alternate toilet model?
Yes / No

23. Toilet connected to: Septic tank / Soakage Pit / Public drain

If connected to Septic tank/ Soakage pit, how often is it emptied or maintained:

24. General waste water/ washing water is connected to: _____

Household Solid Waste

25. Household waste dumped at: Open space
Dustbin
Door to door collection

26. If door to door collection is already implemented,
What is the amount you pay: _____

Door to door collection along with segregation, helps in reducing waste and keeping the town clean. Upon introduction of door to door collection, a fee will be levied and segregation of waste at household level will be required.

27. If there is no door to door collection, Will you be willing to pay the fee for collection and disposal? Yes / No

28. Will you be willing to segregate waste at home? Yes / No

29. If not, why?

30. Frequency of waste disposal: _____

31. Amount of waste disposed each time it is dumped: _____

32. What are the different kinds of waste generated at your home?

Health

33. What are the frequently occurring diseases in your household and who is affected the most? E.g: Dysentery, Joint Pain, Stones

Sl. No	Name	Age	Diseases

34. If they mention diseases like dysentery, jaundice, and other water borne diseases, Why do you think you get the above mentioned diseases:

Other details:

35. What is the approximate medical expenses: Monthly - _____
Annually - _____

36. Have you ever borrowed money for medical expenses? Yes / No

If Yes, What is the approximate amount? _____

Cottage Industry/Enterprise Waste

37. Is there any cottage industry / enterprise in your house? Yes / No

If yes:

Type of industry: Powerloom
Dyeing
Hotel
Others _____

Source of water for the industry: _____

Amount of water required per day: _____

Type of effluents released or solid waste generated:

Amount of effluents discharged/solid waste generated everyday: _____

Method adopted for discharging effluents/solid waste:

38. What steps are you willing to take up to keep your surroundings clean? (solid waste and sanitation)

Observations if any (description of surroundings – presence of garbage heaps, open defecation, proximity of drains):

Signature of Respondent

Signature of Interviewer

Annexure 2 Sampling

Ward No.	Ward Name	Non Slum HH	Slum HH	Total
1	Someshwara Ext.	82	3	85
2	Gangadarapura	119	9	128
3	D Cross	45	3	48
4	Vinayakanagara	23	23	46
5	Siddanayakanahalli	47	13	60
6	Khasbagh	74	48	122
7	Dargapura	15	16	31
8	Vannigarapet	48	0	48
9	Sanjaynagara	56	65	121
10	Veerabhadranapalya	45	57	102
11	Karenahalli	129	9	138
12	Kanakadasanagara	64	0	64
13	Bhuvaneshwari Nagara	61	0	61
14	Naige Beedhi	36	0	36
15	Chowdeswri beedhi	35	0	35
16	Kalasipalya	42	0	42
17	Kallu pete	48	0	48
18	Kuchappanapete	27	0	27
19	Devarajanagar	38	0	38
20	Pinjarabeedhi (Dargha Mohalla)	74	0	74
21	Hemavatipete	50	0	50
22	Nagartharapete	22	0	22
23	Chickpete	33	0	33
24	Vyasara beedhi	40	0	40
25	Yelepete	46	6	52
26	Kumbarapet	15	4	19
27	Rojipura	15	4	19
28	Ganigarapete	48	0	48
29	Vaddarapet	11	45	56
30	Shantinagar	55	0	55
31	Muthyalamma Gudi	24	28	52
Total		1467	333	1800

Annexure 3**Caste Category**

General	OBC (from Central List of Other Backward Classes-Karnataka; http://ncbc.nic.in/backward-classes/karnataka.html)	SC	ST
Naidu Vokkaliga Gowda Bunts Veerashaiva Lingayat Brahmins Shetty_Vaishyas Marati Pattegar Gangatigararu Reddy Patel	Devanga Banijiga Ediga Madiwala Kumbara Ganiga Kuruba Darji Vaalmiki Vishwakarma Acharya Padmasale Thogata Golla Rajput Thigala Kshathriya Vannikula Uppara Bestaru Bajanthri	Maadiga Voddaru Lambani Bovi	Nayakru

Annexure 4

Water Quality

Indian drinking water standards are as per IS 10500: 1991, which states the desirable and maximum permissible limits for certain parameters, shown below

WATER QUALITY PARAMETERS AND DRINKING WATER STANDARDS				
Sl. No.	Parameters	Units	Drinking Water IS: 10500 - 1991	
			Desirable	Maximum
1	Colour	Hazen units	5	25
2	Odour	-	Unobjectionable	-
3	Taste	-	Agreeable	-
4	Turbidity	NTU	5	10
5	pH value	-	6.5 to 8.5	No relaxation
6	Total hardness (as CaCO ₃)	mg/l	300	600
7	Iron	mg/l	0.3	1
8	Chlorides	mg/l	250	1000
9	Residual, free Chlorine	mg/l	0.2	-
10	Dissolved Solids	mg/l	500	2000
11	Calcium	mg/l	75	200
12	Copper	mg/l	0.05	1.5
13	Manganese	mg/l	0.1	0.3
14	Sulphate	mg/l	200	400
15	Nitrate	mg/l	50	No relaxation
16	Fluoride	mg/l	1	1.5
17	Phenolic compounds	mg/l	0.001	0.002
18	Mercury	mg/l	0.001	No relaxation
19	Cadmium	mg/l	0.01	No relaxation
20	Selenium	mg/l	0.01	No relaxation
21	Arsenic	mg/l	0.05	No relaxation
22	Cyanide	mg/l	0.05	No relaxation
23	Lead	mg/l	0.05	No relaxation
24	Zinc	mg/l	5	15
25	Anionic detergents	mg/l	0.2	1
26	Chromium	mg/l	0.05	No relaxation
27	Polynuclear aromatic Hydrocarbons	mg/l	-	-
28	Mineral oil	mg/l	0.01	0.03
29	Pesticides	mg/l	Absent	0.001
30	Radioactive materials			
	(a) Alpha emitters	Bq/l	-	0.1
	(b) Beta emitters	Pci/l	-	0.037
31	Alkalinity	mg/l	200	600
32	Aluminium	mg/l	0.03	0.2
33	Boron	mg/l	1	5

The effect of excessive chemicals is shown below

Chemical Quality	Disease Caused
Nitrate more than 45 mg/litre	Depression
Fluoride more than 1.4 mg/litre	Fluorosis
Sulphate more than 200 mg/litre	Diarrhoea
Arsenic-lead and Chromium-more than 0.05 mg/litre	Skin diseases
Iron more than 1 mg/litre	Diarrhoea

Drinking fluoride contaminated water or consuming food cooked in fluoride water for a long time results dental and skeletal fluorosis, which damages teeth and bones. Rain water can act as an alternative in this case. Nitrate contamination is harmful for babies, and the solution for dealing with this is to prevent source contamination from sewage and water from agricultural fields. Bacterial contamination of water may be due to defecation near water sources, not washing hands, not covering drinking water sources. At household level, boiling water for a minute will help, and at town level chlorination should be undertaken.(Ashwas, 2008-09)

Total Dissolved Solids: Total dissolved solids (TDS) test is used to determine the general quality of water (Total Dissolved Solids, Wilkes University). It measures the inorganic salts and small amounts of organic matter present in solution in water. The principal constituents are usually calcium, magnesium, sodium, and potassium cations and carbonate, hydrogencarbonate, chloride, sulfate, and nitrate anions. TDS in water supplies originate from natural sources, sewage, urban and agricultural run-off, and industrial wastewater.²²TDS test does not provide an insight into the specific water quality issues, such as hardness, salty taste, or corrosiveness (Total Dissolved Solids, Wilkes University).

²² Total Dissolved Solids in Drinking Water, Background document for development of WHO Guidelines for Drinking-water Quality, WHO 2003 http://www.who.int/water_sanitation_health/dwq/chemicals/tds.pdf; Accessed on 14th December, 2009

Annexure 5 - List of Policies/Legislations related to Water and Sanitation

National Water Policy 2002. Available at: <http://www.nih.ernet.in/belgaum/NWP.html>

National Urban Sanitation Policy, 2008, Ministry of Urban Development, Government of India Available at: <http://indiasanitationportal.org/resources/policies/nusb.pdf>

Guidelines – Central Rural Sanitation Programme, Total Sanitation Campaign, Department of Drinking Water Supply, Ministry of Rural Development, Government of India, December 2007 Available at: <http://www.ddws.nic.in/NewTSCGuideline.doc>

Municipal Solid Wastes (Management and Handling) Rules, 2000 Available at: <http://envfor.nic.in/legis/hsm/mswmhr.html>

National Environment Policy, 2006, Ministry of Environment and Forests, Government of India Available at: <http://moef.nic.in/downloads/about-the-ministry/introduction-nep2006e.pdf>

State Water Policy 2002, Water Resources Department, Government of Karnataka Available at: www.ielrc.org/content/e0205.pdf

Karnataka Urban Drinking Water and Sanitation Policy, 2002 Available at: www.ielrc.org/content/e0213.pdf

Karnataka Municipal Corporations (Water Supply) Rules, 2004 Available at: www.ielrc.org/content/e0404.pdf

Rajiv Gandhi National Drinking Water Mission, National Rural Drinking Water Programme, Framework for Implementation 2009-2012, Movement Towards Ensuring People's Drinking Water Security in Rural India, Department of Drinking Water Supply, Ministry of Rural Development, Government of India Available at: http://www.ddws.nic.in/popups/RuralDrinkingWater_2ndApril.pdf

Water Quality Parameters and Drinking Water Standards, IS: 10500 – 1991 Available at: http://www.groundwatertnpwd.org.in/bis_std.pdf

The Karnataka Ground Water (Regulation for Protection of Sources of Drinking Water) Act, 1999; Available at: [http://dpal.kar.nic.in/pdf_files/44%20of%202003%20\(E\).pdf](http://dpal.kar.nic.in/pdf_files/44%20of%202003%20(E).pdf)

Plastics (Manufacture, Usage and Waste Management) Rules, 2009; MINISTRY OF ENVIRONMENT AND FORESTS – NOTIFICATION, New Delhi, the 17th September, 2009 <http://www.fhrai.com/Broadcast/environment.doc>

References

Action Plan for Solid Waste Management, 2006, City Municipal Council, Doddaballapur

A decentralized approach to wastewater management for Doddaballapur city, Alchemy Urban System Pvt Ltd. Bangalore and Integrated Support to Sustainable Urban Environment, WASTE Netherlands, 2009

Ashwas – A Survey of Household Water and Sanitation; 2008-09, Karnataka, Arghyam

A R Shivkumar, Amruta Varshini “Male Neerina Suggi – Vondu Maargadarshi” Department of Rural Development and Panchayat Raj; Karnataka State Science and Technology, 2006

National Urban Sanitation Policy, Ministry of Urban Development, Government of India; Available at: <http://indiasanitationportal.org/resources/policies/nusb.pdf>

Reproductive and Child Health, District Level Household Survey 2002-04, Karnataka

Total Dissolved Solids, Wilkes University, Centre for Environmental Quality Environmental Engineering and Earth Sciences; <http://www.water-research.net/totaldissolvedsolids.htm> ; Accessed on 14th December, 2009

Total Dissolved Solids in Drinking Water, Background document for development of WHO Guidelines for Drinking-water Quality, WHO 2003 http://www.who.int/water_sanitation_health/dwq/chemicals/tds.pdf; Accessed on 14th December, 2009

Glossary

Cottage Industry/Enterprise: Any income generating activity within the house

ppm: ppm is the weight of dissolved material in 1 million equal weights of solution (that is, milligrams per kilogram)

Black water: waste water from the toilet

Grey water: Waste water (laundry, kitchen, bath) except toilet waste

Millennium Development Goals: The Millennium Development Goals (MDGs) are eight goals to be achieved by 2015 that respond to the world's main development challenges. They are drawn from the actions and targets contained in the Millennium Declaration that was adopted by 189 nations-and signed by 147 heads of state and governments during the UN Millennium Summit in September 2000.²³

²³ United Nations Development Programme, Millennium Development Goals, <http://www.undp.org/mdg/basics.shtml>

Svaraj - The Society for Voluntary Action Revitalization and Justice (changing its name from Oxfam India society) is a registered society, established in 1978 and operates across India.

Our **vision** "A just society in a just environment"

Our **Mission** - To enable communities to take control of their destiny in the spirit of voluntarism, to organize and mobilize for collective action in the revitalization, protection and equitable distribution of natural resources in their pursuit of development

Our programmes:

- Mobilising and promoting collaborative action on protection, equitable and sustainable sharing of natural resources
- Mobilising resources and Supporting effective management of community based programmes
- Experiential learning, bridging technology, science and indigenous knowledge advocating for systemic changes
- Research and policy and practice advocacy for the right development for economic and social justice with environment sustainability
- Promoting community self-responsibility and citizenship through social and civic education, organisation, and action in the spirit of voluntarism
- Ensuring transparency and accountability to all our supporters

Svaraj believes working in partnership with community, supporting and building strategic relationship with groups, in the spirit of voluntarism, as an essential part of maintaining the countries economic, social and environmental well being



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