

Living on 30 litres a Day.

*Sustainable Water Consumption: Techniques and Knowledge
from a New Delhi Slum.*

By Samuel J. Millin



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Abbreviations.

- BSP: Bahujan Samaj Party.
- CPHEEO: Central Public Health and Environmental Engineering Organisation.
- CSE: Center for Science and the Environment.
- CSH: Centre de Sciences Humaines.
- DJB: Delhi Jal Board.
- DMC : Delhi Municipal Corporation.
- DO: Dissolved Oxygen.
- Ghd: Gallons per household daily.
- GoI: Government of India.
- GoNCTD: Government of the National Capital Territory of Delhi.
- IDWSSD: International Drinking Water Supply and Sanitation Decade.
- L: Litres.
- lpcd: litres per capita daily.
- MDG: Millennium Development Goals.
- NGO: Non Governmental Organisation.
- Rps: Indian Rupees.
- UNEP: United Nations Environment Programme.
- UP: Udder Pradesh.

1. Introduction.

To begin to explore urban household water consumption is a daunting task. No substance is more critical to every aspect of life on this planet and yet those of us who live in urban areas are increasingly removed from the water resources we depend upon. The methods by which we acquire our water and dispose of it after consumption are largely out of our control, however we are consuming more water in the home than ever before. We humans have a basic biological need of between two and four litres (L) of water each day, depending on the amount of calories we consume (Gleick, 1996).¹ Beyond this, it will be argued, the amount of water that we consume is determined by the complex mix of social structures, technology, and culture.

Fresh water is a renewable resource in the sense that through the water cycle, water evaporates as a vapor, forms into clouds and at a certain temperature, is deposited on the Earth once more as rain. As the human population increases, fresh water resources are becoming increasingly important. Coinciding with world population growth is a sharp increase over the last half century of urbanization. We are, for the first time, a predominantly urban species, preferring to live close to one another in cities rather than in rural areas. Those people choosing to live in cities require a concentration of resources, such as water, to sustain them. Cities, and the way they are designed to consume natural resources, are becoming increasingly similar. The tools through which consumption is facilitated are becoming standardized. Consumption of water in the household too is changing, becoming more standardized across the globe as ethno-historical methods and ideas about how water can be used, established in the Western urban tradition, meet the expectations of newly urbanizing populations of the South and East. The provision of water to this growing number of people will continue to provide

¹ The National Research Council of the National Academy of Sciences estimates that for every calorie of food consumed, between 1 and 1.5 milliliters of water is recommended.

enormous logistical challenges to administrative bodies charged with that task, as expectations surrounding water delivery and sanitation services shift and standardize and spread throughout society.

This thesis then, which has as its focus an unauthorized slum in South Delhi, ambitiously has two goals. The first will be to explore water consumption amongst households subject to conditions of poverty in an attempt to establish *how* water is used on a task by task basis, the second will be to attempt to identify the *determinants* of this consumption or *why* water is consumed in the way that it is. This thesis will argue that water consumption takes place at the nexus of social institutions, technology and culture, by which I mean the centralized administrative structures that we as groups empower to regulate and manage the distribution of water to homes in urban areas, the tools and appliances through which we consume that water, and how we value the outcomes of that consumption.

The thesis will examine theoretical ideas of consumption and attempt to reconcile these with the realities of life of the urban impoverished. This, it is hoped, will provide not only the specific attitudes and motivations behind water consumption, but also a practical account of how to survive in an urban setting when access to water is severely limited. The empirical focus of this study, as mentioned above, will be an unauthorized colony of illegal squatters in the South Delhi industrial area of Oklha, Phase 2, Sanjay Colony. The residents of Sanjay Colony use, on average, 29.64 litres per capita per day (lpcd) and so provide an opportunity to explore how people carry on their daily existence with relatively little water. The thesis will explore how people interact with water through a socio- technical paradigm that channels consumption decisions in specific directions. It will also examine how the residents of Sanjay Colony negotiate complex power structures which control the delivery of water, while satisfying their water needs. It is hoped that by exploring these facets of consumption the thesis will yield real insights into how to achieve sustainable water consumption in the home.

As Scott (1972), Gleik (1996), and Dimri & Sharma (2006) have shown, household level data relating to consumption patterns of slum dwellers is difficult to gather due to the challenges facing researchers in gathering this type of information. It is hoped this thesis will provide not only reliable data for later research to draw upon, but also analysis of consumption drivers and consumption decisions that can be applied in other settings.

Sanjay Colony provides an ideal setting for studying water consumption for two reasons. First, its residents use very little water and thus may be able to provide knowledge of water saving techniques and practices. Second, the settlement is located in a densely populated urban area, and thus can be compared with other high density urban populations.

Research Questions.

Positioning water as an essential resource to human life, my driving research question will be: **What are the determinants of water consumption in Sanjay Colony?**

The thesis will first position urban water use in a cultural historical setting, tracing the rise of contemporary attitudes toward water as an unlimited resource. It will examine how expectations have changed with changing technology and what the consequences of this have meant for water resources use in New Delhi. It will explore how consumption expectations are reconciled with limited resources by those who live in an urban slum in South Delhi. I feel it is important to understand how people act, what their preferences are and what technologies they employ when attempting to meet their consumption expectations, on less than 30 lpcd. By consumption expectations I mean that which is hoped to be achieved through consumption for example having clean clothes. I also feel it is vital when embarking on a project which encompasses elements as multi-disciplinary

as development studies, sociology, anthropology, politics and human rights, among others, that abstract theory must, at some point, be reconciled with practice and that is what I will attempt to do in with this thesis.

Theoretical approach.

As I delved more deeply into the water consumption practices of the residents of Sanjay Colony, several theoretical perspectives became apparently important. Shove's theories of standardization of attitudes (2003), Wilhite's theories of technological agency (2006), Wilks' theory that action is informed by cultural knowledge and restraints (2001) and Scott's theories of client-patron relationships (1972) in particular.

This thesis will employ an ethnographic approach to explore water consumption in the home. It is hoped that this approach will be able to reveal how water is valued and used, litre by litre, within complex social and technical regimes. It will examine taboos that have surrounded water and its uses and disposal which have shaped contemporary attitudes to its consumption and the outcomes of that consumption. It will examine the barriers to water security in Sanjay Colony and how the commodification of water creates powerful social and political institutions which directly affect consumption decisions. As a background to this, the paper will explore the realities of slum life and of living with severely limited access to resources, how standards are affected and how consumption decisions are constructed. Finally it will attempt to draw parallels between living in poverty and living sustainably.

Methodology.

Sanjay Colony, an illegal slum, lies in South Delhi, in the Oklha, Industrial Area Phase 2. Many of the original residents migrated to Delhi from neighboring provinces of Bihar, Rajasthan and Udder Pradesh (UP) in search of employment as unskilled laborers to work on construction projects leading up to the 1982 Asian Games. In the period approaching the Games, the city experienced an infrastructure boom which required low-cost labor and so unskilled factory workers who were working at the various small industries around the Oklha Industrial Area billeted family and friends from their home villages to work on short construction contracts. After these contracts expired, many stayed and found employment in the area and temporary homes for these workers were constructed close to these factories upon vacant public land. Sanjay Colony is now home to over 50,000 residents. The Delhi Municipal Council (DMC) runs one primary school to level IV, and the Non-Government Organization (NGO) Deepalaya, runs a secondary school until level VIII. There are numerous private healthcare options and a multitude of different professions. The average daily income per capita of the seventy households surveyed is less than USD\$1.

By employing both qualitative and quantitative data collection methods to obtain data on water use at the household level, this thesis will explore the reality of living with very little water on a litre by litre, task by task basis. The advantage of using qualitative techniques is that they are better equipped to explore things such as historical links between actions and attitudes, activity processes, and the specific context in which those processes are performed. That is, by being involved in water consumption as it happens, the researcher is able to better understand the *how* and *why* of household water consumption, two facets which are vital to this thesis. Quantitative techniques add ‘hard’ data to the more abstract evidence collected with qualitative data and were utilized through use of a questionnaire.

Ethnographic Fieldwork.

The fieldwork took place between the 2nd of September 2010 and the 14th of October 2010. Having travelled to Delhi prior to this research assignment I had been in contact with The Centre for Science and the Environment (CSE), located in Hamdad Nagar, about assistance with finding an interpreter and narrowing a research location from three possible sights I had identified. Due to the 2010 Commonwealth Games, which began on the 3rd of October however, many of the research staff at CSE was unable to assist me as they were taking time off to leave the city². I spent the first four days trying to organise a research assistant. Staying in Pahar Ganj, the main tourist bazaar opposite the New Delhi Railway Station, I soon found that there were a lot of options, interpreter wise. I sounded out a possible research assistant from Kashmir who had moved to Delhi from Sri Nagar to sell handicrafts and textiles, as local sectarian violence had destroyed the tourism industry upon which his family had depended on, another possible avenue for further research. This relationship did not work out however. Fortunately, through a contact I had made at the Centre de Sciences Humaines (CSH), Marie-Helen Zerah, a leading scholar on water supply in New Delhi, I was put in touch with a Dr. Shankara Gowda who assisted me in my research for the remainder of the period. Dr. Gowda, who has worked on various research projects of this nature throughout Delhi, had worked in Sanjay Colony before and having mentioned it to him he verified it as a suitable location. I expressed that the only prerequisite was a low per capita consumption of water. I felt

² New Delhi, despite huge infrastructure projects, of which some of my informants were involved, was unable to handle increases in traffic and congestion of public places that these games would cause and could perhaps present an avenue for further research on the benefits of Mega-Events for Mega-Cities in the developing world.

that people who consumed very little water would offer the opportunity to, not only study why they consumed so little but also how they consumed it and why they had so little to begin with.

Sanjay Colony is officially divided into nine blocks. This division seems, however to be predominantly for identification by vote hustlers and middle men, as houses commonly have as many as four addresses painted on their walls and residents are more often than not in some confusion as to the current 'number' of their home. I spent between three and four hours with the residents of Sanjay Colony each morning, first completing a series of survey questionnaires, then asking some follow-up, qualitative questions regarding their views on certain aspects of their water use and finally asking them to show me or tell me about a specific activity they performed using water, e.g. laundering, bathing, cooking or cleaning of the home. I was fortunate enough to stay for a 24 hour period with a family in the slum and so was able to fully experience the realities of living with a limited water supply. These experiences will be related in more ethnographic detail in chapters four and five. Topographically, Sanjay Colony is built in a slight depression; those homes located in the middle of the colony are located slightly lower than those closer to the perimeter. Both locations have advantages and disadvantages regarding water delivery. Those who live on the perimeter have less water pressure than those who live in the centre and thus must work for longer when drawing water from the public taps using hand pumps. The low water pressure of this higher ground is offset however by superior drainage during the monsoon months, when torrential rain pours through the lanes of Sanjay Colony, flooding houses and compromising low-lying taps.

The Questionnaire.

The questionnaire, which is attached in its final form in Appendix 1, was designed with the intention of providing statistical data on water use in the home. In order to calculate the water use in liters per capita daily (lpcd), a questionnaire was deemed the most suitable way of accessing the number of households needed to give sufficient legitimacy to my empirical observations. As Overton and Storey (2008:37) point out, quantitative techniques can be extremely helpful in providing ‘hard’ information, in this case information on liters of water used per day, family members per household, average monthly income per household and family water storage capacity. I have supplemented this with qualitative techniques of which I will go into in greater detail below. My research assistant and I spent the first two sessions testing the questionnaire with ten informants. I then altered several questions as I realized I had made assumptions that were not valid and was asking questions the answers of which I had little or no use for. I also added some questions which I thought may prove valuable at a later stage. My original plan was to use the questionnaire to identify households that were using very small amounts of water in lpcd and then return to these households at a later date for a more in-depth interview session. This did not prove realistic for two reasons. The first was that people could not commit to a later date or time due to various commitments. The second was actually locating the home again. Without street names and houses having multiple numbered addresses, locating people through neighbors based solely by name proved practically futile unless we managed to stumble upon the near vicinity of the home, then neighbors would lead us or point us in the right (sometimes wrong) direction. It was a very time consuming exercise and so was abandoned after the third day.

Once I began to get a picture of the average household water use, I was able to do some calculations on the spot and simply extend the interview with those households that I deemed useful to provide some more in-depth information on their water use. The sampling method chosen was what Leedy and Ormrod call ‘convenience

sampling' (2005:206). Convenience sampling, also known as accidental sampling, uses informant that are readily available. In this case we approached men and women who I could see sitting in their homes or performing water related chores in the *gali*³. Once the questionnaire survey was completed, I would extend the interview to include an informal discussion session. This second stage is known as purposive sampling as participants were chosen, on purpose, because they use a small amount of water in lpcd.

Given that I selected informants based initially on availability, it is reasonable to assume some level of bias. Informants who were employed on weekdays between the hours of 10am and 2pm or simply not at home when I called, were not given an opportunity to participate. I did not backtrack to seek out household members who were not available on previous days. Also, I did not interview households immediately next to or opposite each other. While in retrospect it may have been useful for the ethnographic section of this paper to focus on 5 households in one lane/ street however, to provide any meaningful data for the Colony as a whole, the techniques I used present a fairly representative sample.

The Interviews.

In-depth interviews were conducted with twelve heads of households, two local political representatives and 1 chief engineer employed by the Delhi Municipal Corporation (DMC) at the Oklha Pumping station, in an attempt to extract more qualitative data than solely a survey questionnaire. The aim was to extract information from all of the groups involved in water delivery, organization and use. Ideally I would have liked to interview drivers of the water tankers delivering water to Sanjay Colony but this proved impossible

³ Laneway, Alleyway.

as they were too busy working to give any meaningful interviews.

The completion of questionnaires and interviews were facilitated through my research assistant, Dr, Gowda, who translated and interpreted for both me and the interviewees and also proved to be a valuable informant regarding the role and structure of various official bodies related to water delivery to Sanjay Colony. There were some notable exceptions however of informants who spoke freely in excellent English during my overnight stay in the colony. The location of interviews with the heads of households generally took place inside the home or family courtyard. In these cases some immediate family members would often come and go, sometimes adding comments and elaborating on answers given by the interviewee. If the interviews were conducted outside however, neighbors would gather and answers would be discussed and it is reasonable to infer that hardships were amplified and local political issues brought up with more vehemence by individuals with particular neighborhood alliances.

The interviews with local politicians were conducted in the local offices within Sanjay Colony. These interviews were markedly different, as they took on a quasi official air and much more formal tone. Some questions were not or could not be answered according to party policy and those attending rarely interjected or disagreed with answers given by senior representatives. The interview conducted with the chief engineer occurred at the Oklha Pumping station itself and was confined mainly to technical aspects such as capacity of the station and verifying certain things relating to timings of flows as expressed by residents of Sanjay Colony. This interview however did yield interesting attitudinal information regarding the positioning of slum dwellers by an outsider located in an upper- middle income bracket, who pays income tax to fund public services (such as water provision) and also works to provide slum dwellers with water (who pay no water costs, through income tax or otherwise).

Interviews were conducted in a semi-structured, informal manner as much as possible in order to draw out information I was deliberately seeking but also to create threads by

which my informants could easily link other issues to those surrounding water availability in Sanjay Colony and their particular usage habits. I was trying to get at people's 'feelings and opinions', as O'Reilly recommends (2005:113), to get interviewees to tell me more generally of the holistic situation regarding water delivery and how this impacted on their consumption practices. I found that this worked well when interviewing the residents of Sanjay Colony as they had little inhibitions in talking to me after completing the survey questionnaire, however the more official respondents, who had not completed a survey, were somewhat guarded in some of their responses as they were initially suspicious of my intentions. My explanations that I was predominantly interested in *how* people managed to survive with such little water and *why* they consumed in the way that they did, rather than why they had so little water seemed less than probable to both the local political representatives and the employee of the DMC and all three informants strayed onto tangents of blame and responsibility regarding water delivery, misuse and jurisdiction. Although interviews of non-residents did not add to information on individual water use or the consumption techniques used, they did provide an important aspect of the research. Official attitudes to what is 'normal', 'clean' and 'hygienic' is an important element in constructing Sanjay Colony as a 'slum' and reinforcing ideas about how water should be used there as opposed to how it should be used in a non-slum area.

The Participatory Observation.

As Malinowski famously stressed, total immersion by the fieldworker in the lives of the people he or she is studying is a vital method of gaining relative information. While the emphasis of my fieldwork was to collect data and observe people using water for everyday tasks, I was unable to participate in what Pelto and Pelto call 'full immersion'

participant observation (1978:68). This was impossible for two reasons. The first being the time limitations of the masters program itself. Given that the research and writing period of this masters project is 12 months, to spend an extended period of time in Sanjay Colony, six months or more, as well as research and compile a thesis would be an unrealistic goal. The second was the difficulty in actually gaining access to the Colony itself. Although I was able to organize a 2x2 meter room for 24 hours, families were hesitant to billet me as they were concerned for both my health and safety. Also, local NGOs were anxious that I register with the local authorities, which I was hesitant to do for fear of further delays.

I was however, able to immerse myself in the daily water use activities of several households, adding legitimacy to data I had collected through my survey questionnaire. I was also able to experience a 'day in the life' of a slum dweller with access to only 30 lpcd, which I would not have otherwise been able to imagine. My findings and experiences of this participation are given in more detail in chapters four and five.

Challenges and Limits of the Fieldwork.

The challenges of this fieldwork were many. While perhaps hampering this project, however, they may open pathways to further research. The first major challenge presented itself during the pilot stage of the test questionnaires. I made a fundamental mistake in preparing assumptive questions which my respondents had trouble answering. Perhaps the most revealing was the question which asked 'On average how much water do you collect each day'. This could be answered with high accuracy by those who relied predominantly on public taps, and so *did* in fact collect water each morning, however for those who relied on multiple water sources, depending on which could be utilised, water collection *by day* was a concept that was not realistic as the family may go for up to 4

days without any fresh water, relying on stocks, then filling as much of their stock as possible over a period of several days from several sources.

The second major challenge was the necessary use of an interpreter. Not only did finding a qualified candidate prove costly and time consuming, the tendency of my interpreter to explain to me that ‘he’s lying’ or translating to me only when pressed on the pretence that ‘he’s saying basically the same as the others’ as the survey process wore on, became an extra element that I had to be aware of.

The third major challenge was a result of my sampling technique. By choosing people to interview purely by convenience, I left the interview process open at times to intrusion by neighbors, and consequently was forced to involve them in the discussion. This may have altered people’s responses. This proved to be the case both when answering technical questions and questions more open to interpretation. For example, I noted that this happened most commonly when people were asked to estimate the water storage capacity of their home, or how much water they could store in their various containers. This question posed problems as many people did not know the capacity of the different sized buckets, other neighbors would then interject, sometimes with ludicrous figures. Also when asked to identify the biggest problem in the area, a question with no right or wrong answer, neighbors would often loudly disagree with the answers given, creating a consensus which was eventually agreed upon and then given to me. Again this shows a weakness in the questionnaire but also demonstrates how authority is easily assumed in the absence of specific knowledge or uncertainty.

The fourth challenge was perhaps more of an ethical one and was a result of my positioning as a student from a European country. Several times, after completing an in-depth interview, my informants would ask which NGO I was from. The word NGO had entered the local parlance with not so positive connotations. Although my translator attempted to explain that I was not particularly able to assist in constructing a better piped water network or organizing funding for reviving the community toilet blocks, or indeed

able to loan money myself, some informants seemed unable to quite accept that my reasons for being there, for taking up their time, were quite believable, and thus I feel lacked credibility in my informants' eyes.

Another challenge was the time frame I set myself to do this research. I had initially planned to be 'totally immersed' in the community for at least three weeks. I planned, before leaving Oslo, to approach a group of pavement dwellers that I knew of from my previous visit to Delhi, ask them if I could 'observe' how they managed their water needs. After a 45 minute rickshaw ride from my hostel in the centre of the city to South Delhi, through torrential afternoon monsoon showers I saw, to my dismay, that the pavement dwellers were no longer living on that particular piece of pavement. Then, after the anxiety of wasted time through finding a research assistant, I was denied access to Sanjay Colony by a variety of actors. These circumstances impact upon the quality of my ethnographic account. I do believe that if I had have given myself more time in the field, it would have been beneficial for my final thesis.

The limits of the thesis are due to the ambitious scope of the thesis to grapple with the three main themes, consumption, sustainability and poverty. Important aspects which have not been addressed for reasons of space and time, but are equally important aspects of this research are the role of women in setting standards in the home and the role of health in determining consumption decisions. Both of which may provide ideas for further research into household consumption in developing countries.

Structure of the Thesis.

The thesis will be divided into eight chapters through which the research question 'What are the determinants of water consumption?' will be answered. The first chapter, which you have just read, has introduced the topic, the setting, the methodological tools and the

major themes that will be explored throughout the thesis.

The second chapter will introduce the theories which have been employed in an attempt to answer the research questions. It will outline schools of thought on consumption theory and attempt to justify the use of an anthropological ethnographic research method as suitable for explaining water consumption in Sanjay Colony.

The third chapter will analyze the importance of historical decisions for contemporary attitudes and actions regarding water consumption in the home. This is vital as it provides a tangible backdrop to the individual and institutional attitudes that surround water consumption in Sanjay Colony today.

Chapter four will be the first of two presenting the results of fieldwork within Sanjay Colony. It will introduce the research area and position Sanjay Colony in a wider context of increasing urbanization and resource scarcity. It will present findings related to the acquisition of water by the residents of Sanjay Colony and examine the relationships between various actors within Sanjay Colony and the power structures that resource scarcity creates and maintains.

The fifth chapter will provide the ethnographic account of water use in the daily tasks of the residents of Sanjay Colony, providing a picture of water use on a litre by litre basis. It will introduce the techno-cultural relationship between house as appliance and person as consumer and attempt to give an insight into how consumption decisions are made when access to water is severely restricted.

Chapter six presents an analysis of the information presented in chapters four and five. It will attempt to explain the aspects which determine how water is consumed in Sanjay Colony and *why* it is consumed in specific amounts and through specific technologies.

The seventh chapter will examine the links between poverty and sustainability. It will explore the possibility that the aspects of living in poverty which constrain water use may be valuable when thinking about using water more sustainably in households outside

Sanjay Colony. It will also consider the implications of the findings of chapter six in a more global context.

The final chapter will conclude the thesis and discuss the relevance of its findings in a broader framework of sustainable development.

2. Theoretical Perspectives.

Introduction.

This thesis will attempt to explain the purpose of water consumption through an investigation of the amounts of water allocated to four common water intensive activities in the home; bathing, laundering, cooking, and human waste disposal and the techniques used to consume and conserve that water. In such an exploration of consumption practices multiple theoretical frameworks could be utilized spanning several academic disciplines. I have borrowed theories from across the social sciences and humanities to construct a thesis which examines not only the techniques people employ to consume water in the home but the motivations and expectations which drive this consumption.

Sustainability.

The concept of sustainability can never be ignored when studying consumption. As G.S. Brundtland stated in 1987; sustainable development is defined, ‘as paths of progress which meets the needs and aspirations of the present generation without compromising the ability of future generations to meet their needs (Brundtland, 1987). The idea that the planet’s resources are finite and thus present levels of consumption must change means that a better understanding of the *why*’s and *how*’s of consumption is needed. Whether water resources falls into the category of finite resource or not is contentious, as noted above, however this study aims to show *why* and *how* people consume water, that is, the *reasons* behind the way people do things and the *methods* they use to do them.

To live more sustainably we must, as a species, reduce our consumption levels and use resources more efficiently and it is on this theory that this thesis relies. Erik Assadourian, a senior researcher at the World Watch Institute has called for a list of ‘Millennium Consumption Goals’ for developed nations to be installed by the United Nations to run parallel with the Millennium Development Goals. The aim of these proposed goals is to reduce consumption in developed nations and includes things such as halving the working week to better distribute jobs and reduce consumption, and doubling the use of non-motorized transport to promote health and lower greenhouse emissions. A goal that might be included in this list is to reduce household water consumption by 50%. In order to do this we must better understand why we use water the way we do as well as developing a better understanding of the relationship between technology and social institutions.

This thesis will attempt to identify the determinants of water consumption in the home and so provoke further thought on sustainable living through alternative consumption practices.

What is Consumption.

This thesis will use various theories of consumption to explain household water use in Sanjay Colony. It will draw upon theories of consumption as a cultural phenomenon, the standardization of normality, agency in technology, and the creation of identity through consumption. As Moore (in Wilhite 2006:5) relates, when attempting to cover in any depth a subject as complex as consumption, ‘it is no longer possible to speak of coherent theoretical approaches that are neatly delineated from others. Theories are themselves more composite, more partial and more eclectic’. It is hoped that by drawing on the

differing yet related theories below, this thesis will be better equipped to understand why people consume in the way that they do.

So what is consumption? As Miller discusses; it is difficult to construct precise definitions in the social sciences as this can impose constraints on inquiry and lead to essentially unproductive debates over semantics (Miller, 1995:31). Consumption in this thesis will be explored through the actions and attitudes of the residents of Sanjay Colony. The simple act of using water is a form of consumption but also attached to this is the complex social relationships that consumption may reinforce. This thesis will not only deal with the water consumption of the individual, but attempts to understand how individual consumption takes place within social and technical networks as well. The thesis will examine, not only the minimum daily water needs of the residents of Sanjay Colony, but also how the attitudes and beliefs which place value upon consumption outcomes impact upon consumption decisions.

Consumption as Culture.

This thesis explores the theory that the way we consume natural resources is a cultural phenomenon. It will employ Wilks' theory that consumption through the built environment is based on cultural knowledge and constraints (2001). The thesis rests on the anthropological definition that culture is a set of shared beliefs, opinions, attitudes and behaviors of a particular group. As Wilhite theorizes, consumption occurs within cultural webs of meaning (2001, 2006, 2008). This is true also of water consumption. The way we, as individuals, consume water differs greatly across the globe. Where we get our water, how we organize its use, its storage, its eventual disposal are all bound together by our cultural assumptions of what is appropriate, what is possible, and what is acceptable. This thesis will draw on ideas from Anthony Giddens (1991), Mary Douglas

(2001), and Bernd Simon (2004) to show how water consumption, and the consumption outcomes individuals achieve through its use help to create individual and community identity which are important in turn to reinforce acceptable consumption practices and techniques. Whilhite, again employs a useful idea when exploring household consumption which I shall borrow in an attempt to explain the consumption practices of residents of Sanjay Colony.

Socio-Technical Regimes.

Whilhite introduces the concept of ‘Agency in Technology’ (2006:11), stressing that items, such as appliances, take on ‘agentive’ qualities to explain how the home, for example, presents people with specific consumption opportunities, e.g. how to consume energy and water. In Sanjay Colony too, the home takes on certain agentive powers, reinforcing consumption patterns and locking consumers into specific consumption practices. This is an important theory when trying to understand how people consume and change their consumption patterns and how practices become normalized. The interface between culture and technology is important when thinking about resource use as it can help to explain the importance of technology to consumption. That is, the tools we use to consume are also designed and created among those cultural webs of meaning mentioned above.

As mentioned in the introduction to this thesis, we as humans actually need very little water, between two and four litres per day depending on our calorie intake. Other than this what we actually consume is what water can *do* for us for example, clean our clothes, clean our hair, green our lawn, clean our car, dispose of our waste etc. This has great consequences for thinking about consumption on a much larger scale. Homes, cities, entire nations are increasingly locked into rigid consumption regimes within which the individual exerts little or no control over how water is delivered or disposed of. By

focussing on the home, where water is consumed on both an individual level and as a family unit, we can explore how technology and social practices channel consumption through predetermined pathways. We can also examine how and why these systems are maintained and reinforced.

Administrative Institutions and Relationships.

Consumption is also influenced by the administrative institutions and social relationships which people, as groups and individuals, empower to identify, harness, regulate, price, and deliver resources such as electricity, gas and water. In New Delhi this falls to the administrative bodies attached to the government, the Delhi Jal Board and the Delhi Municipal Corporation. Chapter three will explore the development of the administrative structures charged with water delivery in Delhi and the challenge such institutions pose to water security for the residents of Sanjay Colony. Chapter four will explore how such water scarcity creates opportunities for local power brokers to gain political power by establishing client-patron relationships as theorized by Scott (1972).

Standardizing Expectations.

To bathe every day is normal. To flush the toilet after each use is normal; in fact to have a flush toilet in the house, or even several is becoming normal (Knight, 2001:77). Using water to carry human waste away from the home is normal. While these statements can be called 'true' for a privileged minority of people, that number of people is steadily increasing. Elisabeth Shove holds that norms that were, in the past, confined to particular cultures and classes, seem to be extending across the globe. She holds that consumption is changing due to a global standardization of socio-technical regimes

driven by the complex relationships between technology development and consumer demand. As certain technologies are introduced from other cultures, as time or money savers or because of particular aesthetic qualities, certain behaviors and attitudes must subtly be adopted by consumers also, such as the consumption practices that these make possible or in fact, force upon their users (2003:2-11). As Awadhendra Sharan laments, it is the environmental disasters caused by this normalization of consumption habits which are the biggest facing New Delhi today. The very model of economic development, epitomized by increased consumption, needs to be rolled back, he believes, from 'an advanced case of unsustainable, undesirable, ecologically disastrous and inequitable development' (2002:33). The development path along which New Delhi is rumbling has its counterparts throughout the developing world and is manifested in increased and improved infrastructure to facilitate transport and trade, improved amenities and government services as citizens raise expectations, and desires rise to match rising incomes. To sustain this growth, there must be an increase in the exploitation of natural resources as the products which require them become essential to everyday living. This is true for water use also, with residents of New Delhi receiving on average 280-300 lpcd (Hosagrahar, 2011:124), comparable to any modern European or North American centre of politics and commerce.

What then are the factors which facilitate standardization of water consumption in the home? This thesis will explore the factors which embed notions of what is normal in a society. By looking at how the residents of Sanjay Colony use their meager water resources this thesis hopes to provide empirical evidence of how aspirations and attitudes are formed, standardized, embedded in culture and realized through consumption. That attitudes toward cleanliness and comfort are culturally diverse and relevant to consumption decisions is a notion that has been explored by many sociologists and anthropologists (Wilhite et al 2001 Dolincar and Hurlimann 2010).

Higher and Lower Order Needs.

When thinking about human motivation to fulfill specific needs and desires, Abraham Maslow (1954) provides five categories into which most human needs can be placed and ranked in order of importance. These five categories: Physiological Needs (e.g., food, water, air, shelter), Safety and Security (protection, stability), Social (affection, friendship and belonging), Ego (prestige, success, self-respect), and Self-actualization (self-fulfillment) would be fulfilled in order, of lower to higher. Physiological needs would be fulfilled before safety needs and so on. By examining, in ethnographic detail, how the residents of Sanjay Colony use their water resources the thesis will attempt to discover how needs and wants are created by individuals and groups and fulfilled through consumption.

Typically labels used in economics to differentiate between classes of goods or consumables, wants and needs, or what we think we want and think we need are, in anthropological thinking, defined and legitimized by social interaction (Douglas, 1992:149). Douglas believes that ‘...the reason anyone wants anything (physical needs apart) is for sharing with or showing or giving to someone else in recognition of similar gestures, gifts or services received in the past’ (1992:150). Linked to Shove’s theory of standard setting and normalization, ideas that practice is dictated by social interaction is important in understanding consumption and its implication for sustainable use of water resources. Chapter five will use the empirical study of Sanjay Colony to present a picture of the actual water needs of the households of the colony, and how these are standardized or challenged by shifting expectations of what is ‘socially acceptable’.

The thesis has as its background, ideas that fresh water supplies are a renewable, yet finite, resource. This, perhaps confusing, stand, arises because, as stated in the introduction to this thesis, water is renewable in the sense that through the water cycle,

fresh water (rain) is created naturally. It is held to be finite however in the sense that urban centers do not have unlimited access to fresh water. Water in urban New Delhi and in Sanjay Colony is a limited resource. The thesis explores a reality in which people consume very little water (relatively) and that these people may possess vital clues to sustainable water consumption in urban areas through their use of existing technologies and their social norms and standard setting, or for want of a better word, their 'culture'. There are however alternative methods of viewing consumption than through the anthropological lens which must be visited to legitimise the research methods and theoretical methods used in this thesis.

Alternatives to Social Theories of Consumption.

Neo-classical economic theory, which holds 'supply & demand' as its central facet, presents the most widely applied alternative to 'social' theories of consumption. 'Social' comes in inverted commas here because economics has for so long been alienated from the other social sciences by its methodological investigative techniques and its empirical assumptions (Fine, 1995). As Fine states, in economic theory;

Consumption is reduced to the theory of the demand for goods. In turn, this is equivalent to the cost minimizing behavior of the individual in meeting a given level of utility where prices are fixed for the goods involved' (Fine, 1995:128).

Or as Deaton states; 'The decision of how much to consume is a decision about spending money now as opposed to retaining it to finance future consumption for some specific purpose, or for some general unspecified contingency in the future' (Deaton, 1992:1).

Consumer preference is pegged to a utility function where consumers derive utility from consuming goods. Preference in this model embraces two extremes, either that no

one consumer has unique preferences and thus can be grouped under one consuming banner, or that each consumer is individually unique with no common consumption preferences. The theoretical assumption underlying consumption practices is that individuals are motivated solely by maximizing 'previously assumed utility' (Fine, 1995:129). Bentham describes utility as the 'property in any object that whereby it tends to produce benefit, advance, pleasure, good, or happiness...or...to prevent the happening of mischief pain, evil or unhappiness' (J. Bentham cited in (Douglas, M. & Isherwod, B., 1996). These models, presented through abstract algebraic formulas, are able to explain levels of consumption based on income and prices. They rarely specify particular types of goods or services or investigate the motivation behind choices other than those mentioned above, self gain. This allows economics, as a discipline, to answer questions about consumers responses to changes in prices and incomes but only so far as 'tastes', or what Douglas and Isherwood call 'the ultimate unexplainable factor of demand'(1996:3) remain as a given to explain everything else. As Miller points out, these premises are vital to the discipline for three central reasons;

- 1) They assume that meeting demand is unquestionably a good thing,
- 2) They assume that what is 'good' for one person does not change and is not influenced by factors outside that of 'rational self gain',
- 3) They imply that no further investigation into the actual act of consuming is needed as demand constitutes a reliable substitute (Miller, 1995).

I would argue that when dealing with a resource such as water, or any other finite resource, such as those that most consumer goods and services are dependent upon, consumption is a more relevant site for the investigation of human values than production or demand and thus these three points must be investigated thoroughly. As Douglas, Shove, Bastow and Wilhite explore in their investigations, understanding the reasons behind taste, preference and choice is at the very heart of understanding consumption

theory. Rather than holding this as a constant utility relating to supply and demand, this thesis hopes to expose household water consumption as a cultural phenomenon, based within complex social and technical structures dependant on community norms and power relationships. To expose such information, the ethnographic method is the most suitable and it is for that reason it has been employed.

3. The History of water delivery and sanitation services in New Delhi.

Introduction.

The aim of this chapter is to briefly examine the historical pathways of contemporary thinking about how water should be supplied to citizens in New Delhi by mapping the transformations, both technical and attitudinal, which occurred with increasing urbanization and development. Through this investigation it is hoped to better position the residents of Sanjay Colony in a larger cast of actors and structures which facilitate the provision of water and through which they must negotiate. This chapter will also introduce the importance of the control such structures have on the consumption practices of the residents of Sanjay Colony which will be further developed in chapter four. It is important to the thesis to present this historical section so as to realize the importance of past decisions, attitudes and infrastructures on current behavior such as how we consume resources in the home.

Colonial Heritage.

The modern water distribution and disposal structures which determine consumption opportunities in wealthier homes in New Delhi are products of their ancestors in Britain and Europe. However as Black and Fawcett point out, at the time colonial occupiers began to build their urban infrastructure in India, the sewerage system, as an effective system of human waste disposal, and beacon of sanitation and health, was only in its

early infancy in England (2008: 117).

The 1531 Bill of Sewers was a major attempt to regulate London sewers by giving local powers to municipal councils to regulate cleanliness and maintain drainage. Enclosed sewers were intended strictly for excess storm water run-off, while the construction of structurally sound household cesspools, to store human waste, was to be enforced so as not to pollute local drinking water supplies through contaminated water seepage. Cesspools were emptied by ‘scroungers’ at considerable compensation. These scroungers were able to sell the dried-out contents of cesspools to farmers who, at this time, had farming land not far from the city centre (Halliday, 1999: 32-34). The Sanitary Movement, which provided the context for large public works in London during 1840’s, can be seen as the result of public anxiety over the state of this drainage system, or more specifically its misuse. The convenience provided by the sewers to carry human waste away, coupled with people’s desire to save money (cost of emptying cesspools), culminated in, essentially, a rethinking of waste removal and the role of water in the household which we see reproduced and reinforced in New Delhi, and across the globe, today. It also marked the beginning of centralized institutional involvement in water consumption at the household level. A brief examination of the history of water, as a tool to remove human waste, is valuable here, as it will provide us with a better understanding of how individual households have been divorced from water sources and so have had to adjust their consumption practices accordingly as the home was modified with piped water connections and water using appliances, traditionally drains and basins and more recently, washing machines and dishwashers, for example.

Global Standardization of Water Use.

The flush toilet is a device which is synonymous with good health, hygiene and progress. It provides a good example of how technological developments combined with official institutions and people's attitudes transform consumption practices which helps to demonstrate Shove's theory of standardization mentioned in chapter two.

The use of water to carry human waste away from the home is a practice that is largely unexamined in developed nations. However it is a practice that uses a large amount of urban fresh water resources and so investigating its introduction into society is useful when exploring water consumption. The first version of the modern flush toilet was produced in England in 1592 by Sir John Harrington for his godmother, Queen Elizabeth I. It was developed as a novelty for those at the absolute pinnacle of society, not for any reasons regarding increased sanitary conditions or health benefits, which it will be argued were in fact compromised by its wider adoption in the late 18th and early 19th centuries. The widespread adoption of the water closet must be seen in a wider context of an overall increase in home improvements and household consumption which accompanied the rising consumption, living standards and expectations owing to the social and economic waves of the industrial revolution (Black & Fawcett, 2008). The widespread adoption of the water closet had three central and long lasting consequences. The first consequence was that household water consumption in English homes increased dramatically in the years 1850-56 from 180 gallons per household per day (ghd) to 244 ghd. This increase was due solely to the creation of a new socio-technical regime which was to be reinforced by A) the connection to the home of water pipes and drainage pipes, and B) a shift in expectations of the general population and a redefinition of water as a consumable good.

The second was that urine and stool were, for the first time combined, before disposal, with fresh water before being flushed, water performing the dual function of waste carriage device and cleansing agent. However, as the adoption of flush toilets had

happened so far ahead of private connections to the city's sewers, waste, now heavily increased in volume due to the extra water needed to 'flush', flowed into existing, overwhelmed cesspools. This caused cesspools to overflow and urine and faeces to mix with drinking water sources and contributed to the cholera epidemic of 1849 which in many ways was the catalyst for the huge undertaking that was to become the London sewer system.

Third, night waste collection virtually ceased. This was because human waste, now mixed with water, was hugely more difficult to dry and transport than previously. Also, the arrival of guano (dried bird droppings used as fertilizer) from South America undercut the market of human faeces as a source of fertilizer. Night soil scroungers began to charge higher prices and thus poor households could no longer afford to have their overflowing cesspools emptied. The idea of human manure as an economic tool vanished, forever tarnishing the reputation of faeces⁴ (Halliday, 1999: 19-23). It is important to note here that ideas of the time regarding the spread of disease was firmly rooted in the miasmatic school, by which germs were spread through foul smelling air (Corbin, 1986).

What this meant for attitudes toward water can be seen in what has become known as the Sanitary Revolution. Faeces from overflowing cesspools, running directly into the river Thames via several covered sewers, resulted in the 'Great Stink of 1858' in which an unusually hot summer, caused such a stench to pervade the houses of parliament that, what the *Builder Magazine* dubbed, 'The most extensive and wonderful work of modern times' was embarked upon. The London Sewerage Works, which would carry human waste through large underground pipes parallel to the winding river Thames to outfalls at Barking on the Northern side of the river and Crossness on the Southern side was designed by civil engineer, Sir Joseph William Bazalgette (Halliday, 1999). Ironically,

⁴ In China today, over 90% of human excreta is used for fertilizer (Black, M. & Fawcett, B., 2008)

when figures of sickness and death were compiled for the period 1857-1858 by a leading expert on typhoid fever, the figures had dropped remarkably from the previous year (Black & Fawcett, 2008), casting a shadow on the sanitary science which motivated this switch from decentralized sewage treatment in the form of household cesspools, to a centralized system, similar to that in place in New Delhi today.

These ideas, based on faulty science or not, were certainly transferred to the Indian subcontinent as colonial administrators sought to implement British ideas of infrastructure, sanitation and hygiene on the local population.

Household Water Consumption on the Sub-Continent.

Sophisticated water carriage infrastructure had existed in what is modern day New Delhi for several hundreds of years before the arrival of modern hydrological science.

The Hauzi-i-Shamsi Tank for example, lies at the Southern end of the Mehrauli Archaeological Park in central Delhi. Built in the 13th Century, the tank is spread over a 20,000 square meter area and was capable of supporting the entire city throughout the year by channeling and storing monsoon rain water. The tank is dry now, with just a small area dedicated to the catchment of wastewater from households who are not connected to the city's sewer line and so direct their household waste, through self installed drains, to this low lying area. Recent development plans have been suggested to beautify the area and re-energize the tank to help meet the area's acute water shortages during the dryer months however the problem regarding the disposal of household waste will remain.

Four kilometers to the east of the Hauzi-i-Shamsi Tank, lies the Gandhak Ki Baoli (step well), which also formed part of the city's water storage infrastructure. A Baoli or step well consists of two parts: a vertical shaft dug deep enough to meet underground water bodies from which water is brought up to street level, and a huge chamber, dug into

the ground which fills up as water flows into it from surrounding catchment areas through sophisticated networks of gutters and pipes during monsoon season. The Gandhak Ki well continues 8 stories underground. This well would collect rainwater from the surrounding area and the chamber, sealed on all sides by stone, would fill until the water reached street level at which point overflow would be directed, via both natural and manmade water courses, back to the Yamuna. As water was used by the surrounding households after the monsoon rains had passed, the water level would decrease until only well water was available. Not only did these structures fulfill the water needs of the surrounding households, they provided an important focal point for the community. Maintenance was provided by the whole community and water was distributed according to need. Human waste was used as fertilizer and so problems of contamination of drinking water that are wide spread today, did not exist. Several of these structures exist throughout Delhi and thus huge potential exists to augment the municipal water supply with rainwater controlled, collected and distributed by those who use that water (Agarwal & Narain, 2008:33-37). To implement this scheme however, presents real challenges both conceptual and financial.

The construction of New Delhi's modern water supply and sanitation system was facilitated by three main factors. The first was the British imperial rule which lasted from 1857 until 1947. The British brought with them the sanitation science that had been developed since the early 18th century and the regulatory institutions to implement it, ignoring local perceptions of water as, not just a commodity but also as an important social substance (Hosagrahar, 2011: 119-120).

The second was the rapid growth of Delhi as an urban centre in the 1890's as it became the commercial capital of Punjab. This caused a dramatic increase in population but also had a hand in the bestowment of political power by the British in 1911. The third was the role of the British led Municipality who campaigned for funds from the Imperial and Provincial Government to construct a waterworks as, due to neglect and

non-maintenance, the traditional water catchment and storage infrastructure mentioned above had fallen badly into disrepair (Hosagrahar, 2011:116). The Provincial Government, passing the Provincial Account Code to facilitate the loan, insisted that the army benefit directly from any such loan and thus the garrison, located in Shahjanabad, was the first to receive a piped water connection. While many Hindus still preferred to bathe in the Yamuna, the municipality did receive a surprising amount of applications for local connections from many who felt that the water supplies from the canal, in part due to the newly established water works, was becoming erratic and of questionable quality (Gupta, 1981:157-162).

This was the birth of a centralized socio-technical regime in the form of water delivery in New Delhi. Residents, who had previously depended on natural water courses for their daily water needs and had participated in the maintenance of these systems to ensure their water quality, were disengaged from such practices. The new system was not uniform, and was a matter of preference as well as convenience. As Khilnani states, ‘the British ideas of the city, of how its spaces, both public and private, should be utilized were adopted only as far as the Indian elites and middle classes’ (Khilnani, 1997:118).

As the rich moved further from water sources as infrastructure grew, poorer residents moved in to inhabit low lying areas closer to rivers and ground water sources. The effect of this was to turn water into a good which must be purchased and transported and to remove responsibility and control of water sources (including the disposal of household waste) from the citizenry, placing it in the hands of a centralized government body The Delhi Municipal Committee. As Hosagrahar explains, the provision of water required not only complex legal and administrative apparatus but technically specific engineering knowledge also. The technical systems were not local and the knowledge needed to implement and maintain them was not local. Supply to houses also was based on an abstract calculation of household demand, based on colonial assumptions of

cleanliness, hygiene, diet and sanitation and, effectively, erased consumers from their role in managing or maintaining their water resources.

This centralized system of water distribution, in a single generation, superseded a long history of water management through an intimate knowledge of local weather patterns, drainage, drought, flood, and soil systems which relied on the active engagement of everyday users (Hosagrahar, 2011:121).

Delhi's Water Today.

Today, Delhi's urban metropolis spreads over 0.149 million hectares and is home to some 16 million residents, officially. The city sees huge disparities in water distribution with some parts of the city receiving as much as 300L per capita per day (lpcd) and others receiving as little as 30lpcd. Only 40% of households are connected to the sewer system, which is, at the same time, responsible for the provision of household water and the carriage and disposal of human waste. The city draws its drinking water from the Yamuna which is a branch of the Ganges, at Wazirabad to the north of the city. This is supplemented by huge numbers of privately owned tube wells sunk and financed by private residents and businesses seeking to supplement their water supply. Total household water consumption in New Delhi is estimated to be 11, 102 million liters per day. It is estimated that approximately 2,547 million liters of raw sewage is produced per day, or around 160lpcd. However, these figures hide the wide disparity between rich and poor consumers. The capacity of treatment plants around the city is about 1/3 of this (Srinivasan & Suresh, 2007: 1-3)⁵.

Treated sewage is released back into the river further downstream where it mixes with the remaining untreated waste and joins the Ganges where it mingles with, and pollutes, relatively clean water used by villages along the banks before supplying Agra

⁵ Delhi's sewerage treatment plants account for 40% of the total treatment plants in India (Srinivasan & Suresh, 2007: 4).

with its main source of water (Srinivasan & Suresh, 2007:3). As urbanization has expanded, swallowing up villages and towns previously outside the city limits, and commandeering local water supplies to service the growing population, the water level of underground aquifers has fallen alarmingly. Hosagrahar predicts that the water level fell approximately seven meters between 2003 and 2007 (2011:122). A study by the Central Ground Water Commission has cautioned that ground water resources will be completely exhausted in Guragon, an area lying to the South West of the city centre, within ten years if present exploitation continues⁶. According to some, water in New Delhi is running out.

When buying a place to live in New Delhi, residents are unconsciously locking themselves in to specific patterns of behavior regarding their water use, its deliverance and its disposal. They will be forced to negotiate various government regulations and bodies who, for a fee, will determine the quality of the water they drink and how their waste is disposed of. This is seen as normal and convenient. The preceding section has sought to illuminate that this has not always been seen as normal or convenient and how, through a spread of ideas, technology and active campaigning, what is normal has changed significantly in little over 100 years. The entity charged with upholding present day expectations regarding quantity and quality of water services is the Delhi Jal Board, of which a brief examination is useful.

Delhi Jal Board.

The Delhi Jal Board (DJB) was constituted by an act of the Delhi Legislative Assembly in 1998, incorporating the previous Delhi Water Supply and Sewage Disposal

⁶ <http://cgwb.nic.in>. accessed 28th November 2010.

Undertaking⁷. This body is perhaps the most important institution for the residents of Sanjay Colony and this study because of its responsibility for water delivery. The role of the DJB, essentially, is to provide potable water to residents of New Delhi. This is a threefold operation. It involves identifying and securing water sources, treating and purifying of water to potable standards, and the removal and treatment of wastewater. The DJB has 1.33 million domestic connections and operates around 11.5 thousand public taps. Table 1 provides the different modes of supply and the estimated volumes of water supplied to each. The census of 2001 shows that up to 75% of the population of New Delhi are reliant on the DJB for their water. Significantly, 18.7% are reliant on hand pumps which draw water from private tube wells sunk to shallow ground water resources. This means that approximately one fifth of residents still rely on a decentralized system of water collection and disposal and are not connected to the sewer system. This fundamentally influences the consumption of those households. The DJB also grants permission for residents of Delhi to bore private wells. The key word being residents. To prove residency, one must take a ride on the bureaucratic merry-go-round which requires certified forms, photographs and copies of documents such as a domicile certificate, a ration card, a proof of deed to 'immovable property' and proof of residence in Delhi for three years or more. It is very difficult to obtain any one of these forms without the others, and this is where there exists opportunities for client-patron relationships to emerge, which will be discussed more thoroughly in chapters four and six.

⁷ http://www.delhi.gov.in/wps/wcm/connect/doiit_djb/DJB/Home/About+Us accessed 4th December 2010.

Type of supply	Supply mode	Volume supplied in MLD (Million liters/Day)
Domestic connections	1331820 connections	1124
Commercial and Institutional Connections	52623 connections	34
Industrial Connections	10876 connections	13
Bulk Supply to DMC ⁸	Bulk Supply	158
Public taps	11533 taps	221
Water tankers	493 Vehicles	10

Table 1. DJB's water supply modes⁹.

The aquifers that are used by households to draw water using private tube wells are often of questionable quality as they are subject to pollution from various sources including industrial run off and household and human waste (Maria, 2008:6). The residents of Sanjay Colony receive the majority of their water from the DJB either through pipes which are connected to the Okhla pumping station or from tankers which deliver water to

⁸ Delhi Municipal Corporation.

⁹ Table taken from A. Maria (2008) p.6.

those residents who do not have access to piped connections. This water is of drinking quality but is often compromised as uncovered taps and broken pipes which run along open drains can easily be contaminated by polluted water. In 2005 The Government of the National Capital Territory of Delhi (GoNCTD), through The Government of India (GOI) approached the World Bank for assistance to improve the water delivery and treatment services of Delhi in partnership with the DJB. The proposal was shelved however due to political infighting (Janakarajan, 2005:94).

Delhi's Sanitation Today.

Citizens of Delhi enjoy some of the cheapest water anywhere on the planet. Those lucky enough to be connected to the water grid pay a mere Rs2.20, or about US5 cents per 1000 litres of water for domestic use (Kumar, 1991: 54). Those with access to this distribution system in New Delhi is around 40% of the official population, as noted above. What this per liter price fails to account for, is the cost to the environment of an infrastructure that lacks the capacity to process waste water once it has been contaminated through household use.

Western style flush toilets and sewage transportation methods were thought to be the most hygienic and convenient way of dealing with human waste when brought to India, and the system that is in place today means there is scarce place for alternatives, either practical or conceptual. Flush toilets use typically between 10-15L of fresh, drinking quality water per flush. This water, contaminated by faeces, urine and household products, such as detergents and soaps, flows into a grossly inefficient sewer network which has the capacity to treat only about one third of household waste water generated. Treated and untreated sewage alike flows into the Yamuna. The river, as it

runs through New Delhi, is dead, with levels of Dissolved Oxygen (DO) at 0%¹⁰. It is thought that 80% of the pollution in the Yamuna is fecal matter from 40 % of Delhi's households (Suresh, BS & Bahrat, LS, 2007:16). Sunita Narain holds that, given the costs associated with water distribution and especially waste treatment, state governments have tended to view the supply of water as more politically valuable than its disposal.

The DJB does not have the responsibility or the jurisdiction to supply unauthorized residents with water from the water grid. That responsibility has been grasped by local political aspirants. Since the creation of the Ganga Action Plan in 1981¹¹ and its subsequent implementation in 1985, Rps 5,166 Crore, or about USD12.5 Million, of public money has been invested in various river clean-up projects. At 2005, 44% of this budget had been spent on infrastructure that would transport and treat 37% of the human waste of those fortunate enough to be connected to the sewer lines. The funding for these projects has understandably faced various political barriers. The state Government initially agreed to fund 100% of the construction of sewage lines and treatment plants however this was reduced to 70% after changes in administrative heads in 1992. Thus, individual state governments and municipal councils have been handed the remaining costs.

More importantly however, operation and maintenance was left the sole responsibility of state governments. This presented huge financial and technical barriers, resulting in many sewage treatment plants being underutilized or abandoned altogether due to malfunction and disrepair. It is illuminating to again note that the city charges US 5cents per 1000 L of water it supplies to households. It costs the state about US 15cents to supply that water and about US 78cents to treat 1000 L of raw sewage. The state government, which is responsible for the operation of this infrastructure, is placed under

¹⁰ Dissolved Oxygen is a measure for gauging life in water bodies.

¹¹ A scheme designed to clean up the Ganges and its tributaries.

considerable financial burden to provide these services, however an increase in prices for the middle classes would almost certainly spell political annihilation for those brave enough to suggest it (Suresh & Bahrat, 2007: 1-13). There exists neither the money, the political will or in fact the water, to supply the entire population of New Delhi with an unlimited water supply.

Water Distribution to Slums.

The National Capital Territory of Delhi (NCTD) is the fastest growing metropolis in India. Between 1991 and 2001 it saw a population growth of 46.31% as against a national average of 21.34% (Dutta, 2005:440). As mentioned above, this is perhaps the single greatest challenge facing the city. Wherever these migrants end up living, they need water to survive and as it is, about half the city is excluded from the water planning framework. At present there are approximately 1.4 million people living in unauthorized colonies in New Delhi in similar situations to Sanjay Colony.

Unauthorized colonies are those which have developed on land not initially zoned for human habitation and the DJB or the Delhi Municipal Corporation (DMC), which is responsible for solid waste collection, does not service these communities. How they organize their sanitation and the general cleanliness of their community depends mainly on the resources available to them which in turn depends on the location of their particular slum. The residents of Sanjay Colony for example use a forested area beneath the city's overground railway to defecate. Partially hidden by trees and bushes, and with a plentitude of soil left in heaps from the construction of the rail line, such hygienic and humane options are not available for every slum.

Post colonial thinking on sanitation and hygiene can be seen to have really began with the United Nations Conference on Water held in Mar Del Plata in

Argentina, from which came the declaration that 1981- 1990 would be declared the International Drinking Water Supply and Sanitation Decade (IDWSSD). Target 7c of the UN Millennium Development Goals (MDGs) declaration aims to “Reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015”. Here MDGs reporting has tended to highlight the deficiencies in rural water and sanitation delivery. Of the 2.6 billion people globally who do not have access to ‘improved sanitation’ only 600 million are thought to live in urban areas (WHO & UNICEF, 2006). However, this disparity is thought to be unrealistic as the poorest people living in slums and illegal colonies in urban areas are close to invisible to data collectors as they do not officially exist. However as Black and Fawcett note; whether the number is 600 million or 900 million, as some urban experts suggest, it still implies that the focus must be heavily skewed toward a focus on rural delivery if the MDG is to be met (Black, M. & Fawcett, B. 2008:48).

The practical aspect of the urban slum which prevents unlimited water supply and waste disposal, and it is true of Sanjay Colony, is that there is little space to install infrastructure needed to either deliver water or remove human waste and even less money to pay for it. Water pipes can only be laid down the widest of *galis*, septic tanks installed beneath only the largest and most wealthy of residences, and then only by hand. The widest *galis* being about 1.5 meters across prevents heavy earthmoving machinery. The United Nations, in its 2006 publication titled: *Meeting the MDG drinking-water and sanitation target: the urban and rural challenge of the decade*, also realizes that a flush toilet and private tap for every house is just not a realistic goal in the developing world, and thus the term ‘improved’. When the UN talks about ‘improved access to drinking water and sanitation’, it means for drinking water, essentially, a source protected from contamination and of potable quality, and for sanitation, a place to go to the toilet that is private and that will not contaminate drinking water sources. The recognition that centrally controlled sanitation and water systems is but one alternative to meet people’s

water needs has been formalized and institutionalized by the Government of India also. In 2008 a task force was put together with the assistance of USAID to formulate policy designed to deal with the challenges of urban sanitation faced by Indian cities. Under the heading Policy Vision and Goals the paper outlining the role of the National Urban Sanitation Policy states;

The vision of the policy is that all Indian cities and towns will become totally sanitized, healthy and livable and ensure and sustain good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women (GoI, 2008: 25) .

The policy document outlines the following five policy goals through which it will achieve the above:

1. Awareness generation and behavioral change, in an attempt to educate people about how to adopt healthy practices with the infrastructure they have.
2. To eliminate open defecation; by promoting access to safe sanitation facilities whether community managed or owned by individual households, depending on space, economic and tenure constraints.
3. To improve integrated city wide sanitation services i.e. solid waste removal as well as increased sewage treatment capacities.
4. To improve disposal of waste so that 100% of human waste is disposed of in a safe way, be it through underground sewers, latrines or septic tanks.
5. To ensure the proper operation and maintenance of all sanitary installations by promoting community structures to insure proper usage and upkeep (GoI, 2008: 28).

What this policy document outlines is a wider acknowledgment amongst the development community that the ‘Urban East’, at least the vast majority of those urbanites who are poor, are going to have to be comfortable with different standards of sanitation, cleanliness and hygiene than those of the ‘Urban West’. In New Delhi this is as much to

do with a lack of water as a lack of infrastructure and so may provide other water stressed urbanites, poor or not, with some valuable insights into living with less water.

Conclusion.

This chapter has attempted to show how attitudes to and techniques of water consumption in the home have been transformed over the last three centuries. This chapter illustrates that in New Delhi there exist parallel socio-technical regimes through which water is consumed (and disposed of) in the household. The difference in provision of water between rich and poor means that consumption will be driven by different needs, motivations and aspirations, that is, water will be used for different tasks, using different techniques, and for different ends. It also shows the limitations of urban centralized water systems when faced with huge increases in population (in New Delhi's case largely due to migration) and shortages of fresh water resources. Another aspect which will be looked at in more detail in chapters four and six, is how the delivery and disposal of water to the household is as much a political issue, as an engineering accomplishment. The following chapter will attempt to present the realities of this alternative regime mentioned above from the point of view of the residents of Sanjay Colony. It will examine how people acquire their water and the power structures that are created and maintained by resource scarcity.

4. Water Acquisition in Sanjay Colony.

Introduction.

September 5th 2010 10:14am

It's taken me 3 sweaty hours on the local bus network and 45 bone shaking minutes in a tuk tuk but I finally stand at the entrance to Sanjay Colony. At least I think it's the entrance to Sanjay Colony. I appear to be in an industrial park like any other I've ever been in. Offices and warehouses for various industries, suppliers, small factories, seedy looking café's for the office staff to grab a bite to eat. The road I've just come down terminates in a T- junction, continuing on to the left and right. In front of me, allegedly, is Sanjay Colony. All I can see is a solid wall of low slung shacks and small stalls, appearing to sell identical wears of cigarettes, bidis, plastic bottles of water and potato chips, their proprietors lounging inside, occasionally doing some business. Every now and then someone emerges from between two stalls, almost having to turn side on, so as to squeeze through the narrow opening. I turn back to the old timer frying lunch-time snacks in a pan of oil. He motions with his hand toward the narrow gap; 'Sanjay Colony' he insists.

The following chapter will attempt to isolate the determinants of water consumption by exploring the ways in which residents of Sanjay Colony acquire their water, the power structures that are created and reinforced by resource scarcity, and the effect that this has on consumption. It will examine the impact of relationships on water consumption, both between individuals and between individuals and quasi-official institutions in the form of service providers, middlemen and local political aspirants.

Acquiring Water in Sanjay Colony.

It is important to reiterate here that given Sanjay Colony's status as an unauthorized settlement, the DJB does not have a legal responsibility to supply water or sanitation services of any kind. The residents are effectively illegal squatters on government land. This does not, however, prevent them acquiring ration cards and vote cards, perhaps two of the most important documents available to slum dwellers. In order to obtain a ration card through regular bureaucratic channels, one must produce two passport sized photographs, verified by a gazetted officer, proof of land ownership and a form verifying the deletion of any previous ration cards. To be included in the electoral roles, one must present themselves at a hearing to determine the eligibility of their resident status in that particular state. One document which will help to determine this is the 'Domicile Certificate'. To obtain a domicile certificate the applicant must produce two authorized passport photos, proof of continuous habitation in the particular state or proof of ownership of land in the state ¹². It is next to impossible for the residents of Sanjay Colony to produce these documents and navigate the bureaucratic maze to acquire these items legitimately as they own homes which are built illegally on government land and have no legal status as residents of New Delhi. Their political status provides the catalyst for the client- patron relationship to flourish as patrons provide, among other things, an opportunity for these slum dwellers to vote. It is this eligibility to vote, and that they do, which goes some way to securing the water services they do have, as local *Pradhans*, middlemen for local politicians, have the bureaucratic connections to have pipes laid and water trucks sent, which they often do, in the name of their political superiors, amongst much fanfare during the run up to elections.

¹² <http://india.gov.in/howdo/index.php>

The residents of Sanjay Colony get their water from three main sources as shown in Figure 1.

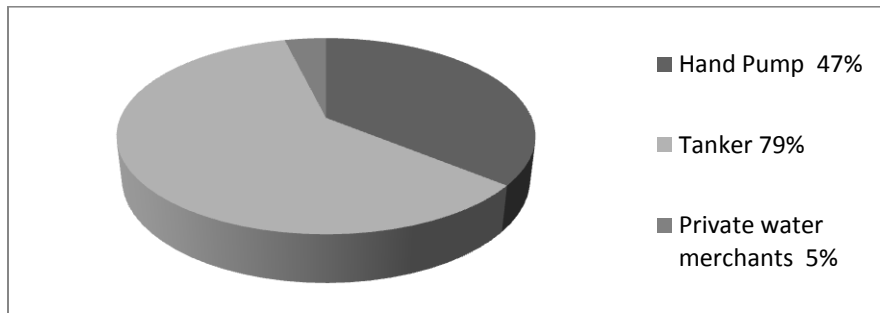


Figure 1. Sources of water collection for residents of Sanjay Colony by household.

The majority of residents augment their supply from multiple sources, depending on which is available and most convenient.

Clientellism and Patronage.

India is ranked as the 87th most corrupt country in the world in 2010, along with Jamaica, Albania and Liberia by Transparency International, a German based NGO¹³. Because of the civil status of the residents of Sanjay Colony, and the prevalence of corruption amongst government officials, there exists an opportunity for a client-patron relationship to develop and flourish. Client- patron relationships are found throughout Africa, South East Asia, the MiddleEast and less developed European countries (Scott, 1972:98) and are relevant here because they directly impact upon levels of water consumption.

As Dipankar Gupta holds, in a highly stratified society such as India, when it is expected that those with superior resources will get what they want, the meaning of corruption, as it is known in more egalitarian societies, becomes altered and transformed (Gupta, 2000:135). The vast gulf between those who have political power in New Delhi

¹³ http://www.transparency.org/policy_research/surveys_indices/cpi/2010/results accessed 8th of February 2011.

and the illegal residents of Sanjay Colony is such that the cultivating of client- patron relationships is an effective mechanism available to slum dwellers to organize vital resources such as electricity and water. The pipes that have been laid down several of the wider *galis* in Sanjay Colony have been funded by various local candidates for major political parties. The most recent network, which consists of approximately 100 meters of pipe laid down in the Western area of the slum, was organized and paid for by the local candidate representing the Bhahujan Samaj Party (BSP) in 2007 in the run up to local bi-elections. This is not done for free but as part of an exchange for votes. In India people do not elect government officials but rather they elect patrons (Gupta, 2000:137). And so must the member of BSP rely on patrons higher up the political chain to organize for the water to actually flow through the pipes with the help of the DMC and the DJB. In return for votes, patrons must be able to appease the minimum of expectations placed on them by the clients.

These relationships exist throughout the layers of society present in Sanjay Colony from highly placed government officials in charge of water supply to the slum dwellers, vying for favor and patronage. The owner of the electric pump, who siphons off electricity from the light post installed by a previous local aspirant, is empowered by the placement of a tap at his doorstep by his patron. He must repay his patron somehow and that is by convincing his neighbors to vote for that particular candidate. His neighbors, eager to have their water cans filled quickly and surely every day, agree to this small request. In Sanjay Colony, the lack of water and the channels through which its residents must negotiate its acquisition create relationships between patrons and clients which reinforce this status quo. That is, if those with the political clout saw it as their civic duty to deliver a reliable and regular water quota to the residents of Sanjay Colony they would then lose perhaps their most valuable political 'carrot'. They would have to devise new issues, and very powerful ones, to mobilize the voting community in their favor. Capitalizing on water shortages is a simple way to mobilize residents to vote for

candidates who lay pipes and get water to flow through them. Also, those within the community who have been able to curry favor with those who control the water supply, and so benefit from these relationships would also lose out. Those who control the taps too enjoy an elevated position in Sanjay Colony. Other residents must keep them on good terms if they wish to suckle at the teat of limited water supply. And it is this reality through which clientelism should be viewed. As Auyero holds, to simplify the concept as essentially votes for favours ignores the important role of both the clients and the patrons in their day to day activities (Auyero, 2000:58). Water is not just a political favour: its control and acquisition is perhaps the single most important aspect of life in Sanjay Colony and its consumption is certainly determined by the strength of this relationship. The strength of the relationship, which is built in part upon the services the client has to offer, will determine how regularly and in what quantity water can be obtained and thus how liberally it can be consumed.

Public Taps.

The soft voice of a woman singing wakes me from my light sleep. I blink my eyes in the pitch black trying to orientate myself. As I lie on the thin mattress in the darkness trying to understand where the music is coming from I become aware of other sounds. A low murmur, as if a crowd of people are off somewhere in the distance and another sound, the tink thump, tink thump not dissimilar to a bicycle pump putting air into a flat tire. The singing is coming from Seena, my neighbour who is living with her husband and three young children next door to me in an identical 2x2 m room. I sit up in bed and open my door, revealing a hive of activity. People are up and about and from my vantage point on the roof of my host's house, I can see people are generally moving along the lanes in one direction, to the low lying pipe connections where the water pressure is strongest. I put on my sarong and sandals and climb down the rickety ladder to the lane below, and join the crowd. I am in the heart of the slum yet for the

first time no one is paying me the slightest attention. As I am borne along with the flow of people I see most households have their doors open, wives, mothers and daughters preparing the morning meal over small gas stoves. I round a corner and see the source of the bicycle pump noise I had heard from my room. In a small intersection or junction where three smaller galis opened onto a main artery, which has several water pipes laid down, an electric light burns high overhead casting an eerie light onto the masses of people working below. Hand pumps are set up at four locations, being worked frantically in turns by groups of young sweating men tink thump, tink thump, tink thump. As one man tires another steps in to take his place. Another man holds the hose and directs the flow of water into lines of waiting water receptacles of all shapes and sizes. The moment two containers are filled up they are immediately carted off and two more take their place, two new empty containers are added to the back of the line by frantic late comers and the whole mass of containers wriggles forward like a long, life sustaining caterpillar. Some way down the lane, I see a man standing above the crowd, his waist at head height on the third step of a stairway leading to the roof of his house/shop. He has his own electric light attached, through a series of tangled, drooping, many times repaired wires, to the larger light supplied to the community. Below him chugs an old electric pump. A younger relative works the hose as this mighty water king dictates who will be next to have his water tanks filled, the baker? The butcher? A favourite relative? Or some other grovelling associate. He stands, hands on hips, wearing a white sarong and white singlet in the early morning, looks over those not fortunate enough to have harnessed the power of electricity, catches my eye, smiles and winks.

According to a senior engineer working for the Delhi Municipal Corporation at the Okhla Water Works pumping station, situated about five kilometers away from Sanjay Colony, water is supplied to the Colony through three separate pipe networks, each covering a separate area of the Colony. Water is pumped twice daily, once at 5am and again at 4pm. According to the official, water is pumped for 30 minutes on each occasion. Bore water is also supplied by a separate but equally comprehensive pipe network and is pumped for

15 minutes directly after the drinking- quality water. Borehole water is treated by a chlorine purifier and is safe to drink although it may taste ‘funny’.

The small snapshot into how water is collected every morning in Sanjay Colony above provides an example of an important facet of water consumption: the power relationships between those who control the taps and those who do not. The consequences of these relationships on consumption will be examined in chapter six.

Municipal Tankers.

As shown above, piped water is only available in Sanjay Colony for a limited time each day. Given that this is the preferred method of collecting water for most, unless residents have a family member or contact with a tap in front of his or her house they will get, at best, a few liters, and at worst, and more usually, nothing at all but wasted time. Ideally, residents would refill their stocked water supply every day, replacing what has been used the previous day with fresh water. However this is impossible given the number of people who rely on each tap and that water is shut off after a specific time, about 20 minutes, according to residents. Those people with their containers at the back of the queue or who are not favored by those who control the taps, the *Pradhans* or their family members, usually have to rely on other methods to meet their daily water requirements.

The DJB estimates that they send between 30 and 40 tankers, each holding approximately 12,000 liters, to Sanjay Colony per day. This is enough water to last between 360 and 480 families about 3 days.

Sitting in the middle of the road that borders the western side of Sanjay Colony are three water cans. An employee at one of the nearby offices, backing out of his parking space, nearly runs them over, knocking one onto its side as he drives away. I set down my chai on the bench of the small chai shop, trot over and remove the containers from harm’s way. Feeling good,

knowing that I have saved someone's precious containers I sit back down to finish my drink. A young girl emerges from one of the small galis leading into the slum and looks around, hands on hips. She shoots some questions at an old man who is sitting on a rug beneath the shade of a blue tarpaulin, using a heavy axe blade to strip bamboo into thread. He points to the now safe cans and then over to me. The girl marches over to the water containers, dramatically picks them up, looks at me and sets them down very deliberately in the middle of road. I had certainly blundered but I wasn't sure how so. I would find out soon enough.

A short time later a boy of about 12 years comes running along the laneway and ducks into a courtyard opposite where I am interviewing a shop keeper from Bihar. A man emerges with an old rusty bicycle. Hanging from the bent and battered crossbar are two meat hooks, each one holding an empty 40L water container. Strapped to the luggage rack on the back using an old inner tube, another empty 40L container is held in place. Through my interpreter I ask 'what's going on'; 'Water tanker will be here soon' he replies simply. Other families begin to emerge from their compounds on either side of us with similar contraptions.

On the street which I had been sitting earlier that morning a crowd of 50 or so people had gathered with close to 100 containers of all shapes and sizes forming a long line along the centre of the road so as to let cars and scooters pass on either side. There was much jostling for position, small children being usurped by larger ones, the larger children being overpowered by adults. People are looking nervous. A mobile phone rings, more activity. An old truck rumbles around the corner, double declutching down gears as it slows, belching dark diesel smoke, navigates its way past the crowd of people and the containers and lurches to a halt about 20 meters further down the dusty road. The driver jumps down from the cab and walks casually to the back of the water tanker. He pulls himself up the ladder attached to the back. As people begin realize he is not going to back up, they begin to grab containers and run for the tanker, order is lost. Hoses appear from the top of the tanker and water begins to cascade out onto the ground, the hoses writhing like bright blue snakes leaving precious trails in the dust. The first to reach the truck is a boy of 15 with a 20L bucket, the water pouring out of the hose fills the bucket in about 5 seconds, he looks around for someone he knows, spots a young girl, his

sister perhaps, and fills her container. When that is full they pass the hose on to a friend and bundle their way through the crowd and down into the slum. They return a few minutes later with two more empty containers and a grandmother who hobbles after them with her own empty container. By now some order has descended on the scene with designated pipe operators making sure containers are filled in order and that as little water as possible is wasted. The driver sits down at the chai shop where he indulges in free chai and sweet cakes while he waits for his load to empty. Families begin to organize themselves according to which hose their representative is operating, roughly ten families are here collecting water and each family has a hose pipe from which to fill their containers. These are the people who were unable to get any of the water from the taps this morning.

Community Organization.

As Figure 1. shows, just fewer than 80% of the residents of Sanjay Colony , which translates to approximately 40,000 people, collect water from water tankers. For around 20,000 people, it is their primary water source. As mentioned above, water tankers are distributed by the DJB who fill their tankers at the huge water storage facility located three km away at the Okhla pumping station, which is under the jurisdiction of the Delhi Municipal Corporation. The drivers of these water tankers are subcontractors who are hired by the DJB on a daily basis. To organize a tanker to deliver water, families must organize themselves into groups of ten, with a single leader who has the political connections, the literacy skills and the time, to fill out an application form at the DJB office in nearby Kal Kaji. If this person's request is then verified by a local politician or political henchman, or if this group of families is known to the administrative official, a tanker will be dispatched, usually the same day. For a group of families without any significant political clout, however, it can take as many as three separate trips to the office, three separate application forms, three days of lost income, and three days without water.

Groups of families will often form together because they are from the same village, are of the same sub-caste or speak the same regional dialect. They will help each other out with filling of tanks if the other family members cannot be there when the tankers arrive, and they will share water if one family runs out before the next tanker arrives. Water, in this way, acts to create bonds within the community. Alone, the residents of Sanjay Colony are powerless to organize water through administrative channels. Together it is possible. However when delving deeper into this situation we see that it is not simply a matter of getting your nine neighbors together and marching off to the office. Neighbors do not always get on with one another, there are disputes about who should be burdened with the responsibility of facing the DJB, who has the time, who has the skills to fill out the form. Often neighbors are in conflict with each other or wish to be affiliated with other family members who do not live close by. As one man related, he did not have a family group to be a part of, he was old and his family often traveled back to UP to help out with agricultural harvesting. His only option was to wait at the end of water lines, be humble and take any water that was left over. He was often insulted and saw water wasted before he was given a chance to fill his container but, as he said; ‘I need water, what can I do’?

Alternative water Sources: Private Water Merchants, Oklha Pumping Station and Mohti Mills.

Those with no political or social connections in Sanjay Colony are effectively locked out of official avenues of water distribution provided by the DJB. They still require water however and so must make alternative arrangements. Privately operated water tankers are filled from privately owned tube wells and park along a main road about two kilometers away from Sanjay Colony. There are three tankers parked regularly which are used by Sanjay Colony residents, however the drivers can contact friends if there is

demand for more water from residents. Water costs residents US 4cents per 20L of water but it is often of questionable quality and is used, if possible, for bathing and washing of clothes rather than drinking or cooking.

Oklha Pumping Station which supplies water to all piped connections in the area and the water tankers which service Sanjay Colony, will also distribute water to individuals. Residents of Sanjay Colony don't particularly like utilizing this source though as they are looked down upon by DMC and DJB employees. Also there is often nobody present to operate the tap, which requires a removable handle and so can't be operated without an attendant.

Mohti Mills, located three kilometers away, in the opposite direction to the Oklha pumping station is perhaps the favorite alternative for the residents of Sanjay Colony as the water is generally of a decent quality and costs the same price as that bought from private water merchants, Rps2.00 for 20 L.

Storing Water.

All families in Sanjay Colony store water. The data collected for this thesis suggests families store enough water for between 4 and 7 days normal use which translates to between 710 L and 1244 L. Water is stored in plastic containers which are kept directly outside the house. A simple inventory method is used to keep track of the age of the water in each container and this dictates its use. The tasks that water is used for are ranked hierarchically as mentioned above, with drinking water at the top, requiring the freshest water, and house cleaning (floor washing) at the bottom. This ranking of water of different qualities will be examined in more detail in Chapter five. Storage tanks are generally between 40ltrs and 60ltrs in size, so that water can be carried from pipes close to home or fixed to a bicycle and brought from further afield such as water tankers, Mohti

Mills or the Okhla Pumping Station. Generally a larger container (100-200 L) is used to empty half full containers which is kept as an emergency supply. This water is used to wash clothes or to bathe when it is known that more water will be available in the near future.

Conclusion.

Water in Sanjay Colony is controlled and distributed by actors who are legitimized through political mechanisms and power relationships. They are 'elected' because they control water supply to Sanjay Colony and they control water supply because they have political connections to service providers such as the DJB and the DMC. This chapter has detailed the prevalence of clientelism in Sanjay Colony, and introduced the consequences of this for water consumption. The stronger the relationship between consumers and suppliers, the more water is available. The importance of these relationships, both between individuals and between individuals and larger institutions and local elites, is difficult to overstate, as water is distributed based directly on the strength of these relationships. These relationships then form our first pillar of water consumption. The following chapter will focus on how this water, once acquired, is consumed in the home in an attempt to establish how more tangible factors, notably technology, contribute to water consumption.

5. Water Use in Sanjay Colony.

Introduction.

September 28th 2010 1:47pm

'Everyday is the same, we wonder about where we will get our water from. We worry. We worry if we don't get enough water from the tap. We worry that the tanker will not come today, maybe not tomorrow. We don't want to pay for water because we have no money. So we use very little water'.

Q; What would you use water for if you had more?

A; 'If we had more water we would not have to worry so much'.

The unreliability of water distribution in Sanjay Colony discussed in the previous chapter forces residents to conserve water. It is not to say that there is not enough water, rather, that not being able to count on a reliable and consistent water source means water must be hoarded in case it is not available for a longer period than expected. Of all my informants, only one person felt that they did not have enough water every day. However, all of my informants felt that not knowing where or when that water was to be available was an extremely difficult aspect of life in Sanjay Colony. This is an important distinction to make. As the previous chapter explored, it is the relationships between individuals and service providers that facilitate the acquisition of water and, at the same time, helps to create water security, of a type, among residents of Sanjay Colony. This chapter will explore how the residents of Sanjay Colony use that water when they get it.

In a typical home in Sanjay Colony there exist four primary water intensive activities which take place; bathing, laundering of clothes, cooking (including cleaning of cooking utensils), and human waste disposal. The average water use of those people surveyed in Sanjay Colony using these four categories is 29.64 lpcd. As stated above, this is perceived as an adequate amount of water to maintain acceptable levels of cleanliness of both home and body, to prepare food and dispose of human waste. In order to achieve this feat, people have developed and standardized various techniques and practices that maximize the utility of water while minimizing water wastage. These techniques, the *how* of water consumption, will be catalogued below and provide valuable ideas for others living with or facing limited water shortages and also provide us with empirical evidence upon which to further investigate *why* people consume water in the way that they do.

Table 2. Shows the amount of water used, per person on an average day, per task in Sanjay Colony.

Toilet (human waste disposal)	0.5L
Cooking (including drinking)	4.26L
Bathing	13.55L
Laundering	8.63L
Cleaning	2.71L
Total	29.64L

Table 2. Water use in Sanjay Colony per person, per task.

Human Waste Disposal.

0.5L per person per day.

September 30th 2010 12.15pm

The water has stopped flowing through the pipes for today; all the containers that will be filled have been carried back to the house. It's still dark. The families living next to me are beginning to start their day. Women are preparing chai and flattening roti for the morning meal. I climb the stairs to the roof of the house where my room is situated. The owners of the house have converted the concrete slab of their roof into accommodation consisting of three small rooms, one of which is mine for the night, and an outside area for cooking and relaxing. The two families who live next to me have installed a drainpipe which runs down to the alley outside the front door of the home below. The concrete area around this drainpipe acts as kitchen, bathroom and toilet and I am beginning to understand just how crucial the removal of waste water from the home is. Too self conscious to relieve myself outside my neighbors' front door and in full sight of people in the alley below I decide to use the public facilities. The 'Jungle'. Making my way through the laneways to the main road I turn north and join a thin trickle of people making their way toward the 'jungle'. The jungle is actually an area of lightly forested, government land, marked in Map 1. The area is roughly triangular, with a newly built Delhi Metro line running overhead. Stepping through a two meter wide gap of brick wall that has been knocked down to allow residents ease of access to the area, I notice that the other people ahead of me are all women and are making their way across a 30 meter stretch of cleared earth, before veering off to the right, into the foliage. Each person is carrying a small plastic water bottle about 0.5L in size. I assume that the right is for women and the left is for men and so take a path to the left to look for somewhere to 'go' myself. After walking about ten meters into the scrub I am completely alone and out of sight of any people who might be coming through the hole in the wall. I squat in the dark, aware of insects crawling on my feet and

thighs. As I begin to make my way back, my foot squelches on something and I get a whiff of faeces. It's still too dark to see but I can guess that I've just stepped in the toilet.

Every human being on the planet emits, on average, slightly less than 100grams of faeces and about one and a half litres of urine every day (Black & Fawcett, 2008: 3). To dispose of this discharge is a function that concerns everybody equally. The act in itself is thought of as unmentionable by most of the human race, an act done in private, denied discussion and the sooner forgotten the better. That this is the case can be seen through the semantics deployed to disguise this particular social nasty. 'Going to the restroom' for example or 'using the bathroom' are both commonly used phrases to politely explain absence for defecatory purposes. Often no explanation is offered at all and none asked for, such is the taboo surrounding the depositing of human waste.

Private rooms, which transport waste out of sight, to become out of mind, are fast becoming the preferred facilities across the globe. A flush toilet with a water sealed u-bend is the ultimate in sanitary comfort and convenience. And so it is for the middle class in New Delhi. It is an expression of culture which has placed the flush toilet at the peak of civilized human waste management (Narain, 2002:57-60). Everybody wants one, however in developing countries such as India, this is simply not feasible either financially, as each household connection costs several hundreds of dollars to install, or practically, due to a lack of available water¹⁴.

According to The Central Public Health and Environmental Engineering Organisation (CPHEEO), in India around 12.04 million urbanites do not have a recognized place to go to the toilet. The eradication of 'open defecation', as it is known in development parlance, poses a challenge for policy makers and development agencies who wish to provide 100% access to basic sanitation as in line with the Millennium

¹⁴ Black and Fawcett estimate that in Europe each person uses approx 15,000 liters of water per year in the home (2008:8).

Development Goals touched upon in chapter three¹⁵. The ultimate objective for India's Ministry for Urban Development, is to completely eradicate open defecation by providing sanitary toilets to all urban residents by 2025 (CPHEEO, 2008:23-25). Those living in Sanjay Colony however, given their status as illegal squatters, are not 'residents' of Delhi and so are exempt from such a scheme. And so it is for millions of urban residents living in unauthorized colonies and slums throughout India and the developing world.

Cultural Construction of the Toilet.

Disposing of human waste for residents of Sanjay Colony is an experience governed by strictly observed cultural norms. A lack of sanitation services within the colony has created what is, essentially, a decentralized cesspool servicing the majority of the 50,000 residents, which must be carefully maintained. The reason I was all alone during my foray in to the Jungle is because the residents of Sanjay Colony have carefully designated areas for toilet use. After one area is 'filled up' with faeces they let the waste break down and move further to the 'right' (East). The cycle takes approximately 6 months of deposits and moving before they begin again where they started.

Women visit the 'jungle' before the sun comes up. Men, as a rule, do not use the jungle until after the sun is up to allow women some privacy. Men who are seen in the jungle before sunrise are viewed with suspicion and told to leave the area. Despite men not being welcome, women will often go in groups of two or three to maintain security. Men have more freedom however and many use the jungle only to defecate. Men urinate on walls, posts, trees, so long as it is causing no direct discomfort or insult to others. Children who attend school are encouraged to use the facilities provided by the school. Both the Deepalya School and the Government-run school within Sanjay Colony have

¹⁵ The Millennium goal is access to both clean drinking water and basic sanitation services.

separate toilets for boys and girls and employ an attendant to make sure they are kept clean. Children who are too young to go to school are also deemed too young to go to the jungle alone, and thus if there is no one who can accompany them for the 20 minute round trip, they will squat over open drains in the front of their home. There exist public toilet blocks, such as the Sulabh Shauchalay, which is a pay-as-you-use toilet and bathing facilities and are located throughout India. The one located in Sanjay Colony is one of the largest of its kind in Delhi, with 200 seats. Residents, however, testify that the water was cut off in 2006. The caretaker now orders a water tanker weekly and has raised the entry price accordingly. None of the informants interviewed use the facilities on a regular basis citing uncleanliness and cost as the main deterrents.

That a waterborne waste disposal system does not exist means that residents of Sanjay Colony use relatively little water disposing of bodily waste. A container holding 0.5ltrs is carried by each person going to defecate and is used to wash the anus and hands when finished. There are residents with septic tank toilets within Sanjay Colony but at a minimum cost of USD135, for installation it is well out of reach of the vast majority of families. Essentially, defecating in the Jungle is the normal practice for all but a tiny minority of residents of Sanjay Colony. Given what we know about the development of sanitary conditions in India, and that the middle class enjoy standards which are in line with most European nations, it is important to explore how residents of Sanjay Colony deal with sharing their toilet with 50,000 other people.

Standardization and Normalization.

The standardization of practice is multi- dimensional. New technologies, adopted for their time and money saving capabilities or aesthetic values bring with them particular ways of performing everyday tasks and subtly alter the way we think about and consume resources (Shove, 2003). The wide spread adoption of the flush toilet is a good example

of this. The flush toilet, as mentioned above, is above any other form of waste disposal system in terms of hygienic convenience. Residents of Sanjay Colony know of this technology however few could ever dream of having access to it. In Sanjay Colony the toilet is the Jungle. Residents of Sanjay Colony view defecation as unwholesome a subject as anyone else, however living in urban poverty means that it is privacy, intimately linked to space, which is most compromised when normalizing ideas of a standard waste disposal method. With close to 50,000 residents using the same area for this purpose, going to the toilet in private is impossible. As stated above, women ‘go’ under the cover of darkness and so are less visible than men however they still must coax their bowels into action while in the close proximity of strangers, usually many strangers as well as a handful of neighbors and most likely a couple of family members. That this is the same for the vast majority of residents legitimizes this.

This is an important concept to grasp when talking of sustainability and the use of natural resources. To zoom out from Sanjay Colony for a moment and imagine the world’s resources as being reliant on actions and decisions made by people from across different national borders, we can imagine that we are in fact all sharing these limited resources. Much of our consumption is driven by that which is legitimized by our social group or to protect against that which we believe to be abnormal or taboo. Increasingly, as people become wealthier their consumption shifts to items of status, rather than mere survival and new standards are created based on such ideas. Those surveyed in Sanjay Colony felt the biggest problem with using open forest as a toilet was not that it was unsanitary or that they minded defecating while in full view of neighbors and relatives but that it was too far to walk, too inconvenient. Defecation has been accepted as a natural physiological necessity and the taboo has been compromised by this necessity. As Elizabeth Shove believes, to live a ‘normal’ life has far reaching implications for natural resources and the environment if ‘normal’ is taken to mean the standards enjoyed by those in wealthier countries (Shove, 2004:77). Fitting in to our society means we

consume in particular ways. The home provides a perfect domain to explore how we consume natural resources through the use of technology which has been, over time, legitimized as 'normal'. How we choose to utilize our home as a technical system of water delivery and waste disposal says something about our views about what is acceptable and standard. The residents of Sanjay Colony utilize their homes in a manner that both conforms to their specific socio-cultural situation and at the same time is extremely effective in reducing their water consumption.

Bathing.

13.05L per person per day.

October 1st 2010 11.25am

The water truck didn't come yesterday but I am told that it will probably come tomorrow. Even so today is not tomorrow and probably is certainly not definitely in Sanjay Colony, so for today the family must use water for bathing sparingly. A 45L tank which was collected the week before is chosen as the water ration for bathing for the family today. It is not the oldest water they have, which will be used for clothes washing if the water truck comes tomorrow, nor is it the freshest, which will be kept strictly for drinking and cooking. The eldest boy is first to bathe as he must leave the family home first to be at school at 10am. He attends the local Government school located in Sanjay Colony and being properly groomed and washed is a must. Arriving without combed hair, clean skin and a clean uniform would be an unbearable humiliation.

Water is transferred from the 45L container to a smaller 10L bucket. The bucket is taken outside into the alleyway along with a smaller ladle for pouring the water from the bucket over the head. Soap is applied vigorously, working up a lather over the entire body, naked except for a pair of shorts. When the body is fully covered with soap, it is worked furiously into the hair,

under the armpits, the legs and feet, back and torso. The ladle is then used to rinse soap from the body. The first ladle rinses most of the soap from the boy's hair, the second rinses it completely clean. The third ladle is poured over the chest and the fourth ladle removes any excess soap from the legs and feet. There remains a small amount of water in the bucket, a litre or so, with a soapy residue floating on top. This is taken inside and placed next to the 45L container of washing water, ready for the next person.

As Wilhite explains, cleanliness of both the home and the body is related to ideas of spiritual purity in Hindu culture (Wilhite 2006 :172). Ritual purity is fundamentally different from being clean or hygienic, although the two overlap. (Alley 2002:38). The purpose of this section is to attempt to deconstruct how and why water is used in particular ways to clean the body. What function does the consumption of water actually fulfill? The above account of a typical bathing sequence immediately reveals important water saving techniques as well as attitudes and beliefs linked to water consumption which are somewhat less obvious.

Ranking Water.

The storage of water for household use is not uncommon throughout the world for those who depend on water sources other than a regular piped connection. What is interesting when looking at the residents of Sanjay Colony is the system they use for ranking water. The freshest water is reserved for drinking and cooking while old or stale water, which is judged less desirable for drinking is deemed adequate for certain tasks, such as bathing, laundering clothes and household chores. This simple wisdom has been largely ignored in thinking about water delivery and waste disposal systems such as those discussed in chapter 3. That water is a valuable resource, regardless of the quality¹⁶, is proved in

¹⁶ By this I mean water that is not toxic or poison in any way merely not of drinking quality such as untreated bore water.

several activities by the residents of Sanjay Colony. This categorization, based on quality (age of stored water) allows water to be used in a more efficient way than categories such as tap water and waste water. When it has been confirmed that water will be available for collection, older water will be used immediately and replaced with less stale water, which in turn will be replaced by fresh water of which some will move along this line if not used.

Water Application.

The careful use of smaller vessels to ration water is an important water saving technique employed by residents of Sanjay Colony. By using a smaller bucket to initially take water from the 'bathing container' which was set aside for use for the family that day, each member knows how much water he or she has to bathe with and so can use an appropriate amount. This is much more difficult to keep track of when bathing using a piped connection for example, as arguments in large families with limited hot water supplies prove. Also, by using a smaller ladle again, each individual application of water is carefully directed to where it is most needed and only for its specific purpose.

Specific Water Use.

Soap is the main ingredient required to clean one's body. Water is used primarily as a means to rinse soap from the body and secondly as a solvent to create a cleansing lather of soap which is thoroughly applied to the body. Soap is applied to the body first, used to scrub and wash the hair and body and then water is used to rinse excess soap from the body. Water and soap are used independently of one another. This differs greatly from the Western European tradition of applying soap while immersed in water. The residents

of Sanjay Colony not only use a fraction of the water of Europeans to bathe, the soap they do use has a chance to perform its function before being rinsed off.

What this description of water consumption techniques alludes to, but does not fully capture, are ideas about modesty, hygiene and cleanliness which influence that consumption. To bathe perched over an open drain by the front door of one's house is a practice that is completely acceptable for men and children living in Sanjay Colony. This is for a number of reasons. First it is practical to be close to a drain of some sort when rinsing the entire body with several liters of water. Secondly, homes in Sanjay Colony do not have a segregated area for washing, cooking or living, rather they are combined, and so bathing, as to not inconvenience other family members in the home, is performed outside. Women, however, bathe indoors. Public female nudity, can be met with harsh disapproval and even violence amongst certain branches of Hinduism (Gupta 2000:178). To accommodate privacy for women, each home in Sanjay Colony has a drainage system which connects to the drain outside the house. The floors of homes in Sanjay Colony are invariably made from cement. With a drain in one corner leading to the outside, and a concrete floor, homes are appliances in themselves which allow women to perform their multiple consumption tasks simply while also maintaining their privacy.

Grey Water Re-use.

When I asked my research assistant if we should try knocking on a door which was closed he replied;

'When the door is closed and there is water pouring out of the drain, you know the wives are bathing themselves so they don't have time to talk to us. '

All of my female informants bathed inside their family homes thus I was unable to see how this was done. In Sanjay Colony, women bathe indoors, out of public view. My female informants described how they bathe fully clothed, standing in the corner of the family home, either standing in a large washing tub, to catch water or above a small drainage hole which allows water to flow into the drain outside the home. Women apply soap directly to their clothing, creating a thick lather of soap and water. As the water soaks through the clothes to the body, the clothes are also cleaned. Clothes and body are then rinsed using the same method as males. Excess water which does not collect in the washing tub to be used to wash the floor of the home, finds its way to the drainage hole and out into the alleyway. This practice of washing inside the family home which is designed primarily to protect a woman's modesty, demonstrates how the socio-technical regime which is the bathroom in Sanjay Colony facilitates the re-use of grey water and thus reduces water consumption. Grey water is the term used for water used in the home which is not contaminated with faeces and is thus safe for re-use for tasks other than drinking or cooking.

That water can be used for three separate purposes sequentially is a concept which deserves further investigation. Bathing, washing of clothes and the application of water and soap to the floor for house cleaning is achieved with each droplet of water used by women bathing. This relates to the ordering of water visited above. That the water that is deemed fit for laundering is also deemed appropriate for bathing, but not for drinking or cooking, is important in that it provides a concrete scenario through which we are able to re-construct how water is viewed, as a resource with multiple forms or stages of suitability or quality. Cultural assumptions of how women should bathe, behind closed doors and in private, combined with limited availability of water and space, have created a practice by which the value of water is fully understood and its uses are fully realized. Water is not deemed to be 'un-useful' simply because it has come in contact with human skin or clothing, rather it has simply changed what it is useful for. It becomes useful for

different but equally important tasks. This valuing of a scarce resource, and its utilization suggests vital attitudes to sustainable living which can be divorced from this specific situation of women bathing in a slum colony in and used to inform water use in every home. In water- scarce countries such as Australia, parts of the United States and Middle Eastern states such as Israel and Egypt, there are great opportunities for this kind of water reuse.

Laundering.

8.63L per person per day.

October 4 2010, 10.00am

It's already hot. It's only 10.00am but the temperature is already in the high 30s, the humidity must be in the 80s. I'm sweating profusely in a long sleeve shirt and jeans, shoes and socks, all in the name of modesty. Dr. Gowda, my research assistant is leading me further and further into the galis of Sanjay Colony and I'm not ashamed to admit that some of the perspiration I can smell on myself is of anxiety. We take a sharp left, hop over an open drain and come up on a young woman washing her family's clothing. Dressed in the multi-colored cloth of her everyday 'working' sari, crouching with her bottom and soles of her feet on the ground, knees up around her ears in the pose seen all over South and South East Asia, she works in the door of her brick and corrugated iron shack. Gowda asks her politely in Hindi if she would have a few minutes to answer some questions regarding water, I smile politely, hands clasped behind my back doing my best 'I may not look like I know what I'm doing but I do' routine, feeling embarrassed and foolish.

The shirt the woman is washing is scrunched in to a tight ball; she applies soap to her hands from a small sliver resting in a metal dish kept to her left. To her right sits a 30L bucket of water $4/5^{\text{th}}$ full. A small handle less ladle, almost like a milk jug but with no handle floats in

the bucket. The woman works the shirt into a tight ball, she then lays the shirt out flat, rests the toes of her left foot on the bottom hem of the shirt so that it's held in shape, and proceeds to work up a lather of soapy foam. she kneads the soap into the cloth balling it up again and adding small, half handfuls of water from the fingers of her right hand , she unrolls it, laying it flat again on the floor her home, and continues rubbing her hands over the shirt to apply the soap more evenly. Hand washing. When the shirt is deemed clean it is rinsed with a ladle of fresh water on each side from a large bucket of clean water and then dumped on the floor, waiting to be hung and dried by the sun.

Ranking Laundry Items and Defining Cleanliness: A woman's role in standard setting.

When and how vigorously clothing is washed depends on a compromise between accepted standards of cleanliness and the availability of water, a balance between resource availability and culture. In Sanjay Colony, small children's clothes are the first to be cleaned. Having young children in clean clothes, especially infants, is important for reasons both practical and social. Practically, clothes which have been soiled by bodily wastes, such as feces, are likely to spread sickness and disease. Socially, children will be sent home from school if they are wearing dirty uniforms. Also, presenting the family in clean clothes is a sign to the community that the wife is acting responsibly. Cleanliness, combined with neat personal grooming is expected to be maintained by the wife and is of great importance in maintaining dignity within the community, judgments about a family's appearance weigh heavily on the wife's domestic ability. In this sense it is women who decide upon, and maintain, the boundaries which define ideas of cleanliness.

The 'clean' water which is used to rinse the soap from newly washed clothes is in fact the most stale water the family has stored. As related above, women wash their clothing

daily as they bathe. Men's clothing however, and clothing for children are washed approximately every 3rd day in small batches. Clothes are selected for washing depending on what is perceived as being dirty. This is an important point to make. Dirtiness is a social construct and is relative to what is perceived as acceptable and normal. Dirt has its place and it is not on clothes (Douglas 1977). Wearing an item of clothing does not make it automatically in need of laundering. Nor does dirt on one particular part of a garment relegate the entire garment to the dirty washing pile. Clothing is often 'spot cleaned' to remove stains which conserves water while maintaining acceptable levels of cleanliness.

Those items which are the most soiled are washed first to make sure there is enough water to get them sufficiently clean. Babies' clothing for example is washed first. This means essentially that once items that are truly dirty, stained, and thus un-wearable, are clean, if there is sufficient water left over, other garments will be cleaned also. Commonly, if there is not enough water left for washing, particular items that are needed will be spot cleaned. For example school uniforms or shirts which the husband wears to work, will be spot cleaned under the arms, on the collar and on the cuffs where needed. These clothes washing techniques, combined with the prioritizing of laundry items from truly dirty to 'ok for another wear' raises two interesting points. The first is that by washing each item individually, and not immersing them all together in a tub of water, items which are truly dirty, such as baby clothes, do not contaminate a large amount of water which could be used to wash other clothes. Water is added to clothes as needed from a large bucket using the hands or a small ladle. This not only saves water, as only the specific amount of water needed to clean a particular item is used, it allows for items which only need spot cleaning to absorb less of the daily water allocation.

Laundering is also dictated by poverty. Residents of Sanjay Colony do not own multiple sets of clothing. This is another decisive factor which dictates how often washing is done and why judgments about the 'dirtiness' of clothing must be made carefully. Planning

what is to be washed and reconciling this with the availability of water is a skill that is learned over time. Households in Sanjay Colony employ the same techniques of cleaning and the same ranking methods to maintain a clean family. It could be expected that if water availability were to fall, practices would adapt to meet this challenge. When resources are limited behavior must adapt, shift and become standardized. With a resource such as water, which is used as a tool to reinforce important standards such as cleanliness, if that resource is increased or decreased, the actions for which it is used and the standards which it used to maintain, it is reasonable to infer, will also change.

Water Use and Food Preparation.

1.74L per person per day (not including drinking water).

The staple food in Sanjay Colony is dahl, a thick stew made of lentils and spices, and roti, a thin bread made from wheat flour and water. It may be a little too much to claim that residents of Sanjay Colony prefer these dishes because all water used in their preparation is absorbed into the food, but it could be argued that water availability does restrict diet and encourages absorption cooking techniques. Dahl is prepared each day and is consumed at each meal. Roti is also consumed at each meal but is made fresh for the morning meal and again for the evening. Dahl is kept in, and seved from, the pot in which it is prepared. Roti is prepared on an aluminum tray upon which water is added to flour to make simple dough which is then divided into smaller lumps which are rolled flat. The aluminum tray is used as a working surface but also to catch excess flour. The roti is then cooked on a heated skillet over a gas flame. Roti is stored beneath a cloth. A ladle is used to transfer dahl to aluminum plates and roti is used to scoop dahl into the mouth.

Cooking utensils are washed directly after they have been used to prepare the

meal. Unclean utensils are washed using the hands and a shallow tub of water with approximately five liters of water. Less dirty items are washed first so the water remains as clean as possible for as long as possible. Drinking quality water is used for both cooking and the washing of cooking utensils. As each item is cleaned directly after use there is no need to use soap or any type of abrasive scrubbing brush. It also means that very little water is needed to clean away pieces of food matter as it does not have time to harden or congeal. Clean items are left to air dry, usually on the aluminum tray which was used to prepare roti. Water that has been used for cleaning cooking utensils and containing food is used to wash away any refuse that has collected in the drain in front of the house and flush it further 'down drain'. To get some perspective here, approximately 10 liters of water is enough to wash the dishes for a household of six or more people, twice a day. That the residents of Sanjay Colony wash their utensils after the breakfast meal so they can be used again for the evening meal, rather than leaving them dirty, sitting in a pile to be done at the same time as the 'dinner dishes' means less water is needed to clean the utensils. Residents of Sanjay Colony own few eating and cooking utensils. They must wash their dishes after use unless they wish to eat from dirty plates during the next meal. This is a theme that occurs also with clothes washing. By owning very few artifacts which depend on water to be maintained, residents of Sanjay Colony are able to consume less water. This interesting link between poverty and sustainability will be looked at more closely in chapter seven.

Conclusion.

The residents of Sanjay Colony are severely restricted in their access to fresh water. They are resource poor in this respect, and so have created techniques through which water is used to its full potential. As explored above, the *classification of water* for

different tasks, the use of the same water for *multiple tasks*, and the *normalization of tasks* which use small amounts of water, all contribute to the water use regime of the residents of Sanjay Colony which sees them use just 29.64L of water per person per day. While the human body needs only approximately between two and four liters per day to function, the remaining 25.64L are used according to standards that have been set against cultural constructions of what is acceptable and desirable, the amount of water available and the technology through which it is consumed. The outcome of this is that water is valued in unique and specific ways. Ideas of cleanliness are maintained and reinforced. Appearing clean and well groomed is of paramount importance and conveys values to others both within and from outside the Sanjay Colony community. Taboos, such as defecation and public nudity have been compromised by space and privacy but have been reconstructed to account for this. Behavior and resource use are intimately entwined and Sanjay Colony provides us with a reality which is invaluable when seeking to understand how people survive, what must change, what must be renegotiated, when water is scarce. The following chapter will delve deeper into what determines people's use of water in the home, which is of great importance when thinking about what motivates us to consume water in the specific ways that we do.

6. Where Consumption Happens: The Meeting of Culture, Technology and Social Structures.

Introduction.

As chapters four and five have shown, how we consume is a complex mix of the tools or devices we have available to us, the way institutions construct the suitability of certain objects and actions, and the ideas, motivations and ambitions, or culture, of different social groups. This chapter will explore each of these concepts in relation to Sanjay Colony in an attempt to answer the question posed at the beginning of this thesis; what determines household water consumption?

As an explanation of socio-technical regimes, Geels states;

Socio-technical regimes refer to the semi-coherent set of rules carried by different social groups. By providing orientation and coordination to the activities of relevant actor groups, socio-technical regimes account for the stability of socio-technical systems (Geels, 2004:33).

While Berkhout, Smith and Stirling describe them;

As patterns of artifacts, institutions, rules and norms assembled and maintained to perform economic and social activities (Berkhout, Smith, Stirling, 2004:59).

Both definitions get to the essence of how a combination of individuals (culture), artifacts (tools, devices, appliances), and institutions (groups of actors, politics, society), will facilitate specific economic and social activities. Maslow's hierarchy of needs holds that in order to live, we humans need air, nourishment, sleep, water (in Pepper et al, 2009). It

is fair to say that to live in cold climates we need a source of heat. These are what Maslow calls ‘lower order needs’.

How we satisfy these needs depends upon a regime which relies on a technical aspect: the tools we use to fulfill these needs, a social aspect: the structures we as humans create to regulate and facilitate these needs, and a cultural aspect: the goals we as individuals and groups deem appropriate and methods used to achieve them. Important also are the historical pathways down which those that came before us have trod, for as we are becoming increasingly aware, what is deemed appropriate to one generation may be deemed inappropriate for the next as was explored in chapter three.

Technologies are superseded and become obsolete, our view of the world changes, natural resources are exhausted and alternatives must be found which require new socio-technical regimes to utilize and legitimize. This chapter will once again use the typical household in Sanjay Colony to explore the amalgamation of culture and technology to shed light on how a socio-technical regime combined with structural constraints impacts upon specific consumption practices.

The House as Consumer.

As explored in Chapter three, London and New Delhi and in fact the majority of large cities throughout the world, supply their inhabitants with water through an extensive technical system of pipes, pumps, dams, valves, taps and a vast array of other pieces of technical equipment needed to transport water to millions of consumers across vast distances. Perhaps more importantly, this system is maintained because it fulfills the needs of consumers. Those lower order needs, mentioned above, which require water, are taken care of with a flick of the wrist. Water is on tap. The flip side of this, which is of importance when thinking about sustainable use of resources, is that the way people

consume resources, such as energy and water, in the household becomes invisible. As Wilhite and Lutzenhiser explain, at household level, resources that are consumed are 'embedded in habits and are therefore hard to recognize and harder still to imagine changing' (Wilhite & Lutzenhiser, 1999:283). People do not so much consume a resource, rather consuming what that resource provides, such as heat, light, cleanliness etc.

Utilitarian views explored by Braudel (1973) suggest that the household is organized depending on the tasks which will be performed within. Items of hardware are built into this material context. A large cavity in the kitchen anticipates a refrigerator, taps in the laundry with no basin to catch the water anticipates a washing machine, light fittings assume electricity will be used, a chimney and fireplace assumes fire will be used to heat a specific room in the home. As household activities change, as new appliances are developed and introduced to consumers for example, so then will the physical nature of the house. The house is, in effect, the ultimate appliance, a 'Swiss army knife of consumption' which we humans use to fulfill not just our lower order needs but also our high order needs as well, such as self fulfillment and the respect of others.

Homes, the physical structure of the dwelling, and households, the demographic of those that live within that dwelling, differ throughout the world. Their construction is effected by cultural influences, practical aspects, to take advantage of local environmental conditions and materials, and by various institutions and regulations. As Arnold and Heart describe, the Siglit, a group of Inuit from the Bering Strait region, constructed their houses using whatever material was available to them. With temperatures reaching as low as - 45 degrees Celsius, obviously shelter and warmth were important factors to consider when designing their homes. Pieces of wood, stone and whale bone were combined to make a cage like structure over which animal skins, moss, lichens, clay and snow were used to make the structure airtight. A tunnel was built below ground and supported with pieces of wood which trapped warm air in the structure while

allowing cold air to flow out. The room was heated by lamps burning whale blubber which were kept above the floor, leaving the ground cold enough to store meat while heating the room above (Arnold & Hart, 1992).

As Wilhite explains, houses built in Kerala, in Southern India, in the 18th and early 19th centuries were created in consultation with a priest or astrological authority and would conform to certain principles of *thachusasthram*, a specific type of construction knowledge held by the *Viswakamos*, an artisan caste. Thachusasthram is a science which encompasses all aspects of the house's construction, including the location, size and shape of the plot, the number of stairs leading to the front door, the location of the various rooms and the timing of occupation (Wilhite, 2008). This echoes claims made by Altman and Chalmers which view the house as an expression of culturally specific ideas of privacy, territory and personal space (Altman, I. & Chalmers, M., 1984).

As Glantz relates, the taxation of glass by the English Crown, which led to the window tax, hugely affected how homes were constructed between 1656 and 1891 in the United Kingdom. Taxation legislation stated that any home having more than four windows should be taxed on any other aperture which allowed light or air into the home. This tax increased as windows were added, a tax on eight windows, ten windows, twelve windows, up to twenty windows. One single brick removed to provide ventilation was deemed a window and was thus taxed. This prompted builders and architects of lower income dwellings to severely reduce the number of windows so as not to place a heavy tax burden on their inhabitants. Home owners, with more windows than they could afford promptly boarded or bricked them over or built houses designed to fall into a particular window tax bracket, the results of which can still be seen in many parts of inner London today with houses having seven windows, nine windows, thirteen windows etc. The wealthy, in contrast, built increasingly opulent homes with more windows as they became badges of wealth and status (Glantz, 2008).

The way in which we construct our homes depends on three important factors. The first is to provide for our lower order needs. For this we employ specific technologies, a plumbing system for example to deliver water and dispose of our waste. The second is our cultural beliefs, for example the shape and size of our rooms, the importance of outdoor areas, windows and number of storeys. Third is how we relate to various structures and groups around us, such as those institutions we as a community have empowered to regulate and standardize homes with regard to safety, infrastructure and aesthetics.

Increasingly, how we anticipate our consumption of resources is contributing to this too. An understanding of how we consume through our home is vital when thinking about how to move towards more sustainable methods of resource use. The residents of Sanjay Colony consume resources through this mix of culture and physical technology yet they consume under 30 lpcpd which provides us with an opportunity to examine how this mix of consumption determinates manifest themselves through everyday household activities and how this consumption is restrained or maintained by aspects of poverty.

Structural Constraints on Housing in Sanjay Colony.

The Slum Area Act of 1956 of India, defines slums as ‘those regions where buildings are unfit for human habitation for reasons such as dilapidation, overcrowding, and a lack of ventilation, light and sanitary facilities’ (Saumitra et al., 2006:231). Slums are a manifestation of two aspect of economic growth; the rapid increase of the urban population and the “urbanization of poverty” (UN-Habitat, 2003). As rural-urban migration occurs, overcrowding results, forcing land prices up. This creates pressure to fit more people onto smaller pieces of land. Poorer people are forced to cheaper areas of the city. The average home in Sanjay Colony is between 10 and 11 square meters (sqm), which is about 1.6 sqm per person. Needless to say, space is a major factor when

residents of Sanjay Colony are planning the construction of their homes. Money too is important. The average income per person per day is, depending on the strength of the dollar, a little more or a little less than USD\$1 per person per day. While these figures are useful, it must be said that there exists a wide spectrum of incomes and dwelling sizes in Sanjay Colony. Homes of wealthier residents are built of cement rendered bricks and these owners often rent living space on the roof to poorer families. These rooms, such as the one I stayed in, can be as small as 2x2 meters, and house an entire family. Poorer families use scavenged pieces of corrugated iron and plastic in an attempt to keep dry from monsoonal showers. Many of the oldest dwellings use the walls of existing factories and offices bordering the slum as a base and extend upon them.

The status of the area also, as an illegal slum, means fear of eviction hangs heavy over the residents, discouraging substantial investment in construction and home improvement. Because of this, poorer residents, and those only newly arrived to Sanjay Colony are understandably hesitant to make large capital investments in the structure of their homes. When it comes to the design and layout of homes however, there are certain similarities which are vital to how water is consumed.

Technical use of the Home and Water Consumption.

Wilhite, in his study of changes in household consumption in Kerala, states;

The house as a constructed artifact is the locus of an increasingly complex set of technological infrastructures that make the use of household electrical appliances possible, and that steer the design and use of construction materials in ways that affect cooling and encourage air conditioning (2006:11).

The same can be said of the house regarding water consumption. The house itself is an artifact which promotes consumption in particular ways and through particular technologies. The typical home of a resident of Sanjay Colony is a single room. This room functions as the bedroom, living room, kitchen, bathroom and laundry. The constraints of space, money and legality mentioned above interplay with the necessities of the human body to create a living space which has multiple uses, and can transform between these easily. The two most crucial design traits of these houses regarding water consumption are non-porous flooring and drainage capacity. The ground of Sanjay Colony, in its entirety, is covered in cement. This is predominantly to prevent water-logging, and to direct water into drains and away from the colony. Houses also invariably use cement as flooring. Like ceramic tiles, cement does not absorb water, is relatively cheap and is easy to maintain and repair. It is therefore ideal as flooring for the Residents of Sanjay Colony. The flat hard surface also serves as a work bench to prepare meals, a wash board to scrub clothes, and a sleeping area upon which to unroll sleeping mats in the evening.

Homes in Sanjay Colony typically have either a step up to enter the home or a small retaining wall, about 20cm high at the base of the front door. This is to prevent water from entering the house during monsoon season. Invariably, each home also has a drain pipe either in the corner of the home or at the base of this small wall. This allows water to flow away from the inside of the house and into the drains which run along the front of the houses on both sides of the lane. This drain effectively allows the house to act as a large 'basin' and thus water is very much incorporated into the everyday use of the house. Where water flows, in which direction, from what height and at what pressure is completely controlled by the home 'user'. That these spaces are designed for this purpose is, once again, because of a lack of space and money but also, and this is important, because it is practical to utilize the home in this way. When asking my female informants about the convenience of having to do the laundering and bathing inside the

house the responses given were that it was perfectly convenient as there was nowhere else which provided such ideal facilities as adequate drainage, a hard, large, flat surface to launder clothes, and privacy to bathe. The physical home of Sanjay Colony, in interaction with the attitudes of its users, defines the ways by which water will be consumed. It is an appliance in itself, the utilization of which is governed by culture.

Socio- Cultural Aspects of Water Consumption.

As Wilks states;

Treating the built environment as a product of consumption decisions means that the focus of research must be the human actors themselves and the processes by which people balance various options. The assertion made is that culture does not shape houses in some abstract or even direct fashion; people shape houses. In doing so they are informed by cultural knowledge and they act within cultural constraints, but always in the context of a dialectic between cultural rules and actual behavior that allows both to change (Wilks, 2001:133).

That human actions and decisions are informed by cultural values is one upon which the anthropological discipline rests. For the residents of Sanjay Colony, as seen in chapter five, the home is constructed to conform to certain ideas and expectations and to facilitate the maintenance of certain standards and beliefs. Putting to one side aspects of basic shelter from the elements and a place to sleep at night, and focusing again on how water is used in the home, we can see the importance of culturally constructed ideas of how water consumption relates to identity.

Wilks again, holds that decisions made about how to use resources are decisions which can only be understood when seen in context, and alongside other decision (Wilks, 2001:136). These are vital to the makeup of culture. As Mary Douglas holds, these are

the choices that are absolutely fundamental for the whole life of a group of people. They decide gender roles, dictate family structure, and ‘make visible and stable the categories of culture’ (Douglas, 2001:263). And so it is for the residents of Sanjay Colony. The decisions they make about how to use water are based on ideas, standards and techniques that are reinforced by the community in which they exist. They consume water, not just to nourish the body, but to communicate to their friends, families and neighbours that which they consider important. They consume and display what water can achieve for them, clean clothes, neat appearance, rather than the actual substance itself. As Douglas holds, people consume in an attempt to get some sort of validation from their peers; ‘consuming is finding consistent meanings’(2001:264). This can be applied to the residents of Sanjay Colony and their water consumption practices. By examining ideas of cleanliness and self identity we can explore more specifically why people consume water in the home in the ways they do. Presenting oneself to the community with a clean appearance is important for the residents of Sanjay Colony for two reasons. Firstly, being clean and well groomed are ways by which families are communicating their dedication to hygiene and good health. Secondly, they are resisting, or attempting to challenge, views from outside Sanjay Colony about what slum dwellers are or are thought to be. Ideas of what is ‘clean’ are cultural expressions and the decision by householders to use a combined total of 73% ¹⁷of their daily water needs on laundering clothes and bathing shows that they are important aspects of identity¹⁸.

¹⁷ 73% is arrived at by adding water used for bathing, laundering and house hold cleaning/

¹⁸ Personal bathing and laundering currently account for around 1/3rd of domestic water consumption in the U.K. (Shove, 2003:76)

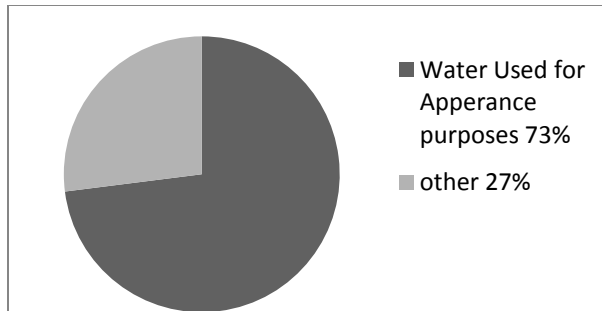


Figure 2. Water used for appearance purposes.

Identity and Consumption.

Bathing, as seen in chapter five is a rigorous affair for those living in Sanjay Colony. The entire body, including the hair is covered in a lather of soap and water each day. Soap is seen as a vital aspect in being properly clean. Clothing must also be clean. Women wash clothing depending on water available to them to ensure that their family is presented to the community in the correct condition. This construction of identity is, as Giddens says; ‘the self as reflexively understood by the individual in terms of his or her biography’ (Giddens, 1991:244). The way that residents of Sanjay Colony consume cleanliness and identity, through the use of water, is a part of this biography. Consumption decisions are made by the individual with heavy influence from the family unit and the wider community. By consuming water in specific ways, the residents of Sanjay Colony attempt to reinforce their place as part of a community and create a self identity which is acceptable to this community. Being clean is linked to notions of being good, being pure, although to equate western ideas of cleanliness and Indian ideas of purity is misleading, being ‘dirty’, not bathing regularly or wearing unwashed clothes in most cases would lower one’s social stock (DuPont in Alley, 2002 :36). Because of this, decisions on how to consume are well regulated and, as we have seen, well disciplined. This notion of consumption as a form of identity creation deserves further investigation

so that we might be better able to understand how identity affects consumption decisions. In order to do this, we must get a better idea of *what* identity does for an individual and *how* it does it.

Bernd Simon (2004), feels that identity serves multiple functions. By examining two of these we are better able to assess how consuming water in particular ways, shapes identity, which in turn may shed some light on another aspect of the social drivers of consumption.

The first identity function identified by Simon is *belongingness*. One's identity confirms one's place in the world, it tells us who we are and who we are not. It dictates relationships and positions us in relation to inferiors and superiors. Our identity is comprised of many psychological facets, of which space prohibits a full analysis, but they must be actively maintained and tweaked to keep up with subtle changes in values and norms of those around us. As Simon explains; identity confirms that a person has a place in society and belongs to the social world (2004:66). For the residents of Sanjay Colony this is an important aspect of consuming water. To step back a moment in the interest of context, the majority of people living in Sanjay Colony are migrants from rural villages in the nearby provinces of Rajasthan, UP and Bihar. The majority of my informants had never lived under any form of water restrictions before moving to New Delhi. The realities of consuming 30L of water per day creates identity by shaping shared ideas and standards of cleanliness and self appearance. When we adhere to the standards and expectations of our community we belong, this reinforces our identity. By consuming water in a particular way residents are reinforcing their identities as members of a particular group, the residents of Sanjay Colony. This can be applied to consumption in a larger context, as Douglas states; '...the reason anyone wants anything (physical needs apart) is for sharing with or showing or giving to someone else in recognition of similar gestures, gifts or services received in the past' (1992:150). We consume to reinforce

social structures and rules. To belong is to have an identity and this identity is created in some way by how we conform to recognized standards which are achieved through consumption.

Secondly, and closely linked to belongingness, identity creates *distinctiveness*. It challenges identity which ‘outsiders’ would bestow. Residents of Sanjay Colony are too often reminded by outsiders of their socio-economic position in New Delhi society, as illegals, slum dwellers, the lowest of the low. This is reinforced by both individuals and institutions. Employees of the DMC often make derisory comments about residents of Sanjay Colony who go to collect water at the Okhla pumping station. Water tanker drivers demand bribes and small gifts to deliver water, school teachers send children home who are deemed inappropriately groomed, residents are denied official recognition of their rights as citizens. One informant, Sabrina, who worked outside of Sanjay Colony for an international architecture firm, related that she was too embarrassed to reveal to her colleagues that she was from the slums. It was embarrassing for her that others would then make judgments about her way of life and her identity would be re-evaluated. When asked how she could move between the slums of Sanjay Colony and the Indian middle class without revealing her ‘identity’ to her co-workers, she replied that her appearance and mannerisms were both important factors. As Giddens discusses, appearance is an important element in creating identity (1991:99). By presenting herself in clean, fashionable clothes and by being groomed in an appropriate manner, Sabrina challenges ideas of slum dwellers living in poverty. And so it is for other residents of Sanjay Colony. By making specific choices about how to consume water they are actively challenging an identity projected on to them by others.

The Client- Patron Relationship and Water Consumption.

When studying consumption, an examination of the relationship between the institutions which facilitate the delivery of resources and the individuals which consume those resources is valuable. It is the relationships between consumers and the complicated web of actors, of both individuals and Institutions, who facilitate resource delivery that is important here. As Richard Berk et al.(1980), and Dolincar and Hurlimann (2010) have shown, people living in the United States and Australia have had their consumption of water affected by various regulations, implemented by governing bodies. A mixture of incentives, penalties and technologies have been used to reduce water consumption across entire communities. This has been achieved in part because of a strong government and effective channels of communication between policy makers, consumers and administrative structures.

In Sanjay Colony too, water consumption is directly affected by the strength of the relationship between supplier and consumer. What is markedly different from the reality in Australia and the United States, however, is that in Sanjay Colony, the delivery of water is controlled by actors who demand patronage in exchange. Those who are on good terms with these ‘suppliers’ are able to acquire water quickly and regularly. Those who are not, face uncertainty and delay. In this way, it is the connections, relationships and structures which determine to how water is consumed.

As James Scott states;

The patron-client relationship- an exchange relationship between roles- may be defined as a special case of dyadic (two person) ties involving a largely instrumental friendship in which an individual of higher socioeconomic status (patron) uses his own influence and resources to provide protection or benefits, or both, for a person of lower status (client) who, for his part, reciprocates by offering general support and assistance, including personal services, to the patron (Scott, 1972:92).

Patron-client relationships which, according to Scott(1972:98), are very much in evidence throughout Latin America, Africa and less developed European states , still endure in India because huge disparities in wealth have been, according to Haider, more or less accepted (1993). In Sanjay Colony local patrons, or *Pradhans* act as both middle men in negotiations between elected officials and their constituents in the slum and patrons to the slum dwellers who rely on them to pass on their aspirations to the politicians.

Pradhans retain their power by improving access to services for slum dwellers through their contacts with politicians and by securing votes for politicians in return. Their connections with, and ability to deal with, officials from the DJB, DMC and other local officials helps to reinforce this power. To maintain this power they must remain as useful as possible to all parties. According to Haider, slum politics is a needs based sphere around which all political activity revolves (1993:408), and because the water supply issue is just about the biggest political issue in Sanjay Colony, *Pradhans* are kept empowered by the irregular distribution channels that exist there.

As seen in chapter four, how residents in Sanjay Colony acquire their water depends on the strength of their ties with these local leaders. They are clients, and the relationship between them and their patron subscribes to Scott's definition of the client-patron relationship. Scott (1972:93-97) holds that what defines a patron-client relationship is first; inequality, which is shown in Sanjay Colony through the power and wealth of these patrons, their connections with the various institutions charged with delivering water and their ability to deprive residents of water. They are able to control something which their clients depend on and, living in abject poverty, these clients have very little to offer in return besides their political support.

Secondly is the face to face character of the relationship which is demonstrated in Sanjay Colony as local leaders live in the colony and so are able to meet their clients face to face. The relationship solidifies over time as the client knows he can turn to his patron when in need and in return will act on behalf of his patron to gather support to further

legitimize his position. Patrons will organize water taps to be installed outside favored clients homes, who in turn recruit more families who depend on that tap for their daily water needs. Those family members are informed as to who they owe their allegiance and in turn are expected to assist when called upon.

Third, is that they are ‘diffuse, “whole person” relationships rather than explicit, impersonal- contract bonds’ (Scott: 95), meaning these relationships need not necessarily contain animosity in any way, but may be based on friendship, historical family ties and past exchanges. The range of services offered by both parties will vary over time and the relationship will continue so long as each party has something of value to offer the other. This is evident in Sanjay Colony by *Pradhans* striving to maintain the status quo of water shortages for without it, they would have significantly less to offer their clients.

In Sanjay Colony there exist both those who are linked to a patron and those who refuse, attempting to form their own connections by grouping with other families. To organize a regular water supply, either through a pipe in front of the home, or a regular water tanker, a person needs something to give in return. This structure is set up in such a way to reinforce the client-patron relationship because in Sanjay Colony people have very little to offer except their vote and their assistance in ensuring others vote in a certain way, for a certain candidate. How people negotiate these power structures directly relates to the amount of water they will receive and the regularity that they will receive it. This in turn impacts upon such diverse aspects of everyday life as; how often and how thoroughly clothes can be laundered, the ability to earn a living (through knowing when their water will be available), and anxiety levels caused by not having access to water.

Conclusion.

Water consumption in the home is directly determined by three distinct aspects. The physical tools through which water is consumed, such as pipes, taps, drains and sinks, or technology; the social structures which are legitimized and maintained to deliver that water, such as the DJB, the DMC the legal system which has deemed the residents of Sanjay Colony illegal, and the middle men who retain power within the slum due to such status; cultural norms such as the identity which imposes standards that consumption helps to create and maintain. These three facilitators of consumption are also deeply entwined with aspects of poverty which face the residents of Sanjay Colony each day. The reality of this however is that residents consume, on average, just 29.64ltrs of water per day. Does there exist then an opportunity to exploit the knowledge and techniques of those living with very few resources? The following chapter will seek to explore the extent to which poverty contains keys to sustainable water consumption.

7. The Sustainability of Poverty.

Introduction.

Preventing the collapse of human civilization requires nothing less than a wholesale transformation of dominant cultural patterns. This transformation would reject consumerism- the cultural orientation that leads people to find meaning, contentment, and acceptance through what they consume- as taboo and establish in its place a new cultural framework centered on sustainability (Assadourian, 2010: 3).

Erik Assadourian, a senior researcher at the World Watch Institute, makes two good points here. The first is that we must change the way we consume because the Earth is running out of natural resources. The second is, that in order to do so, we must change the way we value the things that consumption brings us and thus our very value system. The first point is difficult to argue against although, see Mark Sagoff's 'Do we Consume too Much' (2001) for an excellent attempt. The second point echoes much that has been written on sustainability, that we must fundamentally change our value system in order to alter our consumption patterns, somehow quashing our urge to consume more and to find meaning and identity through such consumption.

It has been argued, by Assadourian and others that a change in values will result in a change in consumption, hopefully for the benefit of the planet. Sanjay Colony provides us with a reality in which water consumption is directly influenced by values, technologies, and social structures, as shown in chapter six, and just 29.64L of water is consumed per person per day. This Chapter then will explore the possibility that in aspects of poverty, specifically those that relate to constraints on resource use in the home, there exists a key to more sustainable living, not only through the alteration of our

values or aspirations but in a transformation of all three of the consumption determinants discussed throughout this thesis .

By comparing Sanjay Colony with water scarce communities who do not share other aspects of poverty (besides being water poor), we are able to better see how the knowledge of the residents of Sanjay Colony could contribute to more sustainable water use in a broader context. That is, we are able to see that people living in poverty have developed the necessary tools, skills, and attitudes to live sustainably in the face of severe household water restrictions.

Aspects of Poverty and Sustainability.

Poverty is measured in a variety of ways; The United Nations uses income levels as a measure of poverty, whereas Amartya Sen uses intrinsic aspects, such as capability. Both have their advantages and disadvantages. In an ambitious attempt to show how being poor can translate into being sustainable I will explore aspects of the lives of the residents of Sanjay Colony which define them as living in poverty. In keeping this section relevant to the preceding chapters, I will again focus on water consumption in the home and specifically how this consumption is impacted upon by being poor.

Poverty is a multidimensional concept which is realized in many ways. As Banik states;

‘Poverty implies ‘need’ (lack of material goods), ‘low standard of living’, ‘limited resources’, ‘lack of basic security’ (vulnerability to social risks), ‘inequality’ (disadvantage in comparison to others in society), ‘exclusion’ (from participation in normal patterns of life) and ‘dependency’ (in relation to other individuals, groups, organizations and the state) (Banik, 2006:11).

The residents of Sanjay Colony experience these aspects of poverty every day of their lives. It is beyond the scope of this thesis to fully explore the economic, social and moral justification for challenging and eliminating poverty and so, as mentioned above, I will focus on how specific aspects of poverty force the residents of Sanjay Colony into specific consumption practices and the parallels these have with sustainable levels of water consumption more generally. Firstly, however it is valuable to briefly outline the concepts of ‘poverty’ and ‘sustainability’ as they will be employed below.

Sustainability.

As Michael Redclift holds, sustainability is a concept which is the subject of much conjecture and interpretation, depending on the context in which it is being used (Redclift, 1992). In *Our Common Future*, The Brundtland Commission emphasized ‘human needs’ as that which should be achieved by sustainability. As Pepper et al hold, research into sustainable consumption crosses many academic boundaries including economics, psychology, anthropology and marketing (Pepper et al, 2009). For the purposes of this thesis I will ignore other aspects of sustainability, such as economic sustainability or political sustainability and rather base the concept on the fact that the world’s resources are finite and we must consume in more sustainable ways in order to ensure we survive as a species. I hold that this may require that, as according to some theories of economic growth looked at below, we as a species must live in a form of poverty as consumption declines.

Poverty.

As Angelsen and Wunder point out, poverty has traditionally been measured through wealth, income, and consumption. That is, the more people earn and spend (consume) the further away from poverty they will be. If people consume less, at a certain point of non-consumption they will be living in ‘poverty’, or below a pre-constructed poverty

line. This approach was championed by economists such as Adam Smith and David Ricardo and dominated economic inquiry into poverty until the 1960's (Angelsen & Wunder,2006).

During the 1970's the concept of poverty was subjected to what Angelsen and Wunder call a 'human development extension'(2006:83), by which attention that had been focused purely on economic indicators of income and consumption, was expanded to include aspects of 'well being' such as health, education, nutrition and life expectancy. The Human Development Index (HDI) was created by the United Nations Development Program in 1990 and ranks countries using such social and economic indicators and is the most comprehensive and widely used development index. India is currently ranked 119 on this list, between Timor-Leste and Cape Verde. Besides economic and social indicators, although closely linked, levels of poverty can also be captured by levels of resource use, such as water.

The Water Poverty Index (WPI), developed by the Centre for Ecology and Hydrology in the United Kingdom, is a tool that has been designed to measure water stress at the household and community level by combining a cluster of data directly and indirectly related to water stress. This index shows a clear correlation between water consumption and living standards; that is, as living standards rise, water consumption also tends to increase (Sullivan, C. et al, 2002). Using this WPI, combined with more traditional indicators of poverty, the residents of Sanjay Colony can certainly be described as living in poverty. I will again focus on the intrinsic aspects of living in poverty which in turn reduce household water consumption of the residents of Sanjay Colony. Firstly, the restriction of access to water by the state authorities, second, the physical infrastructure of the home as constrained by poverty and third, the creation and maintenance of attitudes and beliefs which are reinforced by living in poverty.

Sustainable Water Consumption Through Restriction of Water.

The residents of Sanjay Colony are severely limited in their access to water because of several inter-related factors which are inescapably intertwined with the realities of living in poverty. Perhaps the most instrumental factor limiting their access to water is their relationship with the institutions which facilitate the delivery of water to the Colony. The Government of India, which determines residents of Sanjay Colony as illegal squatters on government land, as discussed in chapter three, along with the authorities who are responsible for providing water to the residents of New Delhi, the DJB and the DMC, are under no obligation to extend water provision to the residents of Sanjay Colony. Limitations on water supply by the state is a practice which has been adopted by several water stressed nations and which could prove instrumental in moving towards more sustainable consumption practices.

Australia, the driest inhabited continent on earth has been affected by severe droughts for the greater part of a decade, leading state governments to place restrictions on residential water use. In the south east state of Victoria, water restrictions are implemented in stages. Stage 1 restrictions are the least severe and restrict water consumption by allocating specific 'water use days', depending on odd or even house numbers, for watering gardens and prohibiting use of hoses for car washing and paved areas. Stage 4 restrictions are the most severe and prohibit the use of hoses for any purpose in order to restrict water use in times of acute scarcity. The Australian Government launched a "Water Buy Back Scheme" in 2008 whereby existing water allocations to farmers and irrigators may be bought back by state governments in order to increase environmental flows in rivers severely stressed by drought. This helps to focus the question of whether the state or the individual consumer is more suitable to act as a regulator of water in times of acute scarcity or in an attempt to reduce consumption to more sustainable levels so that future consumers will have adequate supplies to meet their needs. As Daniel Bromley states: 'Current economic thinking on sustainability tends to

focus on capital, both natural and man-made and neglect the institutions which give value to particular things and not others' (Bromley,2003:2). The state has the unique ability to set values on resources which reflect their 'true' value. If the price of water was to increase dramatically in places where water is scarce, this could act as a mechanism to help reduce domestic consumption

As discussed in chapter three, water provision in New Delhi is both public, in that water is provided by the government authorities, and private, in that any land owner with the necessary means is able to drill for bore water on private property for private consumption. State restrictions on water ownership and distribution, as has been implemented in Australia and other water stressed states (Israel for example¹⁹) has shown to be an effective measure by which to reduce household water consumption regarding there are sufficient mechanisms to implement such restrictions, such as punishments for non-adherence for example . The Office of Water, the arm of the local state government in Victoria, Australia, has gone so far as to reserve the right to limit the amount of water available to households if water levels reach such an acute shortage as to deem such measures appropriate for the continued security of the urban water supply. In effect, this would mean if water levels fell to a specific level, water distribution to urban households could mirror the scenario in Sanjay Colony, of water being available only for specific periods each day with a system of penalties and rewards depending on water conserving use. These restrictions have lead to various water saving techniques and technological innovations which again mirror those found in Sanjay Colony.

¹⁹ See <http://ag.arizona.edu/azwater/awr/c5f59e0e-7f00-0101-014c-28dbab98e29b.html> accessed 12th March 2011.

Sustainable Water Consumption Through Technical Innovations.

As seen in chapter five, the residents of Sanjay Colony have developed specific water saving technologies which allow the consumer to interact with the home in such a way as to reduce and reuse household water. There exists potential to adopt similar ideas and technologies among other communities experiencing water shortages. Water -saving technologies such as low flow shower heads and dual flush toilets are already being implemented by households in water stressed areas (La Palma, California for example²⁰), but technologies through which water can be reused in the home, as it is in Sanjay Colony, is something which is made very difficult by the current technological thinking of home designers and builders who are not constrained by those aspects of poverty such as space and money.

House design in Sanjay Colony allows female residents to reuse bathing water to launder their clothes due to specific drainage positioning. This could be achieved in bathrooms with inbuilt plumbing also using simple gravity drainage, from the shower to a storage unit and then a low powered electric pump or hand pump to transfer water into the washing machine. Similarly, water that has been used for bathing and then clothes laundering could be used to flush toilets, taking human waste away from the home via a centrally controlled sewer system. These are techniques which are implemented with great effect in Sanjay Colony due to the constraints mentioned above, space and money, but contribute significantly to reducing household water consumption. Again, grey water use systems have been implemented in some areas to great effect (the Centre for Science and the Environment in New Delhi for example²¹), but problems arise with storing water that has been contaminated with soaps and other cleaning products such as detergents and

²⁰ <http://www.cityoflapalma.org/index.aspx?NID=208> accessed 13th March 2011.

²¹ <http://www.cseindia.org/content/best-practices-2> accessed 13th March 2011.

bleaches²². This suggests that water consumption in the home needs to be re-evaluated, the value of the resource must be fully recognized and its uses must be appreciated as it is in Sanjay Colony, that is, that water is not necessarily useless after one application, rather what it is useful for changes. This awareness comes not just through technological innovation but also through the transformation and standardization of attitudes and beliefs, as seen among the residents of Sanjay Colony specifically, regarding the consumption outcomes of water use in the home.

Sustainable Water Consumption Through Attitudinal Adjustments.

The motivations behind consumption is an areas of research that has expanded as policy makers try to identify those who are more likely to consume and those who are more likely to conserve in an attempt to better target measures to reduce household consumption (Gligg & Barr, 2006).

According to Pepper et al, research on personal values and consumption has followed two strands; the first is focused on the individuals own goals and has relied heavily on Richins and Dawsons (1992) Material Value Scale to construct levels of ‘materialism’ amongst consumers. The second focuses on the individual’s goals for the society in which they live in or the ‘socio-political materialism of his or her society’ (Pepper et al, 2009:128). This has been followed by the research of Donicar and Hurlimann (2010), who surveyed 1495 people across a range of socio-economic backgrounds in an attempt to discover peoples’ attitudes to water consumption and conservation. The findings of their report suggest that people are unlikely to change their consumption practices if such a shift would cause inconvenience.

²² <http://www.health.vic.gov.au/environment/water/recycle.htm> accessed 14th March 2011.

When trying to implement a shift to more sustainable water consumption in the home, it is attitudes towards what water does for us, cleansing our bodies for example, that are much more difficult to explain and change as opposed to those other facilitators of consumption looked at above. Again, the residents of Sanjay Colony provide us with the foundation upon which to explore how attitudes conducive to sustainable water consumption are developed and maintained.

As explored in chapter six, it is the standards and attitudes which are adopted by a community which forms one aspect of consumption. My informants in Sanjay Colony displayed immense pride in the appearance and cleanliness of both home and person and again, all but one of those interviewed felt that they had access to sufficient amounts of water to achieve this. If we hold consumption as a projection of our beliefs and attitudes, of that which is important to us, what Pepper et al call our 'individual materialism', to alter these beliefs about what water consumption gives to us, as individuals at a completely constructed level, is something that must be undertaken at a collective, community level. As seen in Sanjay Colony, various water saving practices are successfully maintained because they are adhered to by the entire community. It is the community which sets the standards which consumption should achieve and which in turn normalizes the practices and techniques employed to do so. In this way sustainable consumption, or a reduction in consumption will be successful when it is standardized by whole communities.

As Shove discusses, changes in technology and attitudes happen at the micro, household level with new technical innovations that are designed and implemented but are confined or constrained by various rules, regulations, technical constraints or societal attitudes hampering change (2003:68). As Schott, Hoogma and Elzen (1998) hold, these new technologies usually develop within 'safe havens' which are not subjected to the constraints of wider market and regulatory activity. Dissemination of such technology then can either be a top down, supplier driven phenomenon or a bottom up, consumer

driven phenomenon. It depends on the complex relationship between historical infrastructure development, strength and flexibility of regulatory bodies to transform and incorporate new technologies and practices and societal attitudes to change (Carlsson & Stankiewicz, 1991). To become more sustainable, consumers need to be *motivated* to change their own behavior, be *enabled* to do so with appropriate technological advancements and *allowed* and encouraged to do so by the administrative structures empowered to regulate such consumption.

Conclusion.

Poverty limits consumption. In Sanjay Colony it is those constraints on space, a lack of resources, and the aspirations which these shape, which dictates the amount of water consumed by individuals at the household level. The aim of this chapter has been to explore the idea that in aspects of poverty there exist keys to sustainable consumption. By again focusing on those determinants of consumption that have been highlighted in chapter six, culture, technology and social institutions, the idea that sustainable living has parallels with living in poverty is an interesting one which deserves further research. This chapter has also attempted to anticipate how such parallels can be applied to limit consumption in a more global context. Understanding the interplay between the institutions which enables the delivery of resources, the technology through which we consume those resources, and the way we value the outcomes of that consumption are vital to understanding how to reduce, or make more sustainable, such consumption.

8. Conclusion

The sustainability of life on this planet depends, in no small part, upon how we as a species consume natural resources. At present the rich consume the majority of natural resources and by doing so they have achieved a standard of living that has been unparalleled in human history. For the poor this is a goal to which to aspire. This leaves the concept of sustainable development in a delicate position. The development of the poor which is of course desirable, to alleviate suffering and misery which is caused by poverty, against questions of the increase in consumption of natural resources by many billions of people that this would entail. What would the consequences for the environment be if everybody could live at the same high standard as the rich do now? The impacts on climate change would be great as increased consumption of fossil fuels means increased carbon dioxide emissions. Cleared land would become more valuable as food consumption rose, leading to the loss of forests and biodiversity. Ocean harvests would significantly increase, further endangering edible fish stocks and marine habitats. Fresh water consumption would increase dramatically also as people became used to living with piped connections and reliable delivery.

Clearly, to deprive the poor of a higher standard of living due to the effects on the environment is an immoral and unrealistic approach. To persuade somebody living in poverty that they, or the other billions of people who are a living in similarly impoverished circumstances, should not be connected to the power grid because it will contribute to global warming is difficult to justify on any grounds, and is not the way to achieve sustainable development. Reiterating the concept as originally defined by Gro Harlem Brundtland in her address on behalf of the World Commission on Environment and Development to the UNEP's Governing Council, in Nairobi in 1987; sustainable development is 'paths of progress which meet the needs and aspirations of the present generation without compromising the ability of future generations to meet their needs

(Brundtland, 1987:4). This simple yet powerful statement has two aspects which make it fundamental to understanding sustainable development. The first is that it groups all people, rich and poor together as a 'generation'. The other is that it leaves open a shift in needs and aspirations of future generations. This thesis has attempted to persuade that what is needed to achieve sustainable development is not only that those living in poverty be able to raise their living standards but that the aspirations and expectations of those who currently consume the majority of the world's resources be altered to more sustainable levels, not by surrendering to a lower standard of living, and that is important, but through changes to how consumption is performed, facilitated and appreciated.

It should be clear from reading the preceding chapters that consumption is a multifaceted phenomenon. What determines consumption is a complex mix of the three theoretical themes that have run throughout this thesis; social institutions, technology and culture. The thesis has also sought to investigate how poverty, (lack of water, space, rights) impacts upon how water is consumed in the home and thus may provide a framework through which to explore techniques that facilitate sustainable living.

The institutions and structures which facilitate the delivery of natural resources to the household play a vital role in determining household consumption practices. It is these institutions, such as state governments, water companies, local councils etc, which develop infrastructure, regulate quality and quantity and set prices of resources. In wealthy countries consumers have grown accustomed to resources such as electricity and water, provided by such social institutions, being available in unlimited amounts at all hours of the day and night. It is these institutions also that are best placed to inform and implement instrumental measures that may help to reduce consumption. Such measures may include a rise in prices, specific restrictions on use, or campaigns aimed at changing consumer behavior. As we have seen in Sanjay Colony, such measures have taken the form of restricted access, legitimized because of the status and lack of rights of the consumer. The effect of this, ignoring arguments over the morality of depriving people

of the natural resource most fundamental to life, is to reduce water consumption. When thinking about altering people's consumption decisions in the home, these institutions and the relationships between them and consumers are fundamental.

Closely linked to the social institutions which facilitate the delivery of natural resources to the home are the technologies we use to transform a raw resource, such as water, into that which we use to fulfill our needs. Technologies such as the flush toilet, the washing machine and the dishwasher are all water intensive technologies which are common throughout homes in rich countries. Often ignored, but also technologies, are the systems we use to take water away from the home once it has been used, such as sinks, pipes, drains and sewers. As seen in Sanjay Colony, here exists great potential to reduce water consumption in the home by reusing water for different tasks. An example of this would be to re-use water which had been used to bathe the body to then launder clothes. In many homes with in-built plumbing this would prove to be a difficult task as water would have to be physically carried from the shower area to the washing machine. A slight alteration in the technologies used to consume water could, potentially, drastically reduce water consumption in the home. As we have seen in Sanjay Colony, this has been achieved by strategic placement of drainage technologies combined with culturally relevant use of the living space as a consumption instrument. Devices to reduce water consumption exist and are widely utilized in some instances, the water saving showerhead in Australia for example, but there exists great scope for larger, city and regional size, innovations to how water is delivered, used and re-used in the home and finally disposed of. This will require a rethinking of the values of the resource and the way it is used in the home.

The way we value resources and our aspirations of consuming such resources are informed by our cultural knowledge and is perhaps the most difficult aspect of consumption to alter when attempting to implement more sustainable levels of

consumption. Social institutions may exist to facilitate the delivery of resources in a sustainable way, technologies may exist to reduce consumption and channel consumption decisions in sustainable ways, but if consumers cannot fulfill their consumption aspirations through such institutions and technologies such measures will not be sustainable. Cultures which are in some way defined by what the individual consumes, will resist changes to those consumption expectations. To tell someone who has lived with unlimited hot water for their entire lives that they will have access to hot water for bathing only three days a week, to use an extreme but possible scenario, will surely be met with resistance. When such restrictions are placed on the entire community, through necessity, that resistance will transform as standards and aspirations adjust. As we have seen in Sanjay Colony, standards are set by entire communities. Identifying with one's community means aspirations and expectations become, to a point, standardized. In cooperation with instrumental measures implemented by social institutions, technologies which inform and channel consumption decisions, cultural change, in the form of standard setting, will be fundamental in changing the way we consume for a more sustainable future.

The sustainable development of the human race will not depend on all of us living in the conditions of poverty seen in Sanjay Colony, denied resources because of citizenry status, forced to live in one room shacks due to low income, and setting standards and making consumption decisions based on 29.64L of water a day. The comparisons made between sustainability and poverty were investigated because living in poverty, we find a reality in which very few resources are available. This in turn provides us with a reality through which to study why resources are so few, the institutions which allow or cause this and how this is dealt with both technically and socially. This thesis does not attempt to glorify or promote the virtues of poverty in any way, merely to suggest that if resource consumption in the home must be severely reduced in rich countries; those living in urban poverty currently provide techniques and knowledge which may be of help to

others who are currently resource rich. Having said that the world's population will not have to live in the conditions of those in Sanjay Colony, it is equally reasonable to assume that the planet will not be able to support the world's population living, and consuming, at the levels the rich currently enjoy. This thesis has presented unique data on water consumption in the home of slum dwellers. It has also provided insight and analysis as to the determinants of that consumption. Finally, it has demonstrated how such information may be applied in a more global context to reduce water consumption to more sustainable levels.

A balance between a rise in the living standards of the poor, coupled with a reduction in consumption by the rich would be a favorable direction to take. It is hoped that the techniques and ideas presented in this thesis may contribute to the greater body of research on sustainable development seeking to achieve that balance.

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Appendix 1: Sample Questionnaire.

Address:

Name

Gender: Male () Female ()

Age:

Respondent is head of house hold: Yes/No

1. What schooling do you have?

1. Occupation:

2. In which province were you born?

3. How long have you lived in New Delhi

4. Housing category:

5. Tenurial Status:

- a. Owned ()
- b. Rented ()
- c. Govt. ()

6. If Rented, what is the rent per month?
()

7. Other services given instead of rent?

8. No. Of rooms:

9. Family members living with you?

- a. No. Of adults (>16 yrs) ()
- b. No. Of children (<16 yrs) ()

10. What is your households Avg. Monthly income?

11. What do you spend most money on per day or month?

- a. Food ()
- b. Water ()
- c. Clothing ()
- d. Rent ()
- e. Other ()

12. What is the most important environmental problem in your area according to you?

- a. Air Pollution ()
- b. Garbage disposal ()
- c. Water quality/ Amount ()
- d. Traffic congestion/ Noise ()
- e. Sewerage overflow ()
- f. Toilet ()

13. Is there a water supply Problem in your area?

- a. Yes ()
- b. No ()
- c. Not sure ()

14. If Yes, is it different from your Home village/City?

15. Can you briefly describe where you got your water from in your home village/City?
16. How would you rate the overall quality of available water available (from public taps, water sellers, municipal wells, private wells etc)
- Good ()
 - Adequate ()
 - Bad ()
 - Unusable ()
17. Do you feel the quantity of water supplied is adequate to your needs?
- Yes ()
 - No ()
18. If no, what would/ could you use more water for?
19. Where do you get your water from?
- Private well ()
 - Public well ()
 - Private water merchants ()
 - Public hand pump ()
 - Public tap ()
 - Bottled water ()
 - Municipal Tanker ()
20. How much water do you collect each day?
21. If from a tap, is water available all day?
- Yes ()
 - No ()
22. If No, when is it available?
23. If you get your water from a municipal tanker, can you explain how this is organised.
24. Have you ever used all your water and been unable to get more? For how long?
25. Do you treat water before using it for cooking/Drinking?
- Yes ()
 - No, we drink directly ()
- If Yes, how do you treat it?
- Boil ()
 - Cloth filtering ()
 - Ceramic candle filter ()
 - Boil+ filter ()
 - Other ()
26. Do you pay for water? If so, How much money do you spend on water per/ Day?
27. How much water does your family use each day?
- Drinking ()ltrs bckts
 - Bathing ()ltrs bckts
 - Cooking ()ltrs bckts
 - Washing Clothes ()ltrs bckts
 - Household washing (floors, dishes etc) ()ltrs bckts
 - Other ()ltrs bckts

28. How Often do you wash clothes (every day, every other day etc)

33. What toilet do you use?

29. Do you bathe every day?

34. How much water did you collect today?

30. Who is in charge of fetching water for your household?

35. If from a pipe, how much was bore water and how much was DJB water?

31. How much time does he/she spend fetching water every day?

36. How much water do you keep in storage

32. Does this affect your employment prospects? How?

Appendix 2: Map of Sanjay Colony.

