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The Liminality of Zimmedari and its Consequences on the Water Quality and Health of Meena Communities in Rajasthan

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Abstract

Water is an essential need for people everywhere, yet its security is increasingly becoming endangered around the world. The escalating global water crisis has profound ramifications for health and livelihood particularly in developing countries like India. India faces enormous development challenges in addressing the needs of a rapidly growing population. The world's largest democracy, India needs to improve its delivery of public services, especially to the poor and those living in rural areas.

The present study investigates the current public health situation in Rajasthan and the challenges India faces in providing water and health services. Fieldwork was conducted in rural communities in Rajasthan to assess the prevalence of water-borne and sanitation-related diseases, as well as diseases from poor nutrition. Such diseases result from unsafe and/or inadequate supplies of water. In rural areas, people are much less likely to have access to safe water than in urban areas. Rural inhabitants also rely on water to irrigate their land and cultivate their crops. Thus, water is necessary not only for life but to produce food.

This paper will examine water and health issues in India within the broader scope of water issues on the international level. These issues are intricately linked to political forces and governance, and so the notion of responsibility in addressing diseases that result from unsafe water, poor sanitation, and poor nutrition will be discussed.

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Introduction

Water is vital for human existence; yet today we are on the verge of a global water crisis, which threatens the survival of human life. Freshwater scarcity is one of the foremost concerns for humanity in the 21st century. For many developing countries the water situation has continued to grow worse (Regmi 2003:435). This issue is particularly salient in countries that are located in "arid and semi-arid areas", "confronted by population pressure and economic trouble", and are already experiencing water shortages (Elver 2006:886). The consequence of freshwater scarcity in such vulnerable areas is on human health. Inadequate sanitation and unsafe drinking water are the most urgent challenges today. One approach to this problem is to frame access to clean water as a basic human right. "Connecting human rights to water issues, namely by way of providing 'access to water for all' implies that the implementation of this right is a responsibility of states with respect to their own citizens" (Elver 2006:892). International laws on environmental issues today incorporate a strong streak of human rights and development (Elver 200:887).

Though the global population continues to grow, there is only a finite supply of freshwater and the rates of consumption are pointing to an impending global water crisis. Water use has been increasing at more than double the rate of population growth in the last hundred year and is expected continue increasing (UN Water 2012c). Only one percent of the total freshwater supply in the world is usable (UN Water 2012b). Freshwater is used for irrigation, industrial purposes, and domestic uses (UN Water 2012c). Today, 894 million people do not have

access to safe water resources and 80 percent of them live in rural areas (The World Bank 2012c). 2.5 billion people do not have adequate sanitation (UN Water 2012a). The daily requirement of water per person per day is two to four liters for drinking and 2,000 to 5,000 to produce their food (UN Water 2012d).

Global development cannot be achieved without addressing water. Water access poverty has been shown to be "strongly related to the Human Development Index" (Shah & van Koppen 2006:3414). The 2002 World Summit on Sustainable Development, also known as Earth Summit, water was emphasized as a key item on the agenda (Regmi 2003:435). The year 2015 is important for both human development and water. Both the Millenium Campaign, which seeks to eradicate poverty and promote development, and the "Water for Life" initiative will conclude that year.

The Millennium Development Goals emerged from the United Nations Millenium Declaration in September 2000 (The World Bank 2012). Leaders of 189 countries pledged to meet eight goals: eradicating extreme poverty and hunger, achieving universal primary education, promoting gender equality and empowering women, reducing child mortality, improving maternal health, combating HIV/AIDS, malaria, and other diseases, ensuring environmental sustainability, and developing a global partnernship for development (United Nations Development Programme 2012a). Each of the MDGs intersects with water: access to an adequate supply of clean water is necessary to ensure health and allow time for children to attend school and women to pursue other productive activities besides water collection; water issues also demand

cooperation from multiple actors and require sustainable environmental solutions. Water is explicitly addressed in MDG 7c, "Reduce by half the proportion of people without sustainable access to safe drinking water and basic santiation" (United Nations Development Programme 2012b)

Water has featured as a key issue on the international agenda since the 1970s. Conciousness about ecological issues emerged on the international stage in with the 1972 Stockholm Conference on the Environement and subsequent drafting of international environmental laws. Such laws cover an array of environmental topics, but issues of water include "freshwater scarcity, groundwater depletion, protection of wetlands…[and] water" (Elver 2006:885). The First Water Decade was from 1981 to 1990 and it was established by the United Nations in the 1977 Water Conference at Mar del Plata (Srinivas 2012). The goal of the International Drinking Water Supply and Sanitation Decade was guided by public health: to promote access to an adequate supply of safe drinking water and basic sanitation by 1990 (World Water Council 2010). The United Nations declared the Second Water Decade the period from 2005 to 2015 the International Decade for Action, "Water for Life" (UN General Assembly 2003). There have also been four World Water Forums. The first viewed water in terms of national security, in that water could become a resource that sparked wars. It was 'blue gold', in contrast to oil, which had been 'black gold'. The second forum recognized the need for improved governance and integrated management of water resources to ensure water security. The third incorporated many of the ideals of the MDGs. The fourth forum advocated for a new approach in

"confront[ing] global water problems", which is to encourage "the participation of local actors" (World Water Council 2012).

The year 2012 was accorded special significance with the theme of "Water and Food Security" (United Nations). This stems from increasing food security and rising food prices, the high proportion of water needed for agriculture, and increasing water scarcity (The World Bank 2012a). There is an urgent need to improve the policy and governance of water.

Poor quality water is a threat to human health. Poor sanitation and unsafe drinking water have extreme public health consequences, causing 1.7 million deaths around the world every year (Suthar 2011:838). Diarrhea is the leading cause of disease and death worldwide. Eighty-eight percent of diarrheal deaths occur because of the lack of access to sanitation and safe water for hygiene and drinking (UN Water 2012a). Ninety percent of those deaths are in children and almost all of them are in developing countries (Suthar 2011:838).

Safe drinking water is "defined as having an acceptable quality in terms of its physical, chemical, and bacteriological parameters so that it can be safely used for drinking and cooking" (Suthar 2011:838). The World Health Organization has established international standards of what constitutes safe drinking water. Yet, different developing countries have different standards for safe drinking water (Suthar 2011:838).

Beginning in the 1980s, policies promoting decentralization as a strategy for development have increased in popularity around the world (Mitchell & Bossert 2010:669). Decentralization is used as a strategy to improve the

relationships between the national and local levels as well as to accelerate social and economic development (Mitchell & Bossert 2010:669-70). The summit at Johannesburg outlined four principles regarding development and water:

> [1] Water users must be involved in the governance of water resources; [2] we must now break the link between economic growth and water degradation; [3] urban water services are crucial for urban stability and security; and [4] policy, planning and implementation must move towards integrated solutions. (Regmi 2003:435)

Decentralization is thus a strategy promoted to improve the governance of water and drive development. Today, there is an added component of stressing integration among various bodies and functions to build comprehensive plans of action on complex development issues such as water security and health.

The present study investigates these issues in rural communities of the *adivasi* group, Meenas. My fieldwork explores the situation of water security in farming communities that are involved in community development projects to improve their water sources and political power. The intent of the study was to learn the prevalence of water-related diseases in these communities and thus the level of access to clean sources of water. However, I discovered that water has a far more complex role than just for drinking in such communities as it is a central component of their lives.

Fieldwork

Since water issues are emerging as one of the foremost global health concerns, I wanted to investigate these on the local level. My study examines the ways in which water intersects the lives of people at the community level. Water is an especially valuable resource in areas where it is scarcer. When water is not as abundant, people must rely on their water sources and are obliged to use them even if they might not be the purest sources. In India, a large portion of the population relies on unsafe water sources (Suthar 2011:838). For those who live in rural areas, water is necessary for more than just consumption and hygiene; it is also necessary for their livelihood, which is agriculture. Without it, they cannot cultivate food.

My fieldwork was conducted in three main fieldsites in the state of Rajasthan, which is located in northwestern India and borders Pakistan in the west.[1] Rajasthan means the 'land of kings'. Before independence, the region was comprised of independent princely states. The British referred to this area collectively as "Rajputana after the dominant community of Rajputs, a designation meaning literally the 'sons of kings'" (Gold 2002:xii).

The second largest state in India (Bhasin & Bhasin 1999:iii), Rajasthan possesses a population of 56.5 million people (Brinkhoff 2011), The almost 16.05 billion cubic meters of surface water Rajasthan possesses is only one percent of the total water resources in India and "the rainfall in most parts of the state is erratic and scanty (Varghese 1999:89). Currently, the water available per capita

[1] See Appendix A for a political map of Rajasthan.

per year is approximately 650m^3. This is already far below the international standard, which states that a person requires 2,000m^3 of water in a year. The availability will reach the point of scarcity that triggers migration, 500m^3, in just a few years (Dey 2010). Thus, water is a scarce resource in Rajasthan that must be managed effectively to ensure a steady and safe supply.

My fieldwork encompasses the eastern and southern regions of Rajasthan. It is important to note that my study does not include the western region, the Thar Desert. The climate and circumstances of that area are vastly different from the areas in which I was conducting my work and my study cannot be generalized to that area. Information was collected over a period of four weeks from participant observation and structured interviews. The first half of my fieldwork was conducted in two small communities adjacent to the cities of Jaipur and Bundi. The information I collected from these sites provides a general picture of water in the non-desert areas of Rajasthan. The second half of my fieldwork, and the bulk of my study, is a focused study conducted in collaboration with two non-governmental organizations working on water resources management and community development.

Part 1: Eastern Rajasthan

The first half of my fieldwork was conducted to complete academic requirements for a study abroad program offered through Syracuse University called “A Path to Water”. The program was a research-oriented, multidisciplinary course, and thus I was part of a five-person team conducting anthropological and environmental research investigating the quality and sources of water and the

conditions and prevalence of water-borne diseases in semi-rural communities. I was able to interview six community members and six individuals who belong to the healthcare community, including hospital administrators, pharmacists, an ayurvedic healer, and a nurse.

In Amer, I conducted interviews in a Meena community that lived around the Panna Meena Kund, which was a steppond. In Bundi, I conducted interviews in a predominantly Hindu community that lived in a poorer part of the city around the Bhavaldi Baori, which was a stepwell. Stepponds, along with stepwells, are traditional structures dating back to the sixth century that serve as access points for groundwater. These structures were important public spaces in the northwestern region of India including the states of Rajasthan and Gujarat.

In both communities, the steppond or stepwell had been a source of drinking water and washing water within the last hundred years. The shift to running water is relatively recent. People reported a clear distinction between the water sources and the kinds of purposes for which it was used. They also reported experiencing water shortages.

Part 2: Southern Rajasthan

The latter half of my fieldwork was a project conducted for my internship at the non-governmental organization, Wells for India. My internship was coordinated by the international volunteer organization, ProWorld. Its branch in India works to support development efforts in numerous sectors, including clean water through traditional micro-scale water harvesting projects. They accomplish this goal by placing interns at local NGOs to carry out individualized projects

involving water harvesting development and research. ProWorld worked with Wells for India, a United Kingdom-based donor NGO, to create a research internship for me.

I was able to design my own study around Wells for India's request to document the water and health issues of *adivasi* communities in the Aravali Hills in the Udaipur district. My project involved assessing the impact of recent water development projects, researching the health of rural *adivasi* communities by assessing water, sanitation, and hygiene, as well as their access to public services. This study filled a gap in knowledge about the quality of the water provided by the water infrastructure and the health of these communities.

My fieldsites are located in the district of Udaipur, which is a primarily rural district in southern Rajasthan. The Aravalli Hills are a mountain range that run from southwestern to the northeast, dividing the state of Rajasthan into two broad regions, the desert in the west and the fertile land in the east (Varghese 1999:85). Udaipur is located in the region covered by the Aravalli Hills (Paliwal & Vyas 2002:65). It falls into two agricultural zones and my fieldsite was located in the Sub-Humid Southern Plain and Aravalli Hills (Varghese 199:85). Udaipur is composed of 10 *tehsils* (revenue units), which have the same boundaries as the 11 *panchayat samitis* (blocks or development units) (Action Research 2005:3).[2]

My fieldwork was conducted in the two villages known as Varanoda and Dangi Kheda. The two villages are among the ten villages in the *panchayat samiti* of Motida. They are located 9 kilometers outside the town of Bhinder and are in

[2] One of the *tehsils* is composed of 2 *panchayat samitis*, and thus explains the difference in numbers.

the *tehsil* of Vallabhnagar. My fieldwork was conducted in July during the planting season.

I conducted a systematic study of nine hamlets across the two villages of Varanoda and Dangi Kheda. Four hamlets were in Dangi Kheda: Magri, Dangi Kheda, Mandir, and School. The other five hamlets were in Varanoda: Main Varanoda, Kaladiya, Arda Verda, Magri, and Bhuja. I conducted structured interviews using a questionnaire that I developed from my previous observations and prior research.[3] Interviews were performed in the homes of the villagers and questions were addressed to the female head of house. The "gender roles in rural South Asia locate women's expertise homes" (Gold 2002:163). It has been well documented that women are largely the ones who are responsible for collecting and providing water for the family. Women are also responsible cleaning the home and looking after the well being of all family members and children (O'Reilly 2006:961). My interviews of men in the first half of my study demonstrated that men do not believe that women become sick as much as men. Thus, to gain a more accurate picture of water activities and family health, including the health of the women themselves, I needed to speak to them directly. My fieldwork was not limited to women, however, and I spoke to men, older people, and children. I was able to conduct interviews at 43 households guided by a questionnaire and with the aid of a translator.[4] I also participated in a panchayat samiti meeting that was held at the headquarters of Sahyog Sansthan as well as a

[3] See Appendix B for the questionnaire.

[4] Though I am a native Hindi-Urdu speaker, my language abilities would often fall short as the people from this region spoke the Mewari dialect, which I had difficulty understanding.

preliminary village-wide meeting.

The villages in which I was working were composed entirely of Rawat-Meenas, an *advasi* group. *Adivasi* refers to the many indigenous groups of India. "The terms *tribe* and *tribal*" are disputed in anthropology (Karnyski 2009:4). The official name for *advasi* is 'scheduled tribe', "but this is a legal and a constitutional term" which varies from state to state (Rehman 1998:95). People of scheduled tribes are legally entitled to "special protective provisions" (Burman 97). More than 95 percent of *adivasis* inhabit rural areas (Rehman 1998:98). *Adivasis* form 12.5 percent of the population in Rajasthan (Agrawal 2006:376), which is one of the highest concentrations of *adivasis*. Though *adivasis* are found throughout the Rajasthan, the Aravalli Hills are their main home. Udaipur is third in its concentration of *adivasis* (Mehta 1999:225).

There is very little literature about Meenas, but what is available indicates that Meenas form the largest *adivasi* group in Rajasthan at 49.9 percent (Bhasin 226). Meenas are located in an area called *kherār*, which covers Jaipur, Bundi and Udaipur (Gold 2002:36). Rawat-Meenas are a sub-group of the *zamindari*, or agricultural, Meenas (Plowden 1883:289). There are strong socioeconomic differences between the Rawat-Meenas and the Meenas from eastern Rajasthan. The latter have reaped the benefits from government reservations, and are more educated, wealthy, and powerful than other *adivasis.* They occupy a majority of the government jobs available to Scheduled Tribes (Meena 2011). The Rawat-Meenas do not exhibit this.

The communities in which I worked were involved in community development schemes and water harvesting projects overseen by the local non-governmental organization, Sahyog Sansthan. The overexploitation of the water table to meet agricultural needs has resulted in a dramatic decrease in the water level in the region. There is an urgent need for more efficient and equitable availability of water that does not deplete the resource. Wells for India has been supporting various water harvesting techniques to bring a reliable supply of water to the poorest regions of Rajasthan, such as the villages in which I was working. Wells for India provided Sahyog with grants to fund projects. These non-governmental organizations provided 50 percent of the capital necessary and the community members had to provide the other 50 percent as well as the labor. The resource development projects are conceived, developed, implemented and maintained by community members. Thus, they are not only locally-driven, but also sustainable.

Thus, these communities were unique because they were already engaged in development projects. They were involved in water resource management projects, such as rainwater harvesting, and community empowerment projects that increased their voice in the circumstances governing their lives. It was imperative to examine the success of these water management techniques in terms of the quality of life provided by a greater availability of clean water. I also wondered whether the community development that was occurring helped promote greater sanitation and hygiene practices in these communities.

By the time I began my fieldwork, a fews wells had already been

renovated and several traditional water harvesting structures were being constructed. These included small stone checkdams, percolating ponds, and anicuts. The focus of these projects was to increase the water supply by harvesting rain water as well as fortifying and recharging sources of groundwater. Sixty-five percent of families rely on open wells for their drinking water and 23 percent use handpumps. This aligned with my previous fieldwork in which a majority of people relied on open wells for their drinking water. Though my initial purpose was to investigate the whether these new water projects increased the supply of clean drinking water, I discovered that the purpose of the current projects was for increasing irrigation water. By increasing the quantity of water from rain, these farmers could better irrigate their land and improve their agricultural output. These projects were mainly targeting water security for food but it was not clear whether water security in terms of health had improved.

Adivasis tend have poorer health and less access to primary healthcare than other Indians. They also exhibit greater malnutrition than other Indians (Balgir 2004:189). The Meenas with whom I worked exhibited the effects of malnutrition and stunting. Anemia was one of the most commonly reported deficiences. The water-related diseases in these communities is covered in the chapter on Diseases.

Meenas are farmers and they earn their livelihood chiefly through agriculture and animal husbandry. The main crops grown in these villages include maize, gram, mustard, wheat, and oil seeds. Wage labor accounts for about a third of the family income. Employment opportunities include construction work as

skilled masons and labor, stone transportation, and infrastructure development activities. People lived in homes that were made of mud, wood and some local tiles. The homes were usually one large room with a courtyard and space for animals.

The scarcity of water is an acute problem for these villagers and it has been escalating in the last five years. Erratic and scant rainfall has not recharged the water sources, which is pointing towards a crisis in water for both irrigation, drinking and domestic use. The result of the growing water scarcity is a loss of crop yield, with 50 percent of the Kharif crops (planted during the rainy season) , and all of the Rabi crops being lost (planted during autumn). In the summer 2002 and 2003, the government had to provide drinking water by tank trucks. The droughts have thus led to both water and food security, threatening the lives and livelihood of these Meena farmers.

There are two government health facilities in the area. There is a sub-center in the neighboring village of Motida, which interestingly is the only village with Rajputs. There is also a community health center in the town of Bhinder called the Gulab Singh Community Health Center, which is a government hospital. Across both villages, people reported that the sick had to be taken to the community health center in Bhinder, which was at least 5 kilometers away for most villagers. Even in Varanoda, in which the sub-center was located, the villagers stated that the sick had to be taken to Bhinder because the sub-center was never open.

Immunization rates in the villages are very low and do not meet the courses set by the government. Women are supposed to receive a course of immunizations as part of their antenatal care through the *anganwadi*, however only one woman reported that she had received one of the Tetanus shots. The children are supposed to receive a regimen of scheduled vaccinations, but 21% of children had not received any immunizations. There are five vaccines that are provided by the government, yet only two, Polio and Bacillus Calmette-Guerin (tuberculosis), are somewhat consistently administered to children. There was a greater percentage of children immunized for polio and tuberculosis in Varanoda than in Dangi Kheda.

Thus, while community empowerment was increasing in these communities, there are still deep issues regarding water security and health. The next chapter will examine the issue of water more thoroughly in India and Rajasthan to provide greater context to the situation in the Motida *panchayat*. As I will demonstrate, the current method for water management is a step in the right direction, but still requires a more comprehensive solution.

Water

The provision of water is at the core of development in India (Black 2005:26). Water is "essential to life and health and fundamental to every productive human activity" (Black 2005:31). The ability to meet the growing drinking water and irrigation water needs of an expanding population is shrinking as the water supply becomes scarcer. The issue of clean water is particulary salient in India, "where the majority of the population lives in villages with bare infrastructure and poor sanitation facilities" (Suthar 2011:837).

India's population growth has slowed from 2.09 percent in 1990, to 1.69 percent in 2000, and 1.39 percent in 2010. Ninety percent of the rural population has access to an adequate supply of water from an improved source, but only 23 percent has access to improved sanitiation facilities. Ninety percent of total annual freshwater withdrawals are for irrigation and seven percent are for domestic uses (The World Bank 2012). Though India is fortunate to possess many water resources, these are not distributed evenly across the country. Similarly, there is a large variation in rainfall across the country and across the seasons (Sigurdson 1977:70). Rajasthan is among the states in which rainfall has become increasingly unreliable; the monsoon rains do not come on time and do not provide enough rain (Black 2005: 23-4). It is estimated that by 2025, India will be confronted with absolute water scarcity (Shah & van Koppen 2006:3413).

Water, especially groundwater, has mostly been studied based on its technical, physical and chemical properties. Comparatively little is known about "the institutions and policies that govern water use" (Mukherji 2005:329). Thus, it

is necessary to explore the system of water management and the current influences on policy. The picture that emerges is the necessity of an intergrated system that incorporates the dual importance of water for consumption and water for agriculture in promoting the security and well-being of rural people.

Water Policy

Prior to the 1940s, people in India relied on surface water and rainwater to meet drinking water and irrigation needs, although the British instituted some major canal projects linking river basins with areas in need of irrigation. In the 1970s, with the increase of new seeds that needed extensive irrigation, there was also an influx of power-driven tube wells that ultimately had a major effect on local water tables. By the mid-1900s, India was facing deep food security and public health issues and both of these were related to the water supply. India needed to reduce the prevalence of water-borne diseases and increase its production of food to meet the needs of its expanding population (Chakraborti, Das, & Murrill 2011:27). Officials were becoming increasingly anxious about India's water scarcity and food security, since the inability to produce enough food caused a dependency on foreign aid (Black 2005:16).

In 1949, the Ministry of Health established the Environmental Hygiene Committee to investigate the health problems associated with the water supply and sanitation system (Atkins 1957). The committee reported that cholera, dysentery, and diarrhea alone accounted for 400,000 deaths per year between 1940 and 1950 (Chakraborti, Das, & Murrill 2011:27). In the First Five-Year Plan, the Planning Committee prioritized water supply and sanitation as a public

health necessity (Atkins 1957). At the time, there was no public health agency in the National Ministry of Health, nor was "the necessary infrastructure for [the] distribution, purification, and storage" of clean water readily available (Atkins 1957; Chakraborti, Das, & Murrill 2011:27). The 1954 national program sought to build more sophisticated water systems in villages, but received only a small allocation of resources (Black 2005:17). Although there was an abundant supply of surface water, extensive surface water solutions proved insufficient in addressing the food security and public health issues (Chakraborti, Das, & Murrill 2011:27).

The 1960s were a period of profound change in development policies regarding water and food security. The use of groundwater in agriculture began to explode in the early 1960s, as the central government began to shift away from using surface water. The use of groundwater for drinking water purposes was promoted by the World Health Organization and UNICEF in a proposal for widespread use of tubewells (Chakraborti, Das, & Murrill 2011, 27). The national drinking water supply program was expanded under the Ministry of Health's Central Public Health Environmental Engineering Organization and the water supply for rural areas received greater priority (Black 2005:17). In the Second Five-Year Plan, the Planning Committee allocated approximately $135 million for "municipal water supply and sewerage and $62 million for grants to states for rural sanitation" (Atkins 1957:1263). The National Rural Drinking Water Supply Programme, a $125 million project, was established in 1969. Under the program,

1.2 million bore wells and 17,000 piped water supply projects were constructed (Chakraborti, Das, & Murrill 2011:27).

The famine in Bihar in 1966-67 exposed the depth of India's food security issues and pushed the policies of the Green Revolution to the forefront (Black 2005:17). "Serious official commitment to rural drinking water services began" in the 1970s (Black 2005:18). The national government continued its commitment to the proliferation of groundwater usage with the Accelerated Rural Water Supply Programme in 1972, which aided states in providing drinking water in rural areas (Chakraborti, Das, & Murrill 2011:27). The national water drinking supply program was expanded under the Ministry of Health's Central Public Health Environmental Engineering Organization (Black 2005:18).

In the 1970s, the focus was on safe drinking water and the international philosophy on water management advocated a "compartmentalization approach" so that different aspects of water use were separated out. The push for safe drinking water was driven by a public health mindset concerned with the spread of disease through unsafe water. However, such an approach overlooked the vital role that water played in their livelihood as necessary for agriculture, as well as the need for sanitation (Black 2005:18-9).

The central government created the National Water Policy in 1987 and again in 2005, which prioritized a safe drinking water supply in water distribution and management. However it has largely failed to rectify the problems that are caused by disconnected management of water, an absence of strict regulation of groundwater, and a "failure to promote drought-proofing energetically in arid and

semi-arid areas with high rainfall variability", such as the southern Rajasthan (Black 2005:22). Such goals are incorporated into the strategy but have failed to be realized. Consequently, it has been rebuked as a nominal policy (Chakraborti, Das, & Murrill 2011:27). In 2005, the national government established the Bharat Nirman Programme to develop infrastructure for drinking water and irrigation in rural areas (Chakraborti, Das, & Murrill 2011:27). The report for the Tenth Five-Year Plan claims that 95 percent of the rural poor have access to a protected water supply, however survey data shows that almost 80 percent of India's rural population does not have contact with a formal water service provider (Shah & van Koppen 2006:3416).

Groundwater

Groundwater is vital capital for the livelihoods and food security of rural people. It is the main source of drinking water and irrigation water. Since 1947, it has been a key aspect of India's water and food security. However, "after decades of intensive use, the sustainable and continued utilization of this vital resource is threatened" (Chakraborti, Das, & Murrill 2011:31). Agriculture that relies on groundwater is unsustainable and "threatens India's ability to maintain food production growth rates" (Moench 1992:A7). The genetically engineered crops promoted during the Green Revolution require robust irrigation, and thus agricultural output is extremely dependent on an adequate supply of water (Moench 1992:A8).

The intensive use of groundwater has only occurred in the last 50 years. In the shorter term, the "impact of groundwater use is positive and includes such

benefits as increased productivity, food security, job creation, livelihood diversification, and general and social improvement" (Mukherji 2005:329). However, in the long term, groundwater use is detrimental with a "permanent lowering of the water table and deterioration of the water quality" (Mukherji 2005:329). In the villages near Bhinder, there has been a dramatic decrease in the water table because of overexploitation. The "excessive exploitation of groundwater resources in many places throughout the country has led to a steadily declining water level, which can alter local water quality" (Chakraborti, Das, & Murrill 2011:31). Though resources were poured into the rural water supply program through the 1990s, the supply did not seem to be increasing. "The drop in water tables all over the country caused by the uncontrollable extraction of groundwater for irrigation meant that many of the new installations functioned only sporadically or dried up in the summer" (Black 2005:22)

A majority of the people I spoke with across all three field sites relied on open wells, and thus groundwater, for their drinking water. Almost two-thirds of the villagers in Varanoda and Dangi Kheda rely on open wells for their drinking water needs. In my fieldsites in Amer and Bundi in eastern Rajasthan, people reported that the water from direct groundwater sources, like wells, tasted better than the water that came from the *nal* (tap). They described the water from wells as sweeter that tap water. Such a distinction has also been found in other studies (Gold 2002). My informants reported that the *nal* water was treated with chemical powders. It follows then, that the water that was chemically treated would taste differently. They described it as containing so much fluoride that they could see a

layer of white powder form at the bottom of a water vessel in which it was collected.[5] My informants in Amer and Bundi complained the heavy fluoride content caused them arthritic symptoms and pain, indicating the disease fluorosis.

An overabundance of fluoride and salinity are the main problems in groundwater quality in regions like the areas in which I conducted my research. Because of the overexploitation of groundwater, groundwater sources that were described as sweet, or fresh, before, are now becoming saline. Rajasthan is one of eight states in which "instances of inland salinity have been documented, resulting mainly from excessive groundwater use for irrigation" (Chakraborti, Das, & Murril 2011:29-30). The groundwater in 27 of Rajasthan's 33 districts has been determined to be too salty to be consumed. In some areas, the salinity is "so high that it is utilized for salt production" (Chakraborti, Das, & Murrill 2011:30).

People across all three fieldsites reported shortages in their water supplies. In Bundi, running water was only available every two days for about an hour. Residents there had to collect water at that time in tanks and other water vessels, and they reported that the amount of water would only meet the needs of a small family.

Water for Health

Water poses a risk to health in several different ways. The scarcity of water threatens life and poor quality water facilitates the transmission of water-related diseases, including microbial and toxin-related diseases. As I have

[5] Because of the scarcity of water, running water was only available on a schedule. Families would collect the water in earthen and metal pots or tanks to store for use.

mentioned above, water scarcity is a threat to the entire way of life for rural people (Black 2005:24).

During the 1970s, water policy was primarily guided by a public health approach to water. This was driven by the knowledge that unsafe water spread epidemic diseases. “This idea had been ingrained in the public health engineering mind since the sanitary revolutions of the nineteenth century banished cholera in the West” (Black 2005:18). The awareness that unsafe drinking water posed extreme “social costs”, such as high morbidity and mortality and the prevalence of diarrheal diseases, legitimated a water policy focused on clean water to promote health (Black 2005:18-9).

However, just emphasizing the importance of safe drinking water is not enough to solve the water issues that millions of poor rural Indian families are facing (Black 2005:24). This is mainly because the “assumption that ‘safe’ water is the key to public health” is false. Water is necessary to have “a decent, healthy, and dignified life” – for personal hygiene and domestic cleaning. This is different from asserting that ‘safe’ water will eliminate infectious disease (Black 2005:20).

Reducing infectious diseases transmitted through water cannot be accomplished solely through safe water. In response to the international momentum on the importance of water supply and sanitation for public health, India allocated increasing amounts of money for the rural water supply. Yet not much action was taken on sanitation until 1986, after it became clear that safe drinking water alone could not fundamentally change public health. Sanitation is crucial to achieve a reduction in waterborne diseases, which are largely sanitation-

related diseases, because water becomes contaminated through inadequate separation of waste. Though a national rural sanitation program was initiated with support from several international donors, in most places in India, and particularly in Rajasthan, the sanitation component has been largely neglected (Black 2005:21).

In the villages in which I was working, the water development projects did not incorporate a health component. The focus of these initiatives was to increase the availability and distribution of water for agricultural purposes. In villages like the ones in which I worked, "the people who need water to drink and the people who need water for irrigation are the same people" (Black 2005:17). Yet, the approach of the 1960s, in which the purposes of water became diverted into distinct policies for health and agriculture is still prevalent. The "division between 'water for agriculture' and 'water for health'" does not make sense in a monsoon climate where precipitation rates fluctuate cyclically (Black 2005:17-8). The projects being conducted were guided by economic needs, rather than an integrated framework which would ensure that the increased supply of water was clean and reduced the prevalence of water-related diseases. It is necessary for water development projects to understand that access to water is a matter of life, health, and economic survival (Black 2005:18).

Water Management

In India, water is the responsibility of the state. The constitution invests the state with the "legislative, administrative, and regulatory power" necessary for managing water (Chakraborti, Das, & Murrill 2011:30). States must develop and

implement their own program for water management (Sigurdson 1977:72). The design and construction of water and sanitation facilities in the 1950s was left to individual states, and states developed their own standards for the facilities (Atkins 1957). States further devolve responsibilities of water management onto local government institutions, such as the Panchayati Raj Instititions (Chakraborti, Das, & Murrill 2011:30). The role of the central government in the water sector is mainly providing financial assistance for projects. It also provides training, conducts research, and maintains monitoring networks (Chakraborti, Das, & Murrill 2011:30).

It is widely recognized that there is a need for a paradigm shift from water resources development to *integrated* water resources management. Since the 1830, India's water management philosophy has been the former, rather than the latter (Shah & van Koppen 2006:3413). However, this shift is occurring slowly as organizations like Wells for India and Sahyog Sansthan focus on water resources management. The components of an integrated water resources management framework include, among others:

> A national water policy so that there is a cohesive, well-understood normative framework to guide all players in the sector; a water law and regulatory framework for coordinated action for sustainable water resources management; [and] participatory water resource management with involvement of women so that "water becomes everybody's business". (Shah & van Koppen 2006:3413-4).

Such goals involve improved governance of water resources and greater decentralization of power to involve local level people in decision-making.

The inability to integrate water policies will result in a competition between the water for consumption and water for irrigation (Black 2005:22). This is problematic because the same people require water for both. While the central government has attempted to decrease the fragmentation among the various water agencies, "the sheer number of governmental bodies, their overlapping roles, and typically compartmentalized approaches continue to hamper overall water management" (Chakraborti, Das, & Murrill 2011:32). An integrated water management policy requires an integrated infrastructure to implement it. Combined, these must address issues of water for drinking and hygiene, water for agriculture, surface and groundwater extraction, as well as environmental conservation and industrial needs (Chakraborti, Das, & Murrill 2011:32). Since water touches many aspects of human life, its management must be equally comprehensive.

In order to provide an adequate supply of safe, clean water to the people, the system that controls the water must be re-engineered. The current system has disparate institutions that do not work cohesively on an integrated plan to ensure the needs of the people. Instead of viewing water as a property to be managed, it must be viewed as a multi-dimensional resource with multiple claims and applications that must be governed. The legal and technical perspectives must be integrated into a broader and holistic framework with multiple actors and organizations (Mukherji 2005:329)."In the climactic uncertainties of the twenty-

first century, in the growing competition in India over scarce freshwater supplies, in the increasing use of market mechanisms to decide allocations, in the growing presence of chemical and bacteriological pollution," (Black 2005:31) there is a pressing need to ensure a clean supply of water and protect the lives of those who are particularly vulnerable and marginalized, such as the *adivasi* communities of Meena in southern Rajasthan.

Health and Health Systems

Poor nutrition works in tandem with unsanitary conditions and unclean water in the prevalence of infectious diseases. Poor nutrition in particular is one of the leading risk factors for susceptibility to infectious diseases. Moreover, common deficiencies in micronutrients, like Vitamin A, predispose children to death by infectious disease. The combination of poor nutrition, poor sanitation and inadequate water means that more than half a million children die annually from diarrheal diseases in India (Zaidi, Awasthi & deSilva 2004:811-12). Compared to East Asia and the rest of the world, India's health indicators are much poorer. This is because public health services like vector control, monitoring of sanitation, and improving water systems are not accorded as much importance as curative measures (Das Gupta 2005:5159). This could be seen in the strong emphasis on eradicating polio by vaccination. In the cities, there would be billboards with Rotary International pushing for polio eradication. Eighty percent of the children in the villages in which I worked had been given the polio vaccination.[6] However, few, if any, had received any of the other required vaccinations. This demonstrates that even the prophylatic measure of immunizations fall short.

Water-Related Diseases

There are a number of different categories of water-related diseases. Three of these are by a water-borne vector: waterborne pathogens, water-based intermediate hosts, insect vectors that breed in water. The fourth is hygiene-

[6] This number is likely lower because some of the villagers I interviewed were middle-aged and old, and their children, who are adults, were not part of the current push to eradicate polio.

related, and the last is from chemical toxins in water (White, Bradley & White 1972). I focused on the first four categories, which are all microbial, in my questionnaires when I inquired about water-related diseases. The reason I chose to focus on microbial diseases is because "microbial hazards" form the majority of "waterborne disease[s] in developed and developing countries" (Suthar 2011:838). I found that it was impossible to ask villagers to identify the list of water-related diseases by name because they either did not recognize the names or there were ethnomedical names for them which I was unfamiliar with. Thus, I inquired about water-related diseases by asking about the symptoms exhibited by such diseases.

A variety of water-related diseases are found in Rajasthan. I found that bacterial diseases were reported in the villages of the Motida *panchayat*, as well as in Bundi and Amer. In the latter two, people reported the diseases malaria, typhoid, hepatitis, as well as symptoms of dehydration, diarrhea, vomiting, and heat exhaustion. These indicate both microbial diseases and diseases of water scarcity.

The water- and sanitation-related diseases reported in the villages in which I was working include malaria, anemia, eye flu, typhoid, various skin diseases, and diseases caused by worms.[7] The diseases reported include all four categories of microbial illnesses. Sixty-seven percent of the households I interviewed indicated that disease could be caused by water. However, villagers' knowledge about how water caused illnesses was limited. Most people described water-

[7] The other two diseases reported were tuberculosis and polio.

related disease as caused by the first rains of the monsoon. Almost 90 percent of those who reported that water could cause illnesses in Varanoda and 25 percent of those who reported that water could cause illnesses in Dangi Kheda said that the first rains in the monsoon caused disease. They described this water as unsafe to drink because it would cause vomiting. The water would be brown as it cleared out the pollution in the air. Out of the sample of 43 households, 1 reported that contaminated water caused disease, 2 reported that stagnant water caused disease, and 4 indicated that the water needed to be clean in order to prevent disease.

The two mosquito born illnesses of malaria and dengue fevers are prevalent, especially in the rainy season from July to October. (National Rural Health Mission 2012b). Almost 50 percent of villagers interviewed indicated that illness was more common during the monsoon season. 86 percent indicated that malaria still occurred in the villages, and malaria was the most frequently reported illness. However, the villagers did not connect these two phenomena together; though people readily admitted that mosquitoes caused disease, they did not conceptualize malaria as a water-related disease. When I inquired about the susceptibility of the open water sources that were being created by the projects to mosquito breeding, the villagers asserted that because these mini-reservoirs were far away from people's homes, it was not a problem. The villagers also asserted that the open wells from which they obtained their water was clean, by which they meant that the water was visibly clean – free of dirty, debris, and clear. However, by the profile of symptoms described when people fall sick (including diarrhea,

fever, and vomiting), it is evident that the water is not safe from bacterial agents that cause disease.

The prevalence of diseases caused by the fifth category of water-related disease, chemical toxins, yielded surprising results. Such diseases were highlighted in Bundi and Amer, but not mentioned in the villages of Motida. People complained that the mineral deposits from the bleaching powder used to treat running water caused rheumatic and arthritic symptoms and pain. Such descriptions indicate that people in these communities suffer from fluorosis. Fluorosis is the chronic intoxication of fluoride from high levels in drinking water. The disease is endemic in many states in India, particularly in Rajasthan, which has high fluoride content in the groundwater sources of nearly every district. The highest levels are in southern Rajasthan, where there is a large population of *adivasis*, in the districts of Udaipur, Banswara and Dungarpur (Choubisa 2001:61). In Udaipur, it is the groundwater and not the surface water that contains large amounts of fluoride (Choubisa 2001:63). It is strange that people from Amer and Bundi complained of fluoride more than the villagers, since fluoride levels are much higher in southern Rajasthan, including the Udaipur district, than in the districts in which Amer and Bundi are located. The people from Amer and Bundi complained of excessive use of chemicals to purify the tap water and attributed the fluoride level to this, rather than to the groundwater. The people from the villages of Varanoda and Dangi Kheda did not complain about fluoride levels or any of the symptoms that people from my other two fieldsites did. It is unclear why such a pattern exists.

Suthar, Chhimpa & Singh's (2009) study of open water sources in Rajasthan showed contamination by ten bacterial species. Three of them, *E. coli*, *E. aerogenes*, and *Klebsiella,* form a majority of the coliforms found in open water sources and indicate fecal contamination of drinking water. *E coli* is one of the major causes of diarrhea in infants in developing countries (Suthar, Chhimpa & Singh 2009:44). Diarrheal diseases were one of the most common causes of illness in the villages where I studied. The doctor from the community health center stated that there was diarrhea epidemic in the area in 2006 and that Hepatitis A is prevalent. Fortunately, there have been no recent cholera epidemics.

There is a strong link between poor sanitation and water-related diseases. Many water-related diseases are actually diseases caused by poor sanitation. Sanitation is defined as the clear hygienic separation of human excrement from human contact. Poor sanitation and lack of hygienic practices are associated with the contamination of water in rural areas:

> The risk of water contamination resulting in water-borne diseases is higher in rural areas under the following conditions: inadequate availability of water, poor quality of water at source, ill-maintained water pipelines and sewer lines, open air defecation is rampant, lack of disposal of human, animal and household wastes, and lack of awareness of good sanitation and personal hygiene practices. (Suthar, Chhimpa & Sinng 2009:50).

The lack of sanitation threatens the water quality of open water sources. Probing issues of sanitation was difficult as I discovered in my interviews. Excretion is a

topic that is taboo to discuss openly, and so my team and I had to find a way of asking about toilet facilities indirectly or inferring the possibility of a latrine based on the conditions of the house. All of the villagers indicated that excretion was done in the fields, as there were no latrines. Sanitation is absent in these villages. Moreover, hygienic measures, such as washing hands with soap and water, particularly after excretion, is not practiced widely in these communities.

The villagers rely on open water sources for both drinking water and water for agriculture and these are at risk of bacteriological contamination. Open wells serve as the primary source of drinking water; 65 percent of families in the villages in which I worked relied on open wells for their drinking water. Surface water sources, like those that were being created through the water management projects, were being used for irrigation. Fecal contamination of open water sources in rural areas, like the villages in the Motida *panchayat*, occur from rainwater runoff from the fields in which people excrete (Suthar, Chhimpa & Singh 2009:47-9). The villagers come into direct contact with the surface water sources they use to irrigate their fields. These sources can be contaminated from the human excrement from the nearby fields. "The major pathogenic bacteria responsible for water-borne disease are spread by the fecal-oral route" (Suthar, Chhimpa & Singh 2009:44). And since handwashing with soap is almost non-existent, any contact with bacterial agents in the surface water can be ingested and cause further infections. Furthermore, drinking water can also be cross contaminated by the lack of handwashing. Drinking water in the villagers' homes is stored in clay pots, a practice customary across the fieldsites in which I worked,

as well as in the city of Udaipur. Water is removed for consumption by a *lota* (small vase-like bowl). The lack of handwashing combined with this method of water consumption suggests that the drinking water can easily be contaminated. It is not the method of water consumption, but the lack of sanitation and hygiene that spread disease.

Malnutrition

According to data from the National Family Health Surveys, 45 percent of Indian children under the age of 3 were stunted. Growth is not only inhibited by poor nutrition, from nutrient-poor food and/or inadequate quantities of food, but also by repeated infections (Das Gupta 2005:5159). Malnutrition is closely related to a weak immune system and higher risk of infections in young children (Kaur, Singh, Jain, & Bhasin 1999:161). Both healthcare providers and the villagers indicated that malnutrition was endemic.

There are several studies on the nutrition status of Meenas, and these tend to concern children. Nutrition status is measured by height-for-age, weight-for-age, and weight-for-height. Low weight-for-age indicates acute malnutrition and is the first marker of malnourishment. Since skeletal growth is hindered by poor long-term nutrition, low height-for-age indicates chronic malnutrition. Changes in Weight-for-height, which is essentially the same as body mass index, serves as an indicator of current malnutrition (Kaur et al. 1999:161; Agrawal 2006:377). In short, weight-for-age indicates undernourishment, height-for-age stunting and weight-for-height indicates wasting (Kaur et al. 1999:164).

Kaur et al.'s (1999) study conducted in the Sawai Madopur district is particularly comparable to my fieldsite, since the district has a high concentration of *adivasis*, a majority of whom are Meenas (161). Their study found that 20 percent of *adivasi* children exhibit severe acute malnutrition, thus indicating that malnutrition is still prevalent. Thirty-six percent exhibit severe chronic malnutrition, while only three percent exhibit wasting, indicating that current nutrition is an improvement over past nutrition, which was very poor. A greater proportion of children exhibiting mild (25 percent) to no wasting (60 percent) than moderate or severe indicates that nutrition is improving. In contrast, 64 percent of children show severe or moderate stunting, indicating that nutrition was much poorer in the past. (Kaur et al. 1999:162-4).

India has one of the highest rates of protein-energy malnutrition, which is associated decreased immune function, and consequently chronic illness and increased morbidity, anemia, and increased mortality (Kaur et al. 1999:161; Akner & Cederholm 2001:6). Chronic energy deficiency, measured by body mass index, is associated with poor hygiene and low economic status, is also found among Meenas. Agrawal's (2006) study conducted in villages the Jaipur district found that 91 percent of Meena boys suffered from some level of chronic energy deficiency (377-378). Calorie deprivation is a common problem across India, which is increasing in prevalence. The number of people consuming less than 2400 calories a day, which is the average number needed based on the nutritional standard in India, has increased across India[8], and particularly in Rajasthan

[8] Except for the states of Keral, Orissa, and West Bengal.

(Meenakshi & Vishwanathan 2003:370). Thus, Meenas show both low protein intake, which predisposes them to anemia and decreased immune function, as well as a deficiency in energy.

One of the most common nutritional deficiencies was anemia, which is the most widespread nutritional deficiency worldwide. Anemia was the second most commonly reported illness – after malaria – and both male and female villagers associated anemia with women. It is noteworthy that anemia was always mentioned with malaria and that the two were the most prevalent health issues in the villages in which I worked. Anemia has both nutritional and infectious causes, and they often occur simultaneously in the same person. The two major causes of anemia are iron deficiency and malaria. Anemia is a water-related disease as malnutrition and water-borne infections, like malaria, hookworm, and schistosomiasis contribute to anemia (WHO 2012). Though women recognized anemia as a problem, and had access to free iron supplements provided by the government from the *anganwadi* (pre-school), they refused to accept and take the supplements. Though I questioned women further as to why they refused iron supplements, I could not elucidate an answer. Even the college-educated young woman whom I interviewed refused them. Combating anemia requires improving the water supply, sanitation and hygiene, since controlling water-borne diseases will reduce the prevalence of infectious causes of anemia (WHO 2012)

Nostalgia for the Past

There seems to be competing notions of nutrition comparing the past and the present. The 1950s and 60s brought changes in farming with the use of chemical

fertilizers and motor-powered pumps for irrigation (Gold 2002:278). In Gold's (2002) study, the villagers felt that these changes, coupled with the use of pesticides and new crop species, had reduced the nutritional quality and taste of the grains (Gold 2002:81). While chemical fertilizer produced a greater quantity of grain, the villagers felt that *desi* (organic) fertilizer produced crops tasted better (Gold 2002:292). Their narratives also spoke of less dairy products being consumed now than in the past (Gold 2002:57). They described food and drink today as being less pure, robust, and nutritious than in the past (Gold 2002:298). Basically, the villagers believed that technology undermined the strength of the food (Gold 2002:296).

In the communities of Amer and Bundi, I found a similar sense of nostalgia for a past that was healthier and had better nutrition. People said that the food used to be purer and that people used to do more physical labor. One man, for instance, stated that his grandfather had never gotten sick or taken pills in his life. In contrast, the healthcare providers reported that people were less sick now than they used to be in the past (what do you think is the reason for this?. This is corroborated by data from studies like Kaur et. al.'s (1999). Though malnutrition is still widespread, it is not at the same level as it has been in the past.

Health Infrastructure

In rural areas, the healthcare system is in three tiers: a sub-center, a primary health center (PHC), and a community health center (CHC). The data from 2009 for Rajasthan indicate there were 10,951 sub-centers, 1,503 PHCs, and 367 CHCs (Child Health Foundation 2012:8). The sub-center is the lowest tier and the first

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point of contact for villagers with the primary health infrastructure. The sub-center must have at least one male and one female health worker (ANM). They are responsible for providing maternal and child health services, nutrition supplements, vaccinations, and controlling diarrhea, as well as education to encourage behavioral changes for better health. The Rs. 10,000 annual budget is jointly operated by the *sarpanch* (head of the *panchayat*) and the female health worker (Child Health Foundation 2012:2). The primary health center is the first point of contact between villagers and the Medical Officer. The PHC must have one Medical Officer, 14 paramedical staff, and contains four to six beds. It takes referrals from six sub-centers. The PHC is maintained by the state government and focuses on preventative health care, but also provides curative healthcare (Child Health Foundation 2012:3). The community health center must have a minimum of four specialists – surgeon, physician, gynecologist, and pediatrican – as well as 21 paramedical staff. The CHC takes referrals from 4 PHCs and contains 30 beds, one operating theater, an x-ray machine, a labor room and laboratory facilities. The auxiliary nurse midwife (ANM) is the one in charge of preventative health care, including infectious disease control. The ANM is the "key field functionary who interacts directly with the community", and is no longer a midwife, but a general health worker (Child Health Foundation 2012:4).

The *panchayat samiti* of Motida had one sub-center in the village of Varanoda and one community health center named Gulab Singh, in the town of Bhinder. The sub-center was neglected and almost never open. The villagers indicated that people who fell sick had to be taken to the CHC, which was nine

kilometers away. The distance was a hindrance for people to access healthcare and in one case, a young boy lost his eye to infection because his parents were not able to take him to a doctor. The neglect of the sub-center was indicated by the prevalence of malaria in the population, since it was supposed to manage the occurrence of diseases, malaria in particular, by providing palliative care. The other major issue was fraud as health workers inflate numbers and misreport cases to indicate better functioning of the system than is actually occurring. The CHC, though preferred by the villagers out of necessity, is still inadequate in providing quality healthcare. The conditions of the hospital were dismal. When I went to visit the hospital, there was no electricity and animals were inside the building and rooting through trash. The environment was not clean or sterile. From the information provided by the hospital administrators in Amer, there was evidence of contamination in the water by sewage. Water that was used for cleaning and consumption purposes was extracted less than 500 feet away from where the sewage was dumped.

National Rural Health Mission

The National Rural Health Mission (NRHM) was created to correct the "basic health care delivery system" in India (National Rural Health Mission 2012a). Its goal is to improve the accessibility and availability of quality healthcare for rural people, especially those who reside in states with poor public health indicators and infrastructure. Rajasthan is one of the states on which the NRHM focuses (National Rural Health Mission 2012a:2). The NHRM also seeks to integrate several agencies, such as the Departments of Health and Family

Welfare, and the National Disease Control Programmes and Disease Surveillance Programs (National Rural Health Mission 2012a:8-10).

The NRHM consists of several levels of institutions. The Village Health and Sanitation Samiti consists of trained health workers and *panchayat* representatives. The Rogi Kalyan Samiti is a community group that manages public hospitals. There are also State and District Health Missions (National Rural Health Mission 2012a:9-10). The NRHM seeks to decentralize programs so that health can be managed on the district level to strengthen the ability of the *panchayats* to "own, control and manage public health services" (National Rural Health Mission 2012a:2-4). This goal of decentralization has not materialized in the communities I worked in. Such ownership does not exist, nor do the samitis the NRHM was to create. This affects "efficiency, accountability and effectiveness" (National Rural Health Mission 2012a:2). Similarly, the goal of incorporating the various factors that influence health, including safe drinking water, sanitation, hygiene, and nutrition has not occurred (National Rural Health Mission 2012a:2).

Another problem with the public health infrastructure is a lack of funding. Expenditure on public health has decreased in India from 1.3 percent to 0.9 of GDP from 1990 to 1999. The central government contributes only 15 percent of the cost, whereas the state governments contribue 85 percent (National Rural Health Mission 2012a: 2). This places the burden on states and since there are strong inequalities across the country, poorer states like Rajasthan find it more difficult to spend their budget on public health.

The *anganwadi* (pre-school) is the site at which maternal and child health services are delivered. There is a Health Day scheduled every month for people to receive vaccinations, contraceptives, nutrition supplements, such as iron, and ante-natal and post-natal check-ups (National Rural Health Mission 2012a:15). My fieldwork revealed the deficiencies in the health services provided at the *anganwadi*, since the health of women and children in these communities is neglected. Though the NRHM claims the maternal and child health session at the *anganwadi* occur regularly (2012c), the villagers said the *anganwadi* did operate regularly. To combat anemia, which is caused by iron deficiency, the *anganwadi* is supposed to provide education on a balanced diet, perform physicial check-ups, and distribute iron supplements. The only aspect of these that was available were iron supplements, but the women refused to take them. To combat Vitamin A deficiency, which is the main cause of blindness, a syrup form of Vitamin A is supposed to be administered to children in five doses until about age 3 (National Rural Health Mission 2012c). The villagers informed me that the supplement was not administered to children. The nurse that is supposed to visit the villages does not come on schedule or as frequently as needed.

The rate of immunization in the villages is minimal, and does not meet the standards nor the regimen that has been set by the government. Women are supposed to receive a course of immunizations as part of their ante-natal care through the *angan wadi*, however only one woman reported that she had received one of the Tetanus shots. The children are supposed to receive a regimen of scheduled vaccinations, but 21 percent of children had not received any

immunizations. The vaccines that are provided by the government include Bacillus Calmette-Guerin (tuberculosis), which is to be administered at birth; Polio (given orally) and Diptheria/Pertussis/Tetanus at six weeks, ten weeks, and 14 weeks; and Measles at nine months (National Rural Health Mission 2012c). Children are also supposed to receive the Hepatitis A vaccine. Polio and BCG are the only relatively consistent vaccines administered to children; 79 percent of children had received these vaccines. The percentage of children vaccinated with polio and BCG is higher in Varanoda (88 percent) than in Dangi Kheda (67 percent).

The NRHM cites several reasons for the lack of penetration into areas like the ones in which I conducted my fieldwork, including remoteness, "difficult geographic terrain or seasonal inaccessibility", and rejection of services by villagers due to religious reasons (2012c). My fieldwork indicates that these are likely not the root causes, and the problems are associated with a lack of personnel to cover a large area, a failure to meet the goals the NRHM sought to achieve, such as decentralization and strengthening accountability, and inadequate funding. As WHO India notes, "there remains a huge gap in terms of human resources at [the] primary care level", though efforts have been made in the recent years to increase personnel (2008:18). The villagers reported that they would take the ill to government health facilities, rather than traditional healers, which indicates that there is no religious aversion to biomedicine.

My fieldwork helps provide greater information on the current status of the *advasi* community of Meenas in southern Rajasthan. The communities in

which I worked are facing acute water scarcity, which is limiting the water they have available to drink and use for irrigation. Currently, there are water development projects underway, but as the next two chapters will demonstrate, the quality of water and its related effects on health are still very low.

Governance

An examination of political development in India is necessary to understand the role of the state in community health. The relationship between people and the state is linked to the structure of the government and the style of governance. The health of the people is a reflection of a healthy, functioning political system which is able to meet the needs of the people. This chapter will provide a historical context for the political factors that affect the health of people.

India has a long history of pluralism. Political organization in India has historically consisted of a series of loosely tied independent kingdoms. Few regimes have united the subcontinent under one banner. Power has not been concentrated in a single, sovereign figure that rules over the entirety of India. Instead, it has been vested in multiple people, whether it was the individual rulers over the various kingdoms or elected representatives of the people. The endurance of pluralism is linked to the lack of sweeping transformations of society. Rather than being changed by imported ideas, Indians adapted and changed with the infusions and invasions. For example, when the Moghul emperors conquered India, the existing social hierarchies were not completely eradicated. They did not systematically convert the Hindu societies over which they ruled (Kaviraj 2005:271). Rather, elements of Moghul culture were incorporated into the existing society and culture.

Despite the initial skepticism regarding the ability for democracy to continue in India, it has consistently been a democracy since it gained independence in 1947 (with the exception of the between June 1975 and March

1977) (Oldenberg 2010:8). In this chapter, I will discuss the development and nature of democracy in modern India. To this end, I will explore the history of political organization from colonization to the present, including the rise of nationalism.

Colonialism

Contrary to the historiography by both imperial and nationalist sources, British colonization of India was not a comprehensive conquest of an existing nation-state of India. Through the process of colonization, the British created a political India; it did not exist as a unified political entity prior to this. The area contained various independent kingdoms that became absorbed and transformed into a polity as a consequence of British colonization. The process of acquiring control over India was complex, messy, and stealthy, and occurred gradually (Kaviraj 2005:273).

The British East India Trading Company introduced "various military and administrative functions" as needed (Kaviraj 2005:275). Over a period of seventy years, the Company's functions and power grew to form the colonial state. At this time, the colonial state was a hybrid – not completely subsumed under the British Empire, but not completely sovereign – and lacked governmentality (Kaviraj 2005:275).

The Sepoy Mutiny of 1857-58 altered the nature of British colonial rule in fundamental ways (Kaviraj 2005:276). The rebellion did not incite revolutionary fervor in the poles of Indian society: the upper class was concerned with its commercial interests which were intertwined with the British East India Trading

Company, and the peasants were too removed from the "world of political power to respond widely to the contestation of legitimacy of foreign rule" (Kaviraj 2005:277). Prior to the Mutiny, colonial policy was ambivalent and wary of interfering in the social fabric of Indian society. The British government's relationship could be characterized as free-riding on the benefits produced by the British East India Trading Company's rule without assuming any real responsibility of affairs if something went wrong (Kaviraj 2005:276-7). After the rebellion, the British government "assumed direct responsibility of the Indian empire", rolling up the proverbial sleeves to get their hands dirty in all the functions and affairs of governance (Kaviraj 2005:277). They also adjured their formal policy of hesitation in fully penetrating Indian society (Kaviraj 2005:277).

In the reorganization of political power following the Sepoy Mutiny, the colonial authorities realized they needed to collaborate with Indians to establish more robust bureaucratic control. The quasi-hegemonic colonial rule served the interests of both the colonial authorities and the ambitious Indian elites. The Indian elites saw in the growing sovereignty of British an opportunity to expand their own control over Indian society (Kaviraj 2005:277). Those who served in the army and in the bureaucracy tended to be loyal to the British. The nature of civil service in India came from the "administrative system of the Regulation Provinces with its careful definition of the citizenry and the restrictions it placed on the authority of the district officer enabled the growth of political consciousness" (Sayeed 1968:281-2 in Oldenburg 2010:18). Punjab, which was more heavily militarized and had a stronger integration of the military into civil

administration, was on the periphery of Indian territory. In 1920, Gandhi had called on government officials to leave their jobs, making it unpatriotic to serve in the army or in the civil service. These two branches did not serve the independence movement, and thus did not gain any glory from it (Oldenburg 2010:20-1).

Nationalism

The nationalist movement in India was a mass movement, as millions of Indian became a part of the movement starting 25 years before independence was achieved. The All-India Congress, founded in 1885, was the oldest nationalist movement to achieve independence in the post-World War II world. Because of how long it lasted, the movement required new waves of leaders to take over (Oldenburg 2010:21-2). The prominent leaders of the nationalist movement "had significant followings, and represented… particular geographical or other interests" (Oldenburg 2010:22). Not only was the nationalist movement old, but it was run democratically, "reached a mass public early", and it valued the rule of law and non-violence (Oldenburg 2010:21).

"Nations do not make states and nationalisms, but the other way round" (Hobsbawm 1992:10 in Oldenburg 2010:29). In order to create a unified democracy, it is imperative to define and agree on the country's national unit. This delineation of the boundaries of what India was and what it would mean to be Indian developed significantly before independence was achieved (Oldenburg 2010:28).

Constructing a national identity in India was difficult because there were no apparent social or cultural factors that created a national unit; there was no "common religious, linguistic, ethnic, territorial, or historical identity" (Oldenburg 2010:23). In the absence of any apparent social or cultural factors that could create a national unit, "the nationalist movement drew on opposition to British colonial rule, and particularly its exploitative economic system, to unite Indians" (Oldenburg 2010:33). Indian nationhood was engineered on economic and political grounds. "Indians were 'Indian' because they were *collectively* exploited economically and suppressed politically by the British" (Oldenburg 2010:23). Nationalist leaders argued that India was unable to advance economically because of the political restraint of the colonial system (Oldenburg 2010:23).

The Congress Party was not successful in gaining support in the princely states of present-day Rajasthan (Oldenburg 2010:30).[9] The Congress Party and other parties were barred from organizing there. Before independence, Rajasthan was a collection of independent kingdoms, ruled by the Rajputs who had controlled that area for a millennium (Bhasin 1999:iii). A majority of the people who lived in this region has a strong Hindu identity, especially the rulers. Thus, nationalism with a religious identity would have resonated better than the secular one promoted by the Congress Party. The Rajput rulers and the political values from court rule they espoused tended to "support the right-wing Hindi-oriented parties" (Oldenburg 2010:30).

[9] For a map of the princely states, see Appendix D.

This sense of identity continued after independence, as the Rajput lineages continued, though with nominal power. It could serve to explain the support the Bharatiya Janata Party, a right-wing Hindu nationalist party, received in the late 1980s and 1990s in this region. In 1998, the BJP was able "to form what could be described as the first avowedly non-secular government India had seen since independence" (Bates 2007:278). Congress had declined, and the BJP had won enough seats to have a chance at being in power. The other parties were faced with either siding with the BJP, or with Congress, "increasingly maverick and quixotic" (Bates 2007:278). The BJP took power in 1998 from a minority coalition called the National Democratic Alliance. In 2004, although the BJP's coalition was defeated, it won more seats in Rajasthan, demonstrating the strength and support of the party's identity in this region (Bates 2007:298).

Strength of Democracy

It is almost remarkable that India continues to function as a democracy, though it is riddled with problems, including "poverty, illiteracy, corruption, religious nationalism, casteism, political violence, and disregard for law and order" (Michelutti 2008:3 in Oldenburg 2010:124). Some of the characteristics needed to a country to be deemed a democracy include free and fair elections, freedom of association, free press, and the ability to participate in voting. Two of the ways in which democratization has occurred are "the belief in a democracy" and a belief in voting (Oldenburg 2010:9). These pillars are necessary for a country to show that political leaders are truly elected by their citizens and govern with their consent. They can claim to be legitimate representatives of their constituents

(Oldenburg 2010:73). Democracy has endured in India since independence with elections occurring regularly and (almost completely) freely and fairly. The Election Commission, an autonomous agency, works to oversee that free and fair elections occur, which strengthens the legitimacy of elected representatives (Oldenburg 2010:81-2).

Nehru had a profound influence on the democracy in India. His leadership established and ensured the success of democracy (Oldenburg 2010:62). Nehru's strong "commitment to, and understanding of, democratic institutions" as well as the movement of the Congress Party secured the authority of elected representatives and the structures in which they could address issues (Oldenburg 2010:11). Nehru himself was truly a representative of India, as his party won the national elections and almost every state election under his leadership (Oldenburg 2010:60).

After independence, India was able to quickly draft and gain consensus on a constitution (Bates 2007:212). "The launching of the new democratic regime was [fairly] smooth, resting on the solid foundation of a deeply rooted and broadly popular nationalist movement, which a rich array of experienced politicians, able and willing to assert their power over the state apparatus" (Oldenburg 2010:124). In establishing democracy in India, the more salient question was not about how to institutionalize religion, but rather how to organize represenation. This was finally accomplished by organizing states according to language (Oldenburg 2010:73).

Democracy is India is far from perfect, however. One of the issues is with the electoral system of first-past-the-post, in which a party, in which a candidate does not need an absolute majority, but wins by plurality (or the most votes). One of the consequences is that the ruling party might not actually be representative of the country, since an absolute majority of the popular vote was not necessary to vote them in (Bates 2007:239-240). Democracy was dealt a serious blow in the years of 1975 to 1977 and the "subsequent serious decline of Indian democracy" is said to stem from those years (Bates 2007:231). That period was known as the Emergency Period, in which Indira Gandhi centralized control and authority to respond to a threat to India's national security. This had broad ramifications as the Congress Party was the largest party in India and controlled most of the country (Bates 2007:231).

The Power Relationship Between Politicians and Bureaucrats

How is it that democratically elected politicians in India have been able to uphold their dominance over the state apparatus, including the bureaucracy and military? The answer lies in the "balance of power between elected officials and the state apparatus" (Oldenburg 2010:10). This balance of power stems from the institutions inherited from the British (Oldenburg 2010:15) and is further established by the character of the nationalist movement (Oldenburg 2010:21).

The relationships between politicians and administrators became increasingly important as the British colonial system was phased out. At the time of independence, political leaders were stronger in India than the bureaucracy (Oldenburg 2010:17). "The power and authority of the state apparatus they

constituted" (Oldenburg 2010:21) could not challenge the "nationalist leaders who became India's democratically elected representatives" (Kundu 1998:6 in Oldenburg 2010:21).

That is, those officials who were elected by the people had more authority than those who worked in the state structure (Oldenburg 2010:17). A vast majority of the Indian politicians who came to power were from the Congress Party and drew their strength from "their achievement of independence" (Oldenburg 2010:42-3). The civil servants had to "defend themselves against the charge of doing nothing to hasten *swaraj* in contrast to the participation of millions of common people active in the nationalist movement" and prove they would be loyal to the new government (Kundu 1998:46-7 in Oldenburg 2010:27). Though Indian civil servants were nationalist at heart, they were not necessarily supportive of the Congress Party (Oldenburg 2010:40).

Gandhi had held a very different vision for post-independence India, with a minimalist government. Bureaucrats would certainly have been wary of "a Gandhian India" as it would have significantly reduced their bureaucracy and jeopardized their jobs (Potter 1986: 127-8 in Oldenburg 2010:40). Gandhi's conceptualization of *swaraj*, or self-rule, is quite literal as it refers to the individual governing, or exercising discipline over, himself. Gandhi's interpretation of *swaraj* called for a limited government, since the strength to govern is inversely proportional between the individual and the state. Under his interpretation, the growth of liberal ideas of individual freedom exported the responsibility for governance to the state when it was the individual's

responsibility. If the government had to be called upon to govern the people on social matters, it signaled the failure of individuals to exercise self-discipline. In contrast, the Nehruvian and nationalist conception of *swaraj* referred to the Indian collective against the foreign influence of the British (Kaviraj 2005:278).

Gandhi's death removed a barrier between the nationalist leaders and the civil servants. The nationalist leaders needed to build a partnership with the bureaucracy in order to govern effectively (Oldenburg 2010:36). This required strengthening trust and respect to ensure a functioning political system (Oldenburg 2010:27). The post-independence goals of "rapid economic development, political independence, democracy, and rule of law" were objectives that bureaucrats held in common with nationalists (Oldenburg 2010:42). Congress leaders felt an affinity towards senior civil servants because they came from similar social backgrounds. There was more friction between Congress leaders and Indian Administrative Service officers, as the latter felt the former were intrusive (Oldenburg 2010:40-1).

The Indian Civil Service had been powerful during British colonialism but become weakened during World War II (Oldenburg 2010:37). The ICS and other services from British colonialism were not enough to meet the needs of the new republic which needed to "be able to provide both the expanded services and development expertise that a liberated India would require" (Oldenburg 2010:41). Nehru realized the importance of an "expert, non-partisan civil service" with "relative autonomy" to be able to provide those services (Oldenburg 2010:40).

The Indian Civil Service was thus expanded to become the Indian Administrative Service (Oldenburg 2010:36).

The military is firmly placed under civilian control, as politicians use the bureaucracy to control the military (Oldenburg 2010:45). Moreover, there is a marked differential in salary, power, and prestige between serving in the civil services and armed forces. Unlike politicians, the military did not emerge from independence as the heroes of the nationalist movement. The curbing of military influence has prevented Indian democracy from being threatened by military coup, as is the case across the border in Pakistan. The situation also prevents an alliance between the military and bureaucracy from usurping power from elected officials (Oldenburg 2010:50-2).

Decentralization and Accountability

Governance refers to the regulations and mechanisms nations use to "make strategic decisions" and it "encompasses authority, power and decision-making in the institutional arenas of civil society, politics, policy and public administration" (Mitchell & Bossert 670). Good governance should both strengthen the "legitimacy and voice" of citizens, as well as hold policy-makers accountable to the citizenry (Mitchell & Bossert 2010:670-1). Thus, governance is intimately linked to *zimmedari*, or responsibility.

Decentralization has grown increasingly popular as a tool for state apparatus reform. It is used to improve governance and the government's negligence of service delivery. The motivation for using decentralization is to decrease the size of the bureaucracy and increase its accountability at the local

level. By increasing local participation, development can become sustainable and public policy more directly serves the people (Mitchell & Bossert 2010:670-1). Decentralization can be a tool for increasing and appropriating *zimmedari* to officials who can be held accountable by the people.

Under British colonialism, the colonial government attempted a form of decentralization with a process of "gradual devolution of power to Indians at the local, and then regional, level" (Jaffrelot 2002: 253-5 in Oldenburg 2010:18). However, the British mainly used the local Indian officials to establish their own authority. There was no transfer of true power and decision-making ability to Indians at these levels. In order for decentralization to be effective, it must provide greater power to lower level and this can be done in several different ways.

There are several different types of decentralization, including political, fiscal, and administrative. The goal of political decentralization is to strengthen policy-making power among citizens and their elected representatives in local jurisdictions. The goal of fiscal decentralization is to furnish localities with greater control over collection and expenditure of funds. Political decentralization increases democracy at the local-level and fiscal decentralization provides representatives the resources to meet the needs of the people. The goal of administrative decentralization is to increase the power of local administrators to supply public services and redirect accountability to local officials, rather than state officials. There are several ways to decentralize administratively. Deconcentration is the weakest form as it dilutes decision-making at the state-

level in favor of local-level; delegation transfers decision-making to a partially autonomous agency; devolution is the stronger form, and transfers the decision-making related to local needs to local-level institutions (Mitchell & Bossert 2010:669-671).

The appropriate degree of decentralization needed "to improve service delivery" requires examination along two axes: the governance perspective and the health-systems perspective (Mitchell & Bossert 2010:670). From the governance perspective, decentralization should "equip local governments" with greater decision-making power, "as long as they are held (democratically) accountable by local constituents for their actions (Mitchell & Bossert 2010:671).

The 73rd and 75th amendments to the Indian constitution seek to decentralize power to local governments. The 73rd amendment calls for political decentralization in rural areas and strengthening the Panchayati Raj Institutions, and the 74th amendment calls for fiscal decentralization in urban areas and strengthening the municipalities (Ministry of Law and Justice 2011). Despite these policy changes, local governments are still weak. Fiscal decentralization has not actually occurred in practice, so local governments do not have the financial resources necessary to fund service delivery (Oldenburg 2010:121). "Money flows from the center to the local level with significant control held at the center and state levels with very little" at the local level (Alley 2002:241).

While elected politicians hold greater authority than bureaucrats, the bureaucrats control the capacity of the state. Politicians are not heavily involved in providing public services to the people, ensuring accountability, or influencing

private activity (Oldenburg 2010:103). While democratic institutions are firmly embedded in India, they are not serving the needs of the people. Those who are elected to represent the needs of the people are not the ones ensuring the delivery of services to meet those needs. Province-level officials who control local service delivery compound the problem. When state-appointed officials who are answerable to the state, and not the local people replace municipal officials appointed by the local government, it diminishes local power and political stability. State officials can be moved around or changed based on political whims (Alley 2002:167). Attempts to "strengthen the power of local bodies and take decision-making control out of the hands of state and central offices" have failed (Alley 2002:169).

The picture that emerges is that administrative decentralization is severely lacking, and fiscal decentralization is weak. In terms of political decentralization, democratic institutions are increasing in strength at the local level. The citizenry is able to collectively exercise their power and challenge the actions of bureaucrats. However, this has not resulted in any greater accountability by the bureaucracy (Oldenburg 2010:121). Additionally, there is "centralized authority without centralized accountability" which only contributes to further "trickle-down corruption" (Alley 2002:152).

This confusion of accountability is reflected in local understandings of *zimmedari*. One of the questions I asked of my informants in the villages of Bhinder was "Who do you think is responsible for providing clean water for

drinking?"[10] Most of my informants did not understand my question. They would often say that no one was responsible for it. Even when I asked them to consider who *should* have that *zimmedari*, they could not think of an appropriate person or agency, and repeated that no had that responsibility. Some would say that people would clean the water from wells if they found a dead animal or it had a significant amount of debris. Only three of them reported that the wells were treated with bleaching powder once a year to clean them. One of my informants described a spiritual cleansing of wells in the case of a death occurring in the well, such as a suicide. The villagers would take water from the Ganges River to 'clean' it. The varied responses to this question demonstrate that the villagers are not directly involved in the governance of water resources and have little knowledge of policies relating to it. Though the government has bodies that are responsible for water, the villagers are not aware of it. This demonstrates the lack of efficacy in the government services. The people do not feel any connection to the policies and actions of those agencies because the latter are failing to carry out their missions. The villagers do however, show a concern for the cleanliness of their water because people from the villages would help clean out debris or dead animals and remove spiritual contamination. Thus, they are already show some rudimentary maintenance, but it is not enough to ensure an international standard of quality drinking water. The villagers inability to identity the body that is responsible for checking water quality is concerning. Only a few people knew the wells were bleached, and this only occurred once a year, which is not enough.

[10] Appendix B, section E "Perceptions".

Corruption

This leads to one of the most important threats to the legitimacy of the political system: corruption. Indira Gandhi's increasing leftism "after 1971 meant that big business and landowners began to suffer from corporation and profit taxes" (Bates 2007:233). Corruption became pervasive in Indian society and government, as bribery and illegal economic activity increased. Big business stopped funding the Congress Party and instead funded opposition parties, and Congress used shady means to raise funds (Bates 2007:233). Bribes and money laundering reached exorbitant levels. The increasing corruption and decline of the Congress Party changed its identity from a champion of the poor to the middle class, which was growing in power (Bates 2007:276-277).

The rule of law is stronger at higher levels of the judiciary than the lower levels. Rule of law is weakest where it should be strongest as a foundation – at the district level. The Supreme Court is "almost entirely 'clean' and reasonably effective" (Oldenburg 2010:91). The courts at the state level are liminal, as they are not quite as degenerate as the district level, but not as functional at the national level. Overall, the judiciary is corrupt and ineffective at enforcing the law at both the state and district levels (Oldenburg 2010:91).

The picture that emerges regarding governance is while that democratic institutions have been functioning and improving nationally, the bureaucracy has deteriorated in its ability to meet the service the needs of the people. Though there are policies that call for greater decentralization to increase local power and thus enforce *zimmedari*, this has not yet occurred to an appreciable degree. There are

several forms of decentralization and the government's strategy in practice of decentralizing power has not transferred any real authority to local level elected officials. It is necessary for such political factors to be examined and improved in order to change the water scarcity and related health issues in India and in Rajasthan.

Conclusion

The world is fast approaching a global water crisis and consequently there is an urgent need to address the myriad issues of water. Water is fundamental for human life and a key component of development. My research in eastern and southern Rajasthan examined these issues in three different communities to create an understanding of the everyday experiences of people who live in semi-arid areas and struggle to meet their daily water needs.

In the Meena communities in southern Rajasthan, the farmers are involved in community development as well as water resource development projects. They are working closely with an international and local non-governmental organization to take steps in reducing the issue of water scarcity that is adversely affecting their agricultural livelihood. However, I discovered that while the emphasis on sustainable water resource management and rainwater harvesting was an improvement, it was not a comprehensive water strategy that also addressed the health implications.

To examine such issues, I investigated the current state of both water and health policy and infrastructure in Rajasthan. Both water and health infrastructures are largely governed by the states, rather than the central government. Their systems of service delivery show a strong similarity in the lack of *zimmedari*, as there is an absence of direct accountability to the people and prevalent corruption. In policy, water has been a made a priority in several initiatives over the years, but in practice, this has implemented poorly or in a way that does not fit the needs of the people. For many rural people who struggle to

survive, water is not only necessary for life, it is also necessary to grow their food and earn a living. The water policies have not reflected this multidimensional usage of water.

Similarly, the current state of health care in rural areas is inadequate. Though there are initiatives to improve it, they have failed to adequately address the problems in these areas and meet the tremendous demand for health care. The facilities are not reliably open, they are not sanitary, and there is a shortage in personnel.

Improving access to the basic needs of water and healthcare is crucial to increasing the quality of life. The problem that emerges in India is not one of democratic function, as this has been maintained and is increasing at the local level with the *panchayati raj* (village rule). The issue lies with unelected officials who are part of the bureaucracy and who are responsible for ensuring the delivery of public services. To improve the governance of services, there needs to be greater decentralization so that local elected officials have authority over bureaucrats to ensure that they are truly delivered. This increases empowerment of democratically elected officials. This relationship has been demonstrated at the national level, since politicians have held greater authority than bureaucrats as an outgrowth of the nationalist movements. There needs to be greater administrative decentralization as well as fiscal decentralization so that local elected representatives have the power and the resources to implement and direct. There is also a need to improve the accountability of non-elected officials and field workers, as the literature indicates there is a “high rate of delinquency of service

personnel in healthcare…programs in developing regions" (Reda, Panjwani & Cutrell 2011:1). Electonic technologies can be utilized to improve decentralization and empowerment (National Rural Health Mission 2012a:10). Systems such as Hyke, which track attendance of personnel remotely can be effectively used to improve accountability. Reda, Panjwani and Cutrell's (2011) study tested the Hyke system in rural areas in the Udaipur district and it was successful. This system could be utilized for both healthcare and water management officials to improve these systems.

While it is necessary to decentralize, it is also necessary to integrate at the national level. There is an urgent need to develop strong, comprehensive policies for water and health in India. The current systems are fragmented and ineffectual as there are policies that are not being implemented. These need to be restructured and streamlined in accordance with the requirements of the areas and people to whom they apply. Instead of the various bodies and agencies that are loosely connected, if at all, there needs to be a centralized authoritative agency on water that manages, informs and develops water policy for the country. This agency can liaison between international changes and state and local levels needs to build a more effective framework for action. It also needs to provide the resources necessary to support services, particularly health, in rural areas for vulnerable populations like the *adivasis*.

It is necessary to emphasize here that working to improve challenges in water and health should not mean rejecting development strategies in favor of traditional systems. There has been a recent tendency to romanticize the past,

from those who propose returning to traditional systems and from the villagers themselves. This is counterproductive and vague, as 'traditional' is an indefinite and shifting category (Gold 2002:302). Instead, there should be a blending of ideas to create sustainable solutions based on the environment and people for whom they are necessary.

Rajasthan faces difficult challenges in providing better healthcare to the rural poor and combating malnutrition, infectious diseases, and inadequate water and sanitation (National Rural Health Mission 2012c). Further anthropological research is needed on the health of *adivasi* communities, as there is little data on these groups. Such studies are necessary to influence policy that improves healthcare and health service delivery (Tyagi 2002:40-41).

References

Action Research & Training for Health (ARTH)
2005 Census of Health Facilities in Udaipur District, Rajasthan. Udaipur.

Agrawal, Seema
2006 Pattern of Physical Growth and Nutritional Status of School Going Mina Boys in Rajasthan. The Oriental Anthropologist 6(2): 376-383.

Akner, Gunnar, & Tommy Cederholm
2006 Treatment of protein-energy malnutrition in chronic nonmalignant disorders. American Journal of Clinical Nutrition 74(1): 6-24.

Alley, Kelly
2002 On the Banks of the Gangā. Ann Arbor: The University of Michigan Press.

Atkins, C.H.
1957 Development of the National Water Supply and Sanitation Program in India. American Journal of Public Health 47: 1257-1264.

Balgir, R.S.
2004 Health Care Strategies, Genetic Load, and Prevention of Hemoglobinopathies in Tribal Communities of India. South Asian Anthropologist, 4(2): 189-198.

Bates, Crispin
2007 Subalterns and Raj: South Asia since 1600. London: Routledge.

Bhasin, M.K., and Veena Bhasin, eds.
1999 Rajasthan: Ecology, Culture and Society. Delhi: Kamla-Raj Enterprises.

Blair, Harry W
1996 Democracy, Equity and Common Property Resource Management in the Indian Subcontinent. Development and Change, 27(3): 475–499. doi: 10.1111/j.1467-7660.1996.tb00600.x

Black, Maggie
2005 Water A Matter of Life and Health: Water Supply and Sanitation in Village India. New Delhi: Oxford University Press.

Burman, B.K. Roy, and B.G. Verghese, eds.
1998 Aspiring to Be The Tribal/Indigenous Condition. Delhi: Konark Publishers Private Limited.

Brinkhoff, Thomas
2011 City Population. http://www.citypopulation.de/php/india-rajasthan.php?adm2id=0826, accessed March 9, 2012.

Chakraborti, Dipankar, Bhaskar Das, and Matthew T. Murrill
2001 Examining India's Groundwater Quality Management. Environmental Science & Technology 45(1): 27-33.

Child Health Foundation
2012 Health infrastructure in India. http://childhealthfoundation.net/Health%20infrastructure%20in%20India.pdf, accessed March 9, 2012.

Choubisa, S.L.
2001 Endemic Fluorosis in Southern Rajasthan, India. Fluoride 34(1): 61-70.

Das Gupta, Monica
2005 Public Health in India: Dangerous Neglect. Economic and Political Weekly 40(49): 5159-5165.

Dey, Anindo
2010 Water crisis in state to force migration, says study. The Times of India, May 19. http://articles.timesofindia.indiatimes.com/2010-05-19/jaipur/28308380_1_water-crisis-water-policy-capita-water, accessed May 3, 2012.

Elver, Hilal
2006 International Environmental Law, Water and the Future. Third World Quarterly 27(5): 885-901.

Gold, Ann Grodzins, and Bhoju Ram Gujar
2002 In the Time of Trees and Sorrows: Nature, Power, and Memory in Rajasthan. Durham: Duke University Press.

Global Development Research Center
2012 International Decade for Clean Drinking Water, 1981-1990. http://www.gdrc.org/uem/water/decade_05-15/first-decade.html, accessed May 1, 2012.

Karnyski, Margaret
2009 Ethnomedical and Biomedical Health Care and Healing Practices

Among the Rathwa Adivasi of Kadipani Village, Gujarat State, India. Ph.D. dissertation, Department of Anthropology, University of South Florida.

Kaur, B., L.P. Singh, Shweta Jain, and M.K. Bhasin
1999 Nutritional Status of Pre-School Meena Children of Rajasthan. *In* Rajasthan: Ecology, Culture and Society. M.K. Bhasin and Veena Bhasin, eds. Pp. 161-166. Delhi: Kamla-Raj Enterprises.

Kaviraj, Sudipta
2005 On the enchantment of the state: Indian thought on the role of the state in the narrative of modernity. European Journal of Sociology 46(2):263-296).

Machiwal, Deepesh, Madan K. Jha, and Bimal C. Mal
2011 Assessment of Groundwater Potential in a Semi-Arid Region of India using Remote Sensing, GIS and MCDM Techniques. Water Resources Management 25(5): 1359-1386.

Meena, Brijesh
2011 Who Deserves ST Status?. MeenaSamaj.com A social website of Meena Samaj. http://meenasamaj.com/modules.php?name=News&file=article&sid=66, accessed May 4, 2012.

Meenakshi, J.V., and Brinda Vishwanathan
2003 Calorie Deprivation in Rural India, 1983-1990/2000. Economic and Political Weekly 38(4): 369-375.

Ministry of Law and Justice
2011 The Constitution (Amendment) Acts. India Code. Legislative Department, Government of India. http://indiacode.nic.in/coiweb/coifiles/amendment.htm, accessed April 8, 2012.

Mitchell, Andrew, and Thomas J. Bossert
2010 Decentralization, Governance and Health-System Performance: 'Where You Stand Depends on Where You Sit'. Development Policy Review 28(6): 669-691.

Moench, Marcus
1992 Drawing down the Buffer: Science and Politics of Ground Water Management in India. Economic and Political Weekly 27(13): A7-A14.

Mukherji, Aditi, and Tushaar Shah

2005 Groundwater socio-ecology and governance: a review of institutions and policies in selected countries. Hydrogeology Journal 13: 328-345.

National Rural Health Mission

2012a National Rural Health Mission (2005-2012) Mission Document. Ministry of Health & Family Welfare, Government of India. http://mohfw.nic.in/NRHM/Documents/Mission_Document.pdf, accessed March 9, 2012

2012b Programmes. Department of Medical, Health & Family Welfare, Government of Rajasthan. http://nrhmrajasthan.nic.in/Programmes.htm, accessed March 14, 2012.

2012c Special Schemes. Department of Medical, Health & Family Welfare, Government of Rajasthan. http://nrhmrajasthan.nic.in/Special%20Scheme.htm, accessed March 14, 2012.

Oldenburg, Philip

2010 India, Pakistan, and Democracy: Solving the puzzle of divergent paths. London: Routledge.

O'Reilly, Kathleen

2006 "Traditional" women, "modern" water: Linking gender and commodification in Rajasthan, India. Geoforum 37:958-972.

Paliwal, B.S., and Arun Vyas

2002 Ground Water Resources of Rajasthan. *In* Advances in Resources Management of the Indian Desert. B.B.S. Kapoor, Ahmed Ali, S.K. Mathur, and Satish Kaushik, eds. Pp. 61-78. Bikaner: Madhu Publications.

Plowden, W. Chichele

1883 Report on the Census of British India. London.

Reda, Azarias, Saurabh Panjwani, and Edward Cutrell

2011 Hyke: A Low-cost Remote Attendance Tracking System for Developing Regions. Paper presented at the 5th ACM Workshop for Networked Systemf for Developing Regions, Bethesda, June 28.

Regmi, Amreeta

2003 Arena, Terminology and Landscape of 'Bluegold': The 12th Stockholm Water Symposium. Economic and Political Weekly 38(5): 434-436.

Rehman, Javaid

1998 Indigenous Rights at Risk: A Survey of Indigenous Peoples of South Asia. *In* Aspiring to Be The Tribal/Indigenous Condition. B.K. Roy Burman and B.G. Verghese, eds. Pp. 72-121. Delhi: Konark Publishers Private Limited.

Shah, Tushaar, and Barbara van Koppen
2006 Is India Ripe for Integrated Water Resources Management? Fitting Water Policy to National Development Context. Economic and Political Weekly 41(31): 3413-3421.

Sinha, S.N., and B.L. Kotia
1999 Ethnocide: Failure of Reversing Anti Rural Development. *In* Rajasthan: Ecology, Culture and Society. M.K. Bhasin and Veena Bhasin, eds. Pp. 225-258. Delhi: Kamla-Raj Enterprises.

Suthar, Surindra
2011 Contaminated Drinking Water and Rural Health Perspectives in Rajasthan, India: An Overview of Recent Case Studies. Environmental Monitoring and Assessment 173(1-4): 837-849.

Suthar, Surindra, Vikram Chhimpa, and Sushma Singh
2009 Bacterial contamination in drinking water: a case study in rural areas of northern Rajasthan, India. Environmental Monitoring and Assessment 159: 43-50.

The World Bank
2012 Agricultural Water Management. http://water.worldbank.org/topics/sanitation-and-hygiene, accessed 1 May 2012.
2012 Millenium Development Goals. http://data.worldbank.org/about/millenium-development-goals, accessed 1 May 2012.
2012 Rural Water. http://water.worldbank.org/topics/water-supply/rural-water, accessed 1 May 2012.

Tyagi, D.
2011 Tribal Health in Anthropological Perspective. Bulletin of the Department of Anthropology, Dibrugarh University 25: 35-42.

United Nations
Water and Food Security. http://www.un.org/waterforlifedecade/food_security.shtml, accessed May 1, 2012.

United Nations Development Programme
2012a Millenium Development Goals.

http://www.undp.org/content/undp/en/home/mdgoverview.html, accessed 1 May 2012.

2012b Millenium Development Goal 7. http://www.undp.org/content/undp/en/home/mdgoverview/mdg_goals/mdg7.html, accessed May 1, 2012.

United Nations General Assembly

2003 A/RES/58/217 International decade for Action, "Water for Life", 2005-2015. New York: United Nations. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/58/217, accessed May 1, 2012.

UN Water

2012c Drinking Water and Sanitation. http://www.unwater.org/statistics_san/html, accessed May 1, 2012.

2012a Water Resources. http://www.unwater.org/statistics_res/html, accessed 1 May 2012.

2012b Water Use. http://www.unwater.org/statistics_use/html, accessed May 1, 2012.

2012d Water, Agriculture and Food Security. http://www.unwater.org/statistics_sec/html, accessed May 1, 2012.

Varghese, K.A.

1999 Disparities in Agricultural and Demographic Features Across Agro-climatic Regions in Rajasthan. *In* Rajasthan: Ecology, Culture and Society. M.K. Bhasin and Veena Bhasin, eds. Pp. 85-91. Delhi: Kamla-Raj Enterprises.

World Water Council

2010 Water on the International Agenda. http://www.worldwatercouncil.org/index.php?id=708, accessed May 1, 2012.

WHO (World Health Organization)

2010 Anaemia. Water-related Diseases. Water Sanitation Health. http://www.who.int/water_sanitation_health/diseases/anemia/en/index.html, accessed May 7, 2012.

WHO India

2008 Primary Health Care: Indian Scenario. http://www.whoindia.org/LinkFiles/Health_Systems_Development_Primary_Health_Care.pdf, accessed March 9, 2012.

Zaidi, Anita K.M., Shally Awasthi, and H. Janaka deSilva

2004 Burden of infectious diseases in South Asia. BMJ 328: 811-815. http://www.worldwatercouncil.org/index.php?id=708, accessed

May 1, 2012.

White, G.F., D.J. Bradley, and A.U. White
2002 Drawers of water: Domestic use in East Africa. Bulletin of the World Health Organization 80(1): 63-73.

Appendix A
Political Map of Rajasthan

Appendix B
Questionnaire for Fieldwork

Wells for India and SAHYOG Supported Project

"Water and Sanitation Practices in Relation to Water-Borne Diseases in Motida Area, Bhinder Block District, Udaipur, Rajasthan, India"

A. Basic Information

Village/Gram *Panchayat*:

Family Name:

Number of people in household:

Number	Individual's Name	Age	Sex (M/F)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Were you born in this village? (Yes / No)
If not, where?

Did you attend school? (Yes / No)
If yes, until which level?

When were you married?

Where were your children born? (Home / Hospital)

Is there a school? (Yes / No)
(Pre-school, Primary, Middle, Secondary)

Do the children go to school? (Yes / No)

How do you earn an income?

B. Water Facilities

Where can you obtain water in this village?

Where do you obtain your water?

How far is it from your home?

How do you transport it home?

How much do you fetch per day?

Is there a water storage facility in the house? (Yes / No)
Type of water storage facility:

What do you use this water for?
(drinking, washing, bathing, cooking, agriculture/irrigation, other)

Where do you get your drinking water?

Where do you store your drinking water?

How does the water taste?

Do you clean the water before you drink it? (Yes / No)
(boil, filter with cloth, chlorinate or chemical treatment, other)

Is the drinking water contaminated by direct contact (Yes / No)
(hands, mouth) of multiple people?

C. Sanitation and Hygienic Facilities

Is the household clean? (Yes / No)
(free from visible garbage on ground and in home, home has waste containers, solid waste disposed away from home, free from food remains on floor)

Is there a latrine? (Yes / No)
If not, then where do people relieve themselves?

Is it used? (Yes / No)

Who uses it?

Are the latrines clean? (Yes / No)
(free from visible garbage, no faecal matter on floor, smell not bad enough to stop use, no puddles, not too many flies)

Do you clean the latrine after usage? (Yes / No)

Is there any hand washing facility? (Yes / No)
Type of hand washing facility:
(wash basin, hand pump, water stored in a bucket or other vessel, washing space, other)

Do wash your hands after using latrine? (Yes / No)

If yes, with what?

Where do you throw your waste water?

Where do you dispose of solid waste and organic waste?

Is there any stagnant water around the home? (Yes / No)
If yes, where?

What do you fertilize your fields with?
(chemical fertilizer, animal faecal matter, human faecal matter, other)

D. Health Data

Does someone come to the village to treat people who are sick? (Yes / No)
If yes, who?
If not, who do people see when they are sick?
(government hospital, primary health center, private doctor, nurse, traditional healer: homeopathic, ayurvedic, unani, other)

How far is the health facility from the village?

Does someone provide vaccinations?
If yes, who?

Vaccine	Available (Y/N)	Did you receive it? (Y/N)	Did your children receive it? (Y/N)
Hepatitis A / B			
Tetanus			
Polio			
Tuberculosis			
Measles/Mumps/Rubella			
Chickenpox			
Typhoid			
Yellow Fever			

When do people become sick?
(hot season, cold season, monsoon season, season changes, other)

What kinds of symptoms do people have when they are sick?

	Fever		Chills		Constipation
	Diarrhoea		Loss of appetite		Abdominal cramps
	Nausea		Dehydration		Hallucinations
	Vomiting		Tiredness		Shortness of breath
	Anaemia		Dry skin		Boils
	Jaundice		Dry mouth		Cough
	Aches (Muscle/Head)		Fatigue		Bloody stool
	Weakness		Rash		Papules
	Malaise		Sores		Sore throat
	Pain		Dizziness		Other

	(Abdominal/Joint/Back/Neck /Leg)				
	Difficulty (Breathing/Urinating/ Swallowing)				

Do people ever become sick from the water? (Yes / No)

Do any of these diseases occur in this village?

Mosquito		Malaria	Contaminated water		Giardiasis
Mosquito		Dengue Fever			Amoebiasis
Mite		Scabies			Cryptosporidiosis
Roundworm		Ascariasis			Schistosomiasis
		Guinea Worm Disease			Typhoid
Faecal matter		Polio			Cholera
Contaminated water/faecal matter		Hepatitis A	Fungus		Ringworm
		E. coli	Black fly		Onchocerciasis
		Anaemia			Legionellosis
		Tuberculosis			Other

Do you use any home remedies when your family is sick? (Yes / No)
If yes, which ones?

Which type of treatment do you prefer? *(home/traditional, allopathic, other)*

E. Perceptions

How are the water sources maintained?

Who do you think is responsible for providing clean water for drinking?

Do you think the water needs to be cleaned before drinking? (Yes / No)

What can you do to prevent diseases from spreading?

Has the sanitation improved in the community? (Yes / No)
Describe changes:

How has the water quality changed since the water resource development began?

Has there been more or less disease?

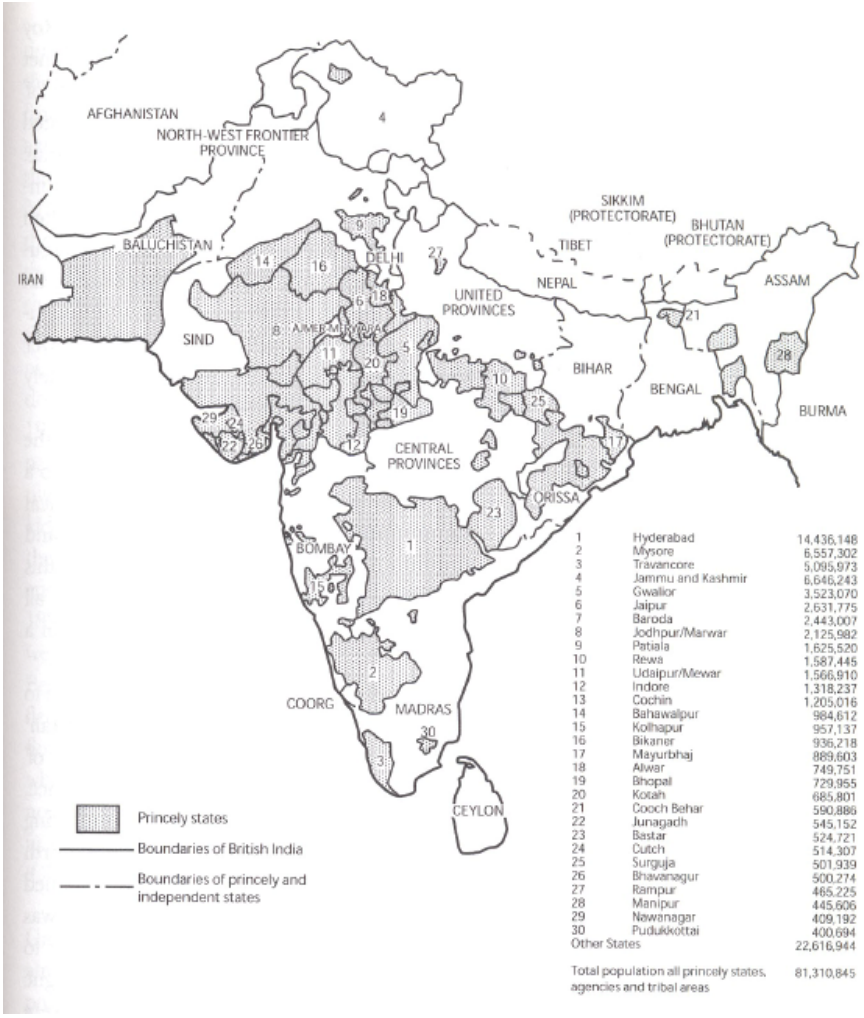
F. Possible Interventions

Handwashing – using soap and water, preferably hot
Using latrines
Disposing of organic and solid waste
No stagnant water
Boiling water

G. Other Observations & Relevant Information

Appendix C

Map of Princely States in British India, 1947



1	Hyderabad	14,436,148
2	Mysore	6,557,302
3	Travancore	5,095,973
4	Jammu and Kashmir	6,646,243
5	Gwalior	3,523,070
6	Jaipur	2,631,775
7	Baroda	2,443,007
8	Jodhpur/Marwar	2,125,982
9	Patiala	1,625,520
10	Rewa	1,587,445
11	Udaipur/Mewar	1,566,910
12	Indore	1,318,237
13	Cochin	1,205,016
14	Bahawalpur	984,612
15	Kolhapur	957,137
16	Bikaner	936,218
17	Mayurbhaj	889,603
18	Alwar	749,751
19	Bhopal	729,955
20	Kotah	685,801
21	Cooch Behar	590,886
22	Junagadh	545,152
23	Bastar	524,721
24	Cutch	514,307
25	Surguja	501,939
26	Bhavanagur	500,274
27	Rampur	465,225
28	Manipur	445,606
29	Nawanagar	409,192
30	Pudukkottai	400,694
Other States		22,616,944
Total population all princely states, agencies and tribal areas		81,310,845

Source: Bates (2007) Subalterns and Raj: South Asia since 1600, p. 177.

Summary of Capstone Project

The scarcity of freshwater is one of the foremost concerns for humanity in the twenty-first century. Water is essential for human life, but we are on the brink of a global water crisis. Though the global population continues to grow, there is only a finite supply of freshwater and the rates of consumption point to a severe depletion. Those areas of the world which face climactic challenges as well as developmental challenges are especially vulnerable to the growing water shortages and lack of access to safe water. Water is a basic human right and must be protected for everyone. Poor quality water is a threat to human health.

Since water issues are emerging as one of the foremost global health concerns, I wanted to investigate them at the community level in an area in which water is scarce. This would more acutely demonstrate the intersecting ways in which water affects the lives and health of people. In rural areas, water is necessary for more than just drinking and hygiene; it is also necessary for agriculture and food security. Farmers are dependent on seasonal rains and the availability of groundwater to nourish their crops, feed their families, and live a decent life.

My fieldwork was conducted in three main fieldsites in the eastern and sourthern regions of the state of Rajasthan, which is located in northwestern India. Water is a scarce resource in Rajasthan and experiences erratic rainfall. The first half of my fieldwork was conducted in two small communities adjacent to the cities of Jaipur and Bundi. The information I collected from these sites provides a general picture of water in the non-desert areas of Rajasthan. The second half of my fieldwork, and the bulk of my study, is a focused study conducted in collaboration with two non-governmental organizations working on water resources management and community development.

My project involved assessing the impact of recent water development projects, researching the health of rural *adivasi* communities of Meenas by assessing water, sanitation, and hygiene, as well as their access to public services. This study filled a gap in knowledge about the quality of the health and water in these communities as a function of the public services infrastructure. While community and political empowerment was increasing in these communities, there are still deep issues regarding water security and health. Water management is primarily through non-governmental organizations and there is a strong absence of *zimmedari* (responsibility) exhibited by the state government in implementing policies of rural water and health programs. The water management projects are strategies to improve irrigation and are thus agriculturally focused. A health approach is missing in these water management projects. My research demonstrates that while these projects are a step in the right direction, more comprehensive strategies are needed to address the quality of life in these communities as related to water.

The ability to meet the growing drinking water and irrigation water needs of an expanding population is shrinking as the water supply becomes scarcer in India.

Groundwater in particular is becoming particularly scarce because of overexploitation for non-consumption purposes. Water policies have attempted to grapple with these issues for the last 50 years. The philosophy of these policies has shifted back and forth between public health and safe drinking water to agricultural needs and food security. To effectively address the issue of water in India, the government needs to have an integrated water management approach that combines *both* a public health perspective as well as a food security perspective. Failure to do so results in a failure to address the multifaceted nature of water. It is important to understand that the people who need water to drink and water to irrigate their crops are the same people.

Water poses a risk to health in several different ways. The scarcity of water threatens life and poor quality water facilitates the transmission of water-related diseases, including microbial and toxin-related diseases. Microbial water diseases are very common in Meena communities in rural southern Rajasthan. Diseases carried by insect vectors, such as mosquitoes, diarrheal diseases and anemia were the most common ailments reported. Understandings of water as a vehicle for diseases were poor however. People were not aware of microbial contamination of water and its impacts on health. However, toxin-related diseases, such as fluorosis are more commonly reported in eastern Rajasthan. One of the most important factors for water-related health is sanitation because without the hygienic separation of excrement from water sources, there is contamination which results in disease. Poor nutrition works in tandem with unsanitary conditions and unclean water in the prevalence of infectious diseases. Malnutrition is still very common, though severe malnutrition has been declining. Thus, food security and nutrition factor heavily into health and exacerbate the effects of clean water insecurity.

It is estimated that India will face absolute freshwater scarcity in the next decade. To protect the availability and quality of freshwater and access to appropriate healthcare, there needs to be strong systems of governance for water and health services. The current infrastructure places the burden of these services at the state level. The national government need to provide a stronger support system, directionality, and funding to help supplement what states, particularly poorer states like Rajasthan, can provide. The public health infrastructure functions poorly in Rajasthan, despite rural health initiatives. People do not have reliable access to primary care facilities and do not receive preventative health measures, such as vaccines, or have access to curative health to combat infectious diseases. Water infrastructure is fragmented and unreliable as well. In eastern Rajasthan, people reported that running water was only delivered three times a week for a very short duration. They also reported the amount was not adequate for all their needs and the quality was poor as it caused health issues. In rural areas of southern Rajasthan, there is no running water and the open wells used for consumption purposes have not been tested for bacteriological contamination. The quantity of water is becoming scarce from depleting water tables and erratic monsoon rains which has compounding effects.

India has a maintained a democratic structure since independence and democratic power is growing at the local levels through the *panchayati raj* institutions. Though politicians, or elected officials, have historically held greater authority than bureaucrats, or appointed officials, there is a profound absence of *zimmedari,* or accountability. This is reflected in local understandings of *zimmedari* and governance as people could not provide a clear answer to the question of who was responsible for ensuring access to quality water. Corruption is one of the most profound barriers to accountability in India. Greater fiscal and administrative decentralization is needed to hold bureaucrats accountable by locally elected representatives to improve the governance of public services and the quality of life of people. When real power can be exercise by local politicians to advocate for their constituents, it will demand greater *zimmedari* from service providers.

Water is a resource that profoundly touches the everyday lives of people, but it is increasingly growing scare, threatening human existence. It is urgent to improve water management to ensure the health and well-being of people around the world, and especially of vulnerable populations. Water security affects public health, economic prosperity, food security, and stability. While community development projects like those occurring in southern Rajasthan help build capacity, stronger and more comprehensive projects need to be pushed to fully address the challenges and issues faced by communities dealing with decreasing water security. It is necessary to promote decentralization strategies at the local level while promoting integrated policy frameworks at the national level to have more effective water management and public health infrastructure. This will help strengthen *zimmedari* and improve water-related health.