



# A Case Study of Private Water Tankers in the Hyderabad Peri-Urban Area

BSc Thesis International Land and Water Management  
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## Acknowledgements

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## Introduction

The changes and challenges regarding the water supply of megacities in developing countries are enormous. This thesis attempts to shed some light on these issues by showing the case of Mallampet, a village on the edge of the south-Indian city of Hyderabad. The changes in this peri-urban region have been enormous, with as one of the most striking examples the rise of a large informal 'tanker business'. This consists of private tanker companies, who purchase surface and groundwater from farmers in peri-urban areas and transport it to consumers and companies in and around the city. Although there is a huge demand for their services, this business operates on the frayed edges of the current water laws and policies.

This thesis has investigated the following research question: what laws and policies govern the informal water tanker business in Mallampet and how does this affect the other stakeholders to the water resources? This question is answered by searching the answers to three separate sub-questions analyzing through structured surveys, group discussions and interviews with the water tanker business, other stakeholders and relevant authorities.

## Background

The world is becoming more urban every day. From Brazil to Bangladesh and from Indonesia to Iran, people are saying goodbye to their rural livelihoods and are taking part in the greatest migration in history – from the countryside to the city (UNHABITAT, 2010). Since 2008 more people worldwide are living in cities than in the countryside. India hasn't quite reached that level of urbanization yet - in 2007 68% of the population was still living in rural areas (Ruet et al, 2007) - but it will before 2030 (UNHABITAT, 2010) and it's home to some of the largest and most awesome metropolises in the world. These growing urban populations have a similarly swiftly growing demand for water, and cities are meeting these demands in increasingly complex ways. The rivers and groundwater aquifers in the proximity of these urban areas do not suffice anymore, so they have to resort to capturing water from rural areas. This is a world-wide process which occurs in both the global North and South (Celio, 2010), and which can be observed in many South-Asian cities. A particularly striking example is the city of Hyderabad, capital of the South-Indian state Andhra Pradesh.

Hyderabad is the sixth largest city in India with a population of 6.8 million people living in an ever-expanding urban agglomerate that constitutes the city (UNHABITAT, 2008). The expansion of the city accommodates a rapidly growing population, which is expected to grow by another 2.3 million people in the next fifteen years (UNHABITAT, 2010), causing the surrounding rural regions to be affected and eventually absorbed by the city (Singh, 2010). Hyderabad is said to be at the forefront of India's economic development, with an average economic growth of 8.7% per year between 2004 and 2008 (Celio et al., 2010). It has earned itself the nickname, Cyberabad because it is home to over 1300 information technology firms (Sreelaka, 2011). However, this growth has not led to prosperity for everyone; in 2001, 23% of the population was identified to live below the poverty line and 37% lived in low-income informal settlements, or slums (GHMC, 2005).

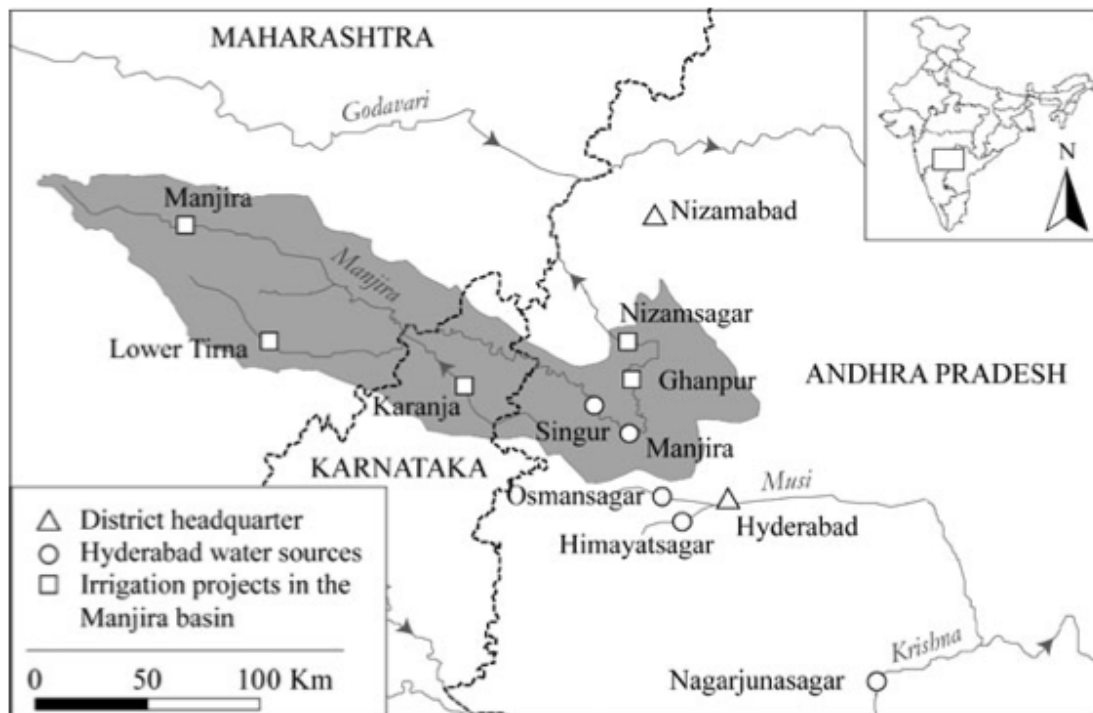


Figure 1: Hyderabad and its surrounding waterways (Celio, 2010)

Water is a scarce resource on the Deccan Plateau. Most of the 750 mm of yearly precipitation falls in the monsoon season (Mall et al., 2006), which means that precipitation cannot be depended on as a water resource for most of the year. Most of the water used by the city and its rural surroundings therefore comes from surface water and, to a lesser extent, groundwater sources (GMHC, 2005). The urbanization and the economic growth have led to a large increase in urban water demand, causing widespread water appropriation. The surface water is retrieved from several rivers (the Musi, Singur, Manjira and Krishna rivers) surrounding the city (figure 1), and to keep up with demand new sources, located ever further from Hyderabad, are constantly being sought for exploitation (Van Rooijen, 2011). The groundwater resources are also under pressure. Due to the increased demand more water is pumped up every day, but the replenishment rate is very low because Hyderabad is based on a hard-rock aquifer (Singh, 2010).

Although the increased water pressure leads to conflicts of interest, the economic imperative of Hyderabad is so much larger than that of the rural population that, in the long run, water resources will always be allocated from rural livelihoods to the city (Van Rooijen et al, 2005). And despite the heavy use of the available resources, the average water supply in the city is about 150 litres per capita per day, lower than the Indian average (van Rooijen, 2011).

Some of the largest changes are occurring in the peri-urban areas – the intermediary, transitional zone between the rural and the urban areas (Narain, 2010). These areas are essential for the urban expansion,

The proximity of the city leads to changes in the peri-urban villager's livelihoods: moving away from agriculture and increasingly towards gathering income through working in cities. The urbanizing environment does not just allow for new economic opportunities, but it also provides the peri-urban households with additional security through income diversification (Narain, 2010). Pumping up groundwater and selling it to urban consumers like apartments and industries is one of these opportunities, and some of the villagers were able to seize this opportunity with both hands. Since this places additional pressure on already-scarce resources, legislators and non-governmental institutions often try to counteract this effect through crafting laws and policies. However, these laws and policies have a tendency of being normative; reflecting an ideal situation that often stands so far away from the day-to-day reality that it becomes impossible to implement (Mosse, 2004).

The peri-urban project 'Water Security in Peri-Urban South Asia' implemented by SaciWATERS with IDRC support investigates the above described water appropriation processes and their impacts on the multiple stakeholders; especially those located in the fluid peri-urban boundaries of the growing city, "to understand the implications ... for water access and use in peri-urban locations" (SaciWATERS, 2011). This thesis aims to contribute to the 'Water Security in Peri-Urban South Asia' project in Hyderabad by investigating the role of tanker companies in water, appropriation from the peri-urban locations and the distribution of the appropriated water in the city itself and its growing peri-urban surroundings. A sizeable fraction of the urban water supply is provided by private tanker companies, who purchase surface and groundwater from farmers in peri-urban areas and transport it to consumers and companies in and around the city. On the demand side, these tanker companies fulfill a vital need to meet the city's growing need for water which is often unmet by other official means of supply (Srinivasan et al, 2010). However, it is at the supply end that several problems arise. Tanker companies usually buy ground and surface water, yet sometimes water is taken without permission – from what are supposedly common resources (Singh, 2010). This appropriation of 'common water' not only reduces availability for former users and uses (farmers, fisher etc.), it also impacts on overall water availability (given the fluid nature of water) and may offset a long chain of outcomes for many engaged in the agriculture setting. As Packialakshmi et al. (2010) argue, this capture of water by urban users deprives peri-urban users from their entitlements and rights to water.



In this thesis, Celio's(2010) definition of water capture and water appropriation will be used. Water capture refers to "the social and political process that effects the physical transfer of water from one geographic location to another" (Celio, 2010). However, when the appropriator secures access to the resource through overpowering the institutions that govern water control, it will be described as water appropriation.

## Methodology

This thesis will attempt to answer the following question: **what laws and policies govern the informal water tanker business in Mallampet and how does this affect the other stakeholders to the water resources?** This question will be addressed by answering three sub-questions:

- How does the water tanker business function and what are the characteristics of the tanker company operations?
- What are the official laws and policies that govern the groundwater resources and the water tanker business?
- What other stakeholders can be identified and how do these multiple stakeholders interpret their right to the water?

In the chapter below, the methodology of the research will be described, followed by the results (ordered by the questions stated above) and the discussion.

## Research area

Hyderabad makes for an interesting case, because it is a textbook example of a rapidly developing South-Asian city. Many phenomena observed in this city can also be found in other upcoming megacities – both in India and the rest of the world. One of the defining characteristics of Hyderabad is that the authorities more or less turn a blind eye to these issues of water appropriation. This approach can be contrasted with that of Chennai – a similarly large city that takes a much more active approach towards these issues through utilizing the initiative of private entrepreneurs to supply its population with water (Zoeteman, 2010).

The oldest part of the city was constructed next to two water bodies; the Musiriver and the artificially constructed HussainSagar lake. However, the water needs of the city have long since exceeded the capacity of these resources. Currently, most of the water used by the city comes from other rivers running further from the city; currently, the Manjira river and the Krishna river and its tributaries are the most important water sources that quench the city's thirst (Van Rooijen, 2011)(Figure 1). Plans are made by the Hyderabad Water Board to find new water resources. The Godavari river, located 240 kilometers from Hyderabad, is currently not being exploited by the city, but it is expected to supply up to 30% of the city's water need in 2020 (Van Rooijen, 2011). Groundwater plays a much smaller role in the city's public water supply. Van Rooijen (2011) estimates it at fourteen percent, but these data are hard to confirm, particularly because a large amount of the withdrawal is not done by public agencies, but by private entrepreneurs (possibly illegally).

The research focuses on the village of Mallampet, on the north-west edge of the city (Figure 2). This village with about 1500 households makes an excellent case study, because there is a rapidly ongoing transition here from a rural to an urban way of life. About twenty years ago the economy of the village used to be based on agriculture, but a rapid encroachment by a growing city has made this much less attractive. First, the inclusion into an urban metropolis dramatically distorts land prices in places like Mallampet. The phenomenal sums of money to be gained by selling land compare poorly to income gained through agriculture. On the other hand, the agricultural viability of the land is also diminished due to degradation of the natural resources (both surface and groundwater resources are threatened by polluting industrial effluents (Singh, 2010), and the availability of surface water is rapidly diminishing). All of these conditions become enabling factors for farmers to pump up and sell groundwater, as the market for water for urban consumption is ever growing.

Mallampet lies a few kilometers outside of the municipality borders of Hyderabad, but it is within the jurisdiction area of the Hyderabad Metropolitan Development Authority (HMDA) (Figure 3). This planning agency is responsible for the construction of the Jawaharlal Nehru Outer Ring Road, a giant 160-kilometer expressway that encircles almost the entire city. This ring road runs along the northern edge of Mallampet; the stretch near the village is still under construction. To the east of the village, just south of the ring road, lies the Kathva Lake. This waterbody was a major source of irrigation water in the past, but it has shrunk massively in the past years. The closest urban areas are Bachupally (to the south of the village) and Bolaram (to its south-west). These areas are both inside the ring road and inside the HMDA jurisdiction, but still outside of the municipality. Mallampet is governed by a *panchayat*, a village council, and it is part of the Outhbullapur mandal (sub-district). The officials from these two layers of government, both elected and unelected, share the responsibility for the proper management of the water resources in the village.



Figure 2: map of the Hyderabad urban area (source: maps.google.com)

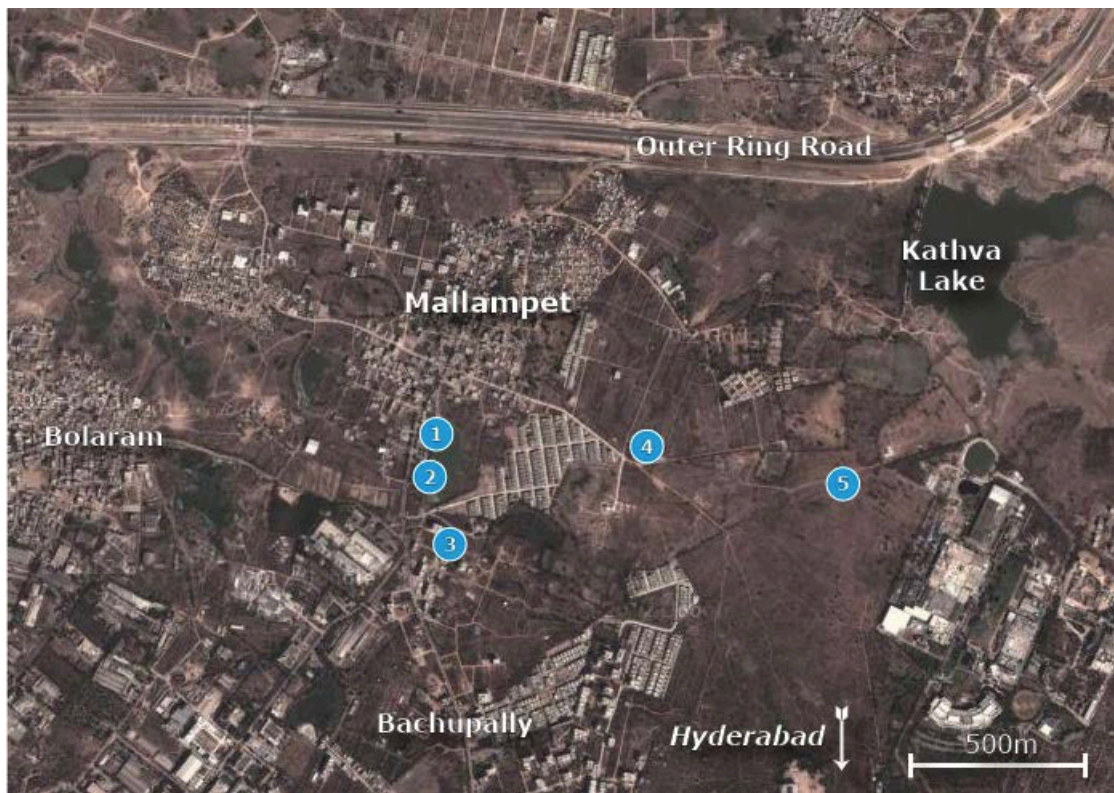


Figure 3: map of Mallampet and its surroundings (source: maps.google.com)

## Sample

- Six different tanker companies were interviewed for the research. These companies active in Mallampetvary in size and business model. From these companies the tanker operators and the owners will be interviewed through structured surveys. The content of these surveys included:
  - Company size
  - Ownership structure of the companies (public or private? Do these companies own pumps or do they buy water from pump owners?)
  - Pricing of the water, both in buying and selling
  - Amount of water bought.
  - Companies and private consumers that the water is sold to, with quantities and prices given.
  - Seasonal variation and structural changes over time in pricing, availability and water withdrawal
  - Institutional environment
  - Conflicts and complaints.
- In a similar manner, operators and owners of the water pumps in the village supplying water to the tanker companies were interviewed through structured surveys, addressing:
  - Ownership structure of the pumps: (public or private? Do these companies own pumps or do they buy water from pump owners?)
  - Pricing of the water
  - Amount of water withdrawn from the bore wells
  - Companies that the water is sold to, with quantities and prices given.
  - Seasonal variation and structural changes over time in pricing, availability and water withdrawal
  - Institutional environment
  - Conflicts and complaints.
- Two industries that buy water from the tanker companies were interviewed. The content of these surveys included:
  - Company size
  - Volume of water consumption
  - Sources of this water: publicly supplied or bought from private companies?
  - Pricing of the water
  - Seasonal variation and structural changes over time in pricing, availability and water withdrawal
  - Institutional environment
  - Conflicts and complaints.

- Group discussions were held with several different groups of villagers:
  - Five villagers who derived their income from agriculture were surveyed in loosely-structured discussions.
  - Several discussion groups of villagers who derived their income from non-agricultural work.
- Representatives from the authorities were interviewed to investigate the institutional arrangements. These include, in the village:
  - The former mayor (*sarpanch*), who used to be the head of the village panchayat.
  - The executive officer, a state-appointed official.
  - The lineman, who is responsible for maintaining the public water supply of the village.
- In the municipality of Hyderabad:
  - The bill collector from the Outbullahpur Mandal, who according to the APWALTA law that governs the management of groundwater and surface water resources, has the final responsibility for the proper use of bore wells, and who has the authority to shut them down if necessary.
  - A representative from the Hyderabad Metropolitan Development council, which has the final responsibility over surface water resource protection. The HMDA is also the city's official planning body, so it has a large influence in carrying out the development necessary for the city's further growth.
  - The Hyderabad Metropolitan Water Supply and Sewerage Board, which has a responsibility to take care of the city's public water supply. They do this with a pipe system, but they also field their own water tankers to supply the city with water.
  - The groundwater department; the branch of the state government of Andhra Pradesh, which is responsible for monitoring the groundwater levels in the entire state.

## Requirements

The most important requirement for the research was to find a translator, who would be able to act like a transparent medium – asking what I wanted to know, and telling me what the respondents told, without moderating the issues both ways. I trust that this worked out fairly well, but it is quite hard to check this since I obviously don't speak Telugu. I was aided in my research by Sandeep Gadde, a biomedics grad student who was fluent in English, Hindi and Telugu, but had no formal training or experience in translating.

The research was based on interviews and surveys, so no measuring equipment was required. The first phase of the research did not require any questionnaires, since investigation will be carried out through open-question interviews. However, questionnaires were drafted to get quantifiable results in later stages of the research.

Another requirement was finding a convenient way of commuting to Mallampet. The village lies about thirty kilometers from both the SaciWATERS office and from the city center. My mode of transport was an autorickshaw – a three wheeler taxi-like service.

### **Workplan**

Preparation for the internship started in the summer of 2011. I arrived at Hyderabad on the 19<sup>th</sup> of October, 2011, and stayed there until the 5<sup>th</sup> of January. The thesis was finished in June 2012.

## Results

### Question 1: how does the water tanker business function and what are the characteristics of the tanker company operations?

In this chapter, the size of the local water economy in Mallampet will be estimated; how much water is used, from what sources does this water come, and how much water is used by each of the stakeholder groups? Particular note will be made of the water tanker business. As explained before, the term “tanker business” refers to all the stakeholders that are directly involved in the water trade in Mallampet. It consists of two user groups: the pump operators and the tanker companies. The way that these stakeholders operate their business will be reviewed.



Figure 4: location of the private water-selling pumps

#### Private water-selling pumps

The **pump operators** are former farmers who, in the light of the approaching urbanization, have sold most of their lands; farming became less and less profitable and the profit gained from selling land became ever larger. However, they still maintained one small plot of land upon which a water pump was placed. From here, they started selling water.

There are five pumps in and near Mallampet that engage in water selling; their locations are indicated on figure 4. Each of these pumps is privately owned; the panchayat does not sell water to tanker companies but only



provides to its citizens for domestic and agricultural purposes. For each of these pumps the ownership, the volume of water sold and the water pricing will be discussed in the light of changing demand and water availability over time.

**Pump 1**, on the road between Bachupally and Mallampet, is one of the busiest pumps in the area. The pump is owned by Kishtaya Goud, one of the richest men in the village, and his family. They used to make a living from farming, but sold their lands to real estate agents ten years ago. They kept one plot, and built a pump on it. The data for this pump comes from two separate interviews: one with the wife of Mr. Goud, and one with their pump operator; Mr. Goud himself refused to talk to me. These two respondents gave strikingly different when surveyed about the water consumption. According to Mrs. Goud, the pump sold between 100.000 and 150.000 liters a day, but the pump operator said this amount was normally about 250.000 liters a day. However, the amount that was sold was subject to seasonality. Because of this year's poor monsoonal rainfalls, a shortage was already occurring at the end of my internship in November. Over the course of my 2.5 month research, the activity at the pump had decreased significantly. Smaller tanker companies - that did not have contracts with the pump owners - were not allowed to take water anymore, and the consumption of the larger contracted companies was limited. The pump operator said that about six 10.000-litre tankers were filled daily in the beginning of December. The water price for contracted companies is Rs. 100 for a 10.000-liter tank. This price stays the same year-round.



Figure 5: pump 2, with a 10.000-liter tanker.

**Pump 2** and **pump 3** are both operated by the same man, Nageshwahar Rao. He used to own both of the pumps, but now he has sold the land of pump 2 to a man in the city. He leases the land for a fixed monthly rent and continues to operate the pump business. When interviewed about pump 2 (figure 5), he claimed to sell about 100,000 liters a day in the autumn. This amount would be doubled in the rainy season. However, these interviews were not the only data source in this case, because I also obtained the logs that keep record of the amount of tankers per day. These give an average water use of about 150,000 liters a day over the month of November (figure 6). A declining trend can be observed; like pump 1, pump 2 was also noticing a decline in the water supply. Here, too, were the uncontracted water tanker companies no longer allowed to buy water.

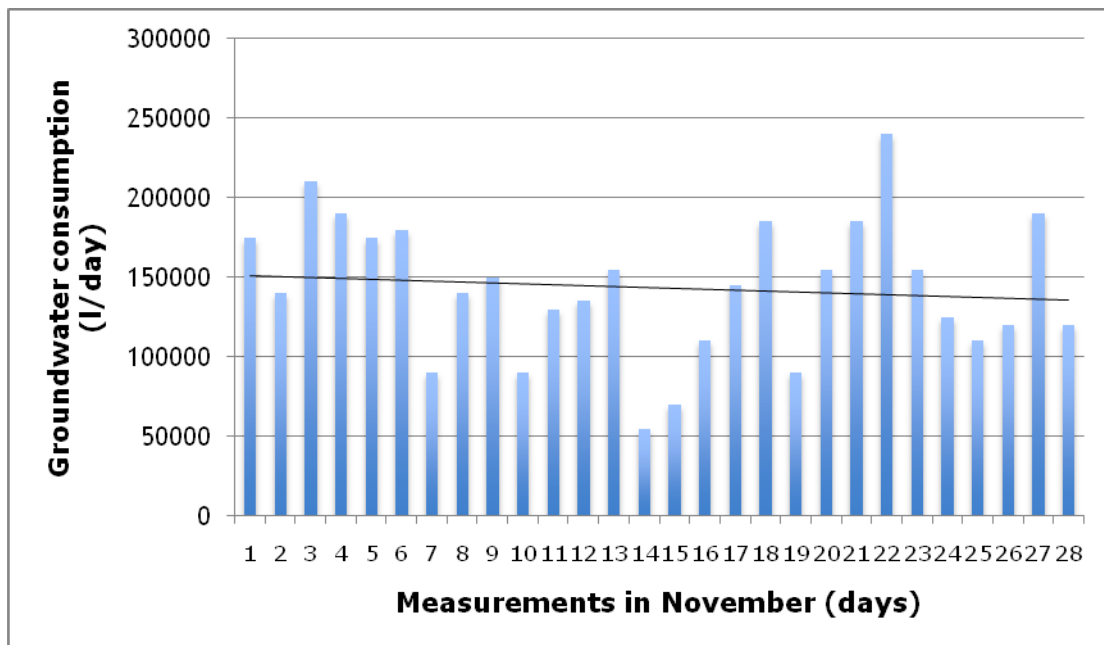


Figure 6: the average water use of pump 2 in November

Pump 3 is currently the most active pump, but unfortunately the data set for this pump is less robust than for the former. Mr. Nageshwahar Rao, who had already been interviewed for pump 2, refused to discuss the operations of pump 3. Consequently, the data on this pump is as collected from the water tanker drivers who come to this pump. Like the other pumps, it is also suffering a seasonal decline in water pressure, and filling one 10,000 liter-tanker takes about 1.5 hours. Going by the statistics of the above fact, as well as data provided by the water tanker companies and data from the other pumps, one can speculate broadly that the daily water withdrawal over the course of November should – conservatively – average between 80,000 and 100,000 liters per day.

**Pump 4** follows a different business model from the other pumps. It does not sell water to separate water tanker companies, because the owners of the pump also own a 180-household apartment complex, which they supply with water from Mallampet. The supervisor and the tanker driver of this venture were surveyed. According to the supervisor, their 10.000-liter tanker makes one to two trips a day, but the tanker driver gave a figure of around five trips a day. They do not charge for this water directly; the pricing is incorporated into the rent the tenants have to pay.

**Pump 5** lies some distance to the east of Mallampet, and I ironically discovered this operating business on the last day of my field work. Even though I had conducted research in the village for quite some time by then, no one had pointed me to it; I only discovered it after driving after a tanker. As with pump 2, there was a notebook that keeps track of the amount of tankers per day. However, the data did not seem to be too accurate; when interviewing one of the tanker drivers, he noted that his company was a regular customer but was not present in the notebook. The average amount of water sold according to the notebook was about 90.000 liters per day, but this can be estimated to be at least 130.000 liters per day. Only contracted companies can get water at this pump: their water pricing is Rs. 90 per 10.000 liters, but here the price was said to fluctuate according to water availability.

The most striking characteristic of the talks with the pump owners was the secrecy surrounding the data. The pump owners were very unwilling to talk, which expressed itself in their inaccessibility. For example, Mr. Kishtaya Goud plain refused to talk to me, despite repeated requests, and Mr. Nageshwahar Rao talked to me once for ten minutes. Furthermore, when talking to them they would not be honest with me or withhold information. Each of the pump owners understated the amounts of water sold, and nobody mentioned any conflicts with villagers or other stakeholders.

This culture of secrecy also manifested itself in the village. People were reluctant to forward me to the pump owners, because they did not want to cause trouble to these rich and prominent villagers. If they would give me information, they would usually add "you didn't get this from me". Although this situation made it hard for me to obtain data for a realistic overview of the tanker business' water consumption, the furtiveness did show me another, equally interesting side of the story. The pump owners and the other village stakeholders are well aware of the questionable legality of the water sale, and felt threatened by my investigation.

### **Water tanker companies**

The water tanker companies are small enterprises, based in the urban areas around Mallampet, like the Bolaram industrial area. The tanker

companies drive to these pumps in large trucks and transport the groundwater to the surrounding consumers

There are about fifteen different tanker companies that buy water from the pumps in Mallampet, of which six have been investigated through structured surveys. These tanker companies are small enterprises that do not have more than ten employees. These surveys were taken with respondents from two different layers in the companies: the management layer - the owners and supervisors – and the tanker drivers. However, often after the management had been interviewed, they were reluctant for us to interview their drivers, or if we managed to survey the driver of a company, the management would have been informed, and would therefore refuse to talk. The surveyed tanker companies are all based in the Bolaram area; the tankers do not come from other parts of the city. This makes sense, because being based further from Mallampet means higher fuel charges and therefore lower profits. The price at which the tanker companies sell their water to the consumers varies between Rs. 400 and Rs. 500 for a 10.000 liter-tanker. These prices have increased over the past years; two companies mentioned selling their water for Rs. 300 only a year ago. This is indicative of the increasing water demand, as well as the supply's inability to keep up with the increasing prices.

One can make a rough division between the various companies based on their size: there are larger companies that possess more than one tanker, and there are smaller one-tanker companies. This difference is not only distinct in the size, but also in the professionalism of the companies. The larger companies have tankers with a 10.000-liter capacity, and usually multiple drivers per vehicle so that they can work shifts. The one-tanker companies may be 5000 liters as well as 10.000, and usually only have one driver. And as shown above, the large companies have contracts with pump owners, which allows them a steady water price and gives them priority when the groundwater is scarce. The smaller companies often do not have these contracts, which makes them much more vulnerable to seasonality. This issue occurs on the other side of the supply chain as well. The large tanker companies usually have contracts with customers, while the smaller companies work on an on-demand basis.

In figure 7, an overview is given of the surveyed companies, detailing the survey source, the amount of employees, the amount and the size of the tankers, the frequented pumps, and the water consumption (in total trips per day). Of these companies, Mallikarjuna, JSM, Naveen Krishna and Mallikarjuna (Chandra Reddy) can be grouped as large companies, and KGN and Srinivasa as small companies.

Although the water tanker companies were generally more accessible and more cooperative than the pump owners, there were still some difficulties

with the data collection. There were still some company owners who did not want to talk to me, and we did not manage to interview both the owners and the drivers from the same company to double-check facts. Nevertheless, their attitude towards us was relaxed when compared to the pump owners, and organizing interviews was a lot easier. A possible explanation for this is that I posed a larger threat to the pump owners than to the tanker companies. Supposing that my research would spur one of the authorities into action. Then, a logical conclusion would be the closure of one or all of the water pumps in Mallampet, in accordance with the Andhra Pradesh Water, Land and Trees Act (to be detailed below). This would be a disaster for the pump owners, but the water tanker companies would simply get their water from another location. It would certainly be an inconvenience, but it does not directly threaten their livelihood. In a similar manner, both the drivers and the owners of the tanker companies are not worried about the declining ground water levels in Mallampet. If supplies run out, they will simply go to some other place.

Finally, all the tanker companies have no registration with the Chamber of Commerce or another government organization. They all claim to require no permits and that they do not have to adhere to guidelines. This more relaxed attitude does not mean that the answers I received were always honest. The company owners in particular tended to downplay the size of their business. The Mallikarjuna company will be used as an example. When I interviewed the owners, they insisted that their company only had one tanker vehicle, and that it made about five trips per day. When I compared this with the data from the log of pump 2, I found out that the company in fact had two tankers, and that they made about seven trips per day. The tanker drivers were less cautious; as far as I could tell their answers were usually quite close to the truth. Both the owners and the drivers would invariably mention that there were no conflicts with villagers or other stakeholders.

Name	Surveyed	Employees	Tankers	Pump	Contract with pump owners	Total water consumption (trips/day)	Notes
<b>Mallikarjuna</b>	Owners	unknown	2 x 10k l	2 & 3	Yes	7	
<b>JSM</b>	Supervisor	8	1 x 10k l 1 x 5k l	1	Yes	5 (10k) 2 (5k)	5k-tanker not used
<b>Naveen Krishna</b>	Driver	5	2 x 10k l	1, 2 & 3	Yes	15	
<b>K.G.N.</b>	Owner	unknown	1 x 10k l	3	No	7	
<b>Srinivasa</b>	Owner	1	1 x 10k l	1	No	3	One-person company
<b>Mallikarjuna (Chandra Reddy)</b>	Driver	5	2 x 10k l	5	Yes	15	A different company than Mallikarjuna, but with the same name. Chandra Reddy is the name of the owner

Figure 7: overview of the surveyed water tanker companies.

## Groundwater consumption

To get an indication of the size of the local water economy, I have made an estimation for the groundwater consumption by the tanker business in the month of November using the data detailed above (figure 8). If you add up the consumption data from each of the pumps, you get a total amount of about 500,000 liters per day.

However, it must be noted that these figures are collected through qualitative interview-based research. There are many uncertainties regarding them. Firstly, these data were difficult to gather because people were reluctant to cooperate with my research, as described above. Furthermore, these figures are very much subject to seasonal fluctuations. Just after the monsoon the water availability is much larger than it is right now, and the amount of water that can be withdrawn will continue to decline over the summer. As was described above, several pumps were already unable to supply as much water as was demanded by the tanker companies, and this effect will only be exacerbated in the future due to the resource's overexploitation.

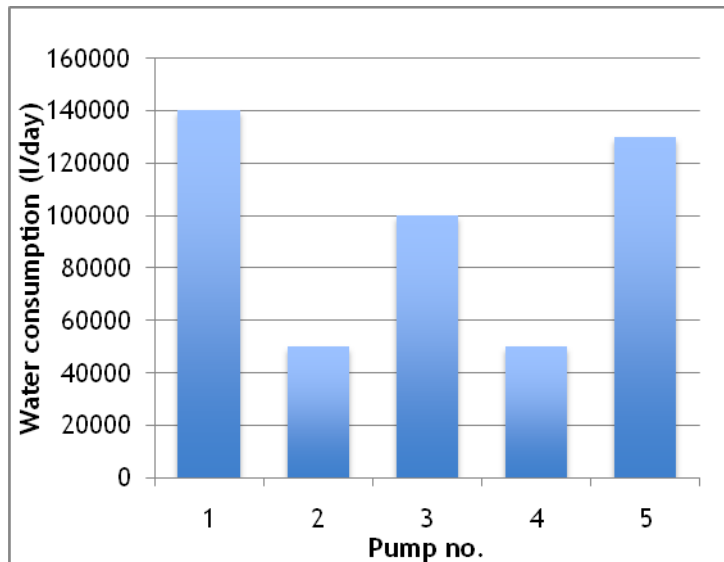


Figure 8: estimation of the groundwater extraction by the water tanker business in November.

Therefore, these figures should not be taken as statistically analyzed values obtained through experiment. Instead, they will be used for an indication of the size of Mallampet's water economy. The tanker business' daily withdrawal of 500,000 liters is responsible for the majority of the village's groundwater use; the other water uses in the village are significantly smaller. For example: the public panchayat water supply, which a large part of the village depends on, can only provide 40,000 liters a day.

## Question 2: what are the official laws and policies that govern the groundwater resources and the water tanker business?

The main document that governs the water resources in Hyderabad and its surroundings is the Andhra Pradesh Water, Land and Trees Act – shortened as APWALTA. This act was published by the parliament of Andhra Pradesh in 2002. According to this document, the responsibility for the management of groundwater resources (among several other environmental responsibilities) has been given to the Water, Land and Trees Authority; a committee of politicians and experts. This committee can delegate their responsibility to a “designated officer”; in this case the revenue officer of the Outbullahpur Mandal.

Below, a selection has been made of several articles of the APWALTA act that are relevant for this thesis.

- All groundwater resources in Andhra Pradesh are regulated by the Authority (article 8.1).
- From the commencement of the act, the owners of all groundwater wells have to register them with the authorities (article 8.2).
- The Designated Officer may prohibit water pumping for a period up to 6 months by individuals, groups of individuals or private organizations in any particular area if in his view this pumping is likely to cause damage to the groundwater level, other natural resources of the environment. After review, this period may be extended for a further period of not more than six months at a time (article 9.1)
- Any person, who intends to sink a well for purpose of irrigation or drinking or for any other purpose close to a public drinking water source, shall apply for permission to the Authority (article 10.2)
- The Authority may on the advise of the technical expert, declare a particular groundwater basin as overexploited for a period of up to six months. During this proclamation, no new wells shall be sunk except for public drinking water purposes or hand pumps for private drinking water purposes. After review, this period may be extended for a further period of not more than six months at a time (Article 11.1-11.5)
- The Authority may prohibit water extraction for up to six months by any well, if it is found to be adversely affecting any public drinking water source. After review, this period may be extended for a further period of not more than six months at a time (Article 12.1).
- If a well has been sunk or water is being extracted in contravention of any of the provisions of the Act, the Authority or any authorized officer may enter the land where the well is located and close the



pumping of the water, disconnect the power supply, seize any material or equipment and take any action that may be required to stop such extraction. The Authority or any authorized officer may also by order require the owner of the well to close or seal off the well at his own expense (Article 15.1)

In the next question, the laws described above are contrasted with the situation in reality. Then, one can see that there are clear differences between policy and practice.

### Question 3: what other stakeholders can be identified and how do these multiple stakeholders interpret their right to the water?

As was shown in the previous question, the water tanker business is a major water user in Mallampet, whose water consumption has a huge impact on the livelihoods of the other local water users. This question will investigate how the rise of the water tanker business has affected the other stakeholders in the village. It will identify the various stakeholders, describe how they view their own water rights and how they are affected by the water tanker business.

The following stakeholders have been identified and will be discussed below:

- Tanker company customers
- Village stakeholders
  - Farmers
  - Villagers
  - Local authorities
- Larger authorities
  - Quthbullapur Mandal
  - Andhra Pradesh Groundwater Department
  - Hyderabad Metropolitan Development Authority
  - Hyderabad Metropolitan Water Supply and Sewerage Board

#### Tanker company customers

The tanker company customers are the consumers upon which the tanker business is based - their demand for water is what the tanker companies supply to. They can roughly be divided into two groups:

- Industries and service companies
- Residential colonies and apartment complexes

Both of these groups are located on the edge of the urban areas – for example Bachupally or Bolaram. The customers cannot be too far away from Mallampet, otherwise it is not profitable for the tanker companies because the fuel costs will become too high.

In this research project, two companies were surveyed: Solokshana Electrical Circuits and Matrix Laboratories. Solokshana buys one to two tankers every day from Naveen Krishna. They do not receive any water from public organizations, because the Bolaram panchayat does not supply it to them. Bolaram is connected to the Hyderabad pipe network, but to extend the connection to the factory would cost Solokshana 5 million rupees, and constructing the extension will take about two years.

However, they do have an additional water source – a personal bore that pumps up 50,000 liters of groundwater per day. Although they could pump up more water, they still buy from the tanker business because their water is better in quality. Matrix buys six to seven tankers a day, as well from Naveen Krishna. The laboratory does not have an additional water supply – they have applied to the panchayat for a pipe connection but will have to sit out the waiting period – so they depend on the tanker water.

This example of dependency on the tanker business and on the groundwater resources is one that recurs throughout the Mallampet area. Due to the increasing urban expansion, there is a large and ever-increasing demand for water, and it is not fulfilled by the public sector. Therefore, a water tanker business arises to fill this market gap.

### **Village stakeholders**

The village stakeholders are the groups in Mallampet that are not directly involved in the water tanker business, but still have their livelihoods affected by this business because they have to use the same groundwater resource. These consist of the farmers, the villagers who do not get their income from agriculture and the village authorities.

### **Farmers**

The **farmers** in the past depended on three different sources to water their fields; rainfall, surface water and groundwater. The rainwater supply is still important, but even in the past it was unpredictable, and never large enough to allow for paddy production. Furthermore, it has become increasingly erratic due to climate change. Until recently, it was aided with auxiliary irrigation from the lake to the east of the village. Unfortunately, that resource has become severely degraded due to the building of the Outer Ring Road along the edge of the lake. The road lies upstream of the lake, and therefore has cut it off from its catchment area; there is no more run-off replenishing the lake. Add to that the dumping of building materials in the lake and the perceived pollution, and one can see why that resource cannot be used anymore. Therefore, the farming around the village is dependent on the groundwater resources; the farmers that did not have a bore well on their lands before the ring road was built are now unable to grow any crops. Finally, the farmers also depend on the groundwater for their domestic water use.

For this research, five farmers were surveyed in loosely-structured group discussions. Although a survey was used as a guideline, the general method was to also give room for the interviewed farmers to mention the things they found important and relevant.

The farmers view their water rights in very utilitarian terms; they do not see much of a difference between their water rights and the amount of

water that is practically available to them. They perceive the degradation of the surface water resource due to the construction of the ring road as the most important infringement of their rights. The plans of politicians, real estate agents and other big shots from the city are regarded with suspicion, even though the selling of agricultural land may provide these farmers with more money than they will ever make on their fields.

The possible degradation of the groundwater resource is of a much lower concern. According to the farmers, the groundwater is tied to the land above it, much like you would have with a mineral resource. They are not aware of the fluid nature of the ground water; they think extracting it at one plot does not affect the water levels elsewhere. The pump owners have the right to all the resources underneath the land they own. Similarly, they claim the right to all the groundwater underneath their own fields for themselves. The main thing stopping them from fully exploiting the groundwater is the irregular power supply. The pumps they use depend on electricity, but this supply only allows them to pump for seven hours per day. The farmers are not aware of the finite nature of the groundwater resource. In conclusion, the farmers do not have any conflicts with the water vendors, or at least none that they would tell me about.

At one point I was talking with an elderly farmer, and I explained to him that the water consumption by the tanker business did in fact affect the long-term water availability for Mallampet. He was visibly startled by this explanation, because he immediately realized that this would be threatening to his agricultural livelihood. When the farmers were asked about their other livelihood options, the first answer was inevitably "I don't know". Most of the farmers were middle-aged men, who had been farming all their lives.

### ***Villagers***

The villagers who do not get their income from agriculture – from now on referred to as just "villagers" - depend on the groundwater as well; it is the only source for their domestic water. Since the village lies outside of the municipal borders, they are not supplied with water by the HMWSSB. The two ways for villagers to access water are through the *panchayat* supply or through personal home-installed bore wells. The latter option is usually taken by the richer families, while the poorer households have to depend on the bidaily public supply. This water is not supposed to be for drinking (there are several water treatment facilities in town), but a significant part of the population resorts to it anyway.

Like the farmers, the villagers were also surveyed through loosely-structured group discussions; about fifteen of them were interviewed. When I surveyed the villagers, I found a great diversity of opinions on

water access and division questions. The panchayat water supply, for example, is perceived as adequate by some, while others see reason to complain about it. The poorer inhabitants of the village – migrants and people from scheduled castes - tend to be more satisfied with it; they are happy with whatever they can get. The richer part of the village mostly consists of long-time residents, who can recall a time when the village was smaller and not as urbanized. Then, there was enough panchayat water to ensure a daily delivery. These people either go to the other side of the village to fetch water or, if they have the money, install a private bore.

The villagers' views on the right to the groundwater vary. Some say that the panchayat has the right to the water in the village, and that the tanker owners are violating it. Others think that the pump owners have the right to groundwater because they own the land above it, or that they obtained legal as well as physical access to the groundwater by buying a bore connection from the panchayat. Finally, one woman replied that the groundwater belongs to God. Like the farmers, many villagers are not aware of the negative impact of the tanker business' water withdrawal on the overall water level. However, they do have a fairly accurate view of the amount of groundwater the tanker business uses: they think it takes about sixty to eighty percent of the village's groundwater consumption - the actual consumption is about seventy to seventy-five percent. They are well aware that this is an inequitable division for such a scarce and valuable resource.

Therefore, the villagers have occasionally taken action against the current state of the tanker business. One striking example was given by a former member of the *panchayat* (village council, explained below), who was part of a movement to stop the tanker business from taking water from Mallampet six years ago. A group of villagers decided to organize a sit-in on the main road from Bolaram to Mallampet, preventing the water tankers from accessing the pumps. However, this threatened the water supply of the business's customers: the industries in Bolaram. They responded by stating that they would need to move their factories elsewhere if the water supply from Mallampet could not be guaranteed. Since many villagers are employed in these factories, this veiled threat was a big concern for them. In the end, the villagers relented in exchange for a deal with the tanker company owners: if Mallampet suffers water scarcity, the tanker business will supply the village with auxiliary water. But despite the fact that the protest did not succeed, this conflict illustrates that – underneath the superficial indifference – some of the villagers certainly perceive the inequity of the current water division.

### *Local authorities*

The **local authorities** are directly responsible for the water supply in the village. The final authority lies with the elected *panchayat* (village council). The daily responsibility lies with three people:

- The *sarpanch*, the elected head of the *panchayat*, who can be seen as a sort of mayor of the village. At the moment, the *panchayat* has been disbanded because there were new elections scheduled. Due to the Telangana riots, these have been postponed state-wide, so currently the *sarpanch's* tasks are taken care of by a state-appointed special officer whenever required.
- The executive officer, a state-appointed official who is responsible for the spatial planning.
- The bill collector, another state-appointed official who is responsible for taxation, including water pricing.

The *panchayat* has hired two 'linemen' to take care of the public water supply. These men are charged with maintaining the *panchayat* water pump and the taps that flow from there to several watering points around the village.

The local authorities have a responsibility for diagnosing improper usage of the water resources. If the farmers or the villagers have any complaints regarding the situation, they can formally address these to the local authorities. The procedure for addressing these is as follows: the *panchayat* receives complaints from the villagers, which are then forwarded by the *sarpanch* to the deputy collector of the Quthbullapur mandal. If necessary, he can continue with this complaint to the municipal authorities of Hyderabad, or to state officials. Besides this, the *panchayat* processes applications for new water connections. If they, the deputy collector of the Quthbullapur mandal and the electricity board give their permission, a bore for personal or agricultural use can be installed for a fee of Rs. 1500. Formally, a water tax of 30 rupees a month is also charged for using these bores, but this is not collected at the moment for unclear reasons.

According to the *sarpanch*, everyone in the village is aware of the illegality of groundwater selling. However, the villagers are apathetic regarding the solving of this problem, because of the previously mentioned culture of secrecy; people perceive alerting authorities or taking other action as causing trouble for a fellow villager. Nevertheless, during his term the *sarpanch* has still received several complaints from the villagers. However, filing these complaints has not resulted in the shutting down of pumps, or any other action.

The executive officer was also interviewed: According to him there have been no conflicts with the water tanker companies, and as long as there

are no complaints from the villagers whatever the companies do is none of his business.

### Larger authorities

The final group of stakeholders consists of several authorities with a responsibility larger than Mallampet. Though they have very different tasks, they all impact the water management in the village in some way.

The **Quthbullapur mandal** is a sub-district that contains several villages – some within the Hyderabad municipality and some, like Mallampet, just outside it. It is responsible for the management of the groundwater resources in its area. The sub-district's revenue officer is given executive authorities in its management: for example, he needs to give his permission before a new bore well can be dug, or he can prohibit water pumping if he considers it damaging to the groundwater level or to other natural resources.

The revenue officer freely admits that he regularly receives official complaints from the entire mandal – including Mallampet. However, he chooses not to act on these complaints. Although he acknowledges the current situation is unsustainable in the long run, shutting down the pumps gives acute water stress to the companies and apartment complexes in the mandal. He justifies this approach by comparing the amount of objections he receives in each situation. In the current situation, he receives occasional complaints from locals, but if he shuts down the entire tanker business, their customers and their connections will call on him to revert the situation because it causes immediate water supplying problems.

The **Andhra Pradesh Groundwater Department** is a state-wide ministry, which is responsible for monitoring the ground water levels. For this, they have measuring points placed around the state. Besides these routine measurements, they also provide local measurements on request of other authorities – the GHMC within the Hyderabad city limits, or the *mandal* revenue collector outside of the city. The department does not concern itself with enforcement, or diagnosing.

I interviewed Venugopal Pushpa, an Assistant Director of the ministry. He felt that the withdrawal of water by the private water tanker business is indeed a large problem, but the Groundwater Department did not know how large – they lack information on the size of the water appropriation. They devolve the responsibility for the diagnosis of this problem to the local authorities, as was described in the APWALTA law. If the department is not called into action they do not conduct any local-scale measurements.

The **Hyderabad Metropolitan Development Authority (HMDA)** is the planning body of the city of Hyderabad. The HMDA is a separate institution from the Greater Hyderabad Municipal Council (GHMC), and it has a larger area of jurisdiction, which does incorporate Mallampet. Their responsibility here is twofold: on the one hand they take up the execution of several public projects, like the new Outer Ring Road. On the other hand, the HMDA chairs the Lake Protection Committee, which is responsible for the protection of surface storages.

I had an interview with Suneel Kumar Gupta, a member of the HMDA's environmental sector. The HMDA claims no responsibility regarding anything to do with groundwater - in accordance with the APWALTA law. However, their developments certainly do affect the general water availability and thereby the groundwater consumption. When asked after this relation, he places the conflict between development and protection of water resources in the context of the enormous growth of the city. Hyderabad is set to have nine to ten million inhabitants in the near future, and that of course requires construction works. The HMDA tries to ensure that this development doesn't interfere with their fieldwork, but "[they] can't satisfy everybody."

The **Hyderabad Metropolitan Water Supply and Sewerage Board(HMWSSB)** is part of the GHMC, and is responsible for the city's water supply. However, Mallampet and the areas around it lie outside of GHMC jurisdiction, which means they are also outside of the HMWSSB concern. To supply the city with water they do not only manage the piped-water system, but they also field their own fleet of water tankers.

I interviewed mrRavi Kumar, a chief engineer of the HMWSSB. According to him, the Board does not involve itself with legalization with regards to the water tankers. The council does not feel threatened by the private water tankers; since the quality of HWMSSB water is higher, so they don't see them as competition (even though the water pricing of the council is about twice as high as that of private water tankers). When I asked them if the failure of the council to provide water to everyone might have resulted in the rise of these private water tankers, he defends himself with the following statistics.

- The HMWSSB manages to supply 150 liters per person per day on average in the city to 98% of the population of the city proper.
- Their coverage in the suburban areas is 65 to 70 percent. Their average supply there is 80 to 100 liters per person per day.

Although the coverage is far from perfect, he mentioned that keeping up with the population growth in Hyderabad is a tremendous challenge. Both the expansion of the piping network and the acquiring of new water resources are occurring at high speeds, but



From the data given by the stakeholders the following conclusions can be made. There is a large water demand in the newly urbanized areas on the edge of the city, and the public sector is simply unable to supply the resource. As a result, there is a gap in the market, which is filled by the private water tanker business. The demand for their services is so high, that the laws governing the management of the groundwater resources are routinely ignored; not just by the tanker business itself but also by the authorities that have responsibility for the resource management (as shown by the behavior of the revenue officer of the Outhbullapur mandal). Therefore, complaints from the farmers and villagers in Mallampet do not have any effect on the current situation.

Furthermore, local awareness regarding the negative effects of the tanker business on their own water supply is at a seemingly low level. Both the farmers and the villagers are aware that the water tanker business pumps up very large volumes of water compared to their own use, but they do not necessarily connect that to a decreasing availability of water for themselves in the long run. However, this perception may be skewed. The fact that large protests were organized in the past suggests that the villagers may not be so unaware as they pretend to be, but rather prefer not to show their village's internal struggles to an outsider.

Finally, the larger (city-wide or state-wide) authorities do not address the problem. I found it peculiar that each of the government organizations I interviewed took pains to shift the responsibility for the management of the groundwater resources to someone else. There is no government organization that can diagnose the problem, assess the size of it and coordinate a joint effort to take steps to solve it, or at least mitigate some of its adverse effects.

## Discussion

This discussion will start an assessment of the reliability of the results. Some problems that were encountered over the course of the research will be addressed, and the results will be compared to other similar research projects. Then, the focus will be taken away from the case study in favor of a broader perspective. The findings from Mallampet will be placed into context with other research done by SaciWATERS on peri-urban water management, as well as with other research on Hyderabad, South-Asian cities and other cities in developing countries. Finally, I will make some tentative policy suggestions.

One of the major issues of this research was the ever-present language and culture barrier. The people in Mallampet were very curious after what I was doing in India, but also more guarded in their answers to me than they would be to a local interviewer. Perhaps an Indian researcher, particularly one that speaks Telugu, would find it easier to connect with the locals.

This research consisted of a case study of only one village in the Hyderabad peri-urban area. An obvious suggestion for further research would be assessing whether my conclusions hold for other locations in Hyderabad, South Asia and other cities developing countries with burgeoning water scarcities. When trying to extrapolate the situation in Mallampet to the entire Hyderabad metropolitan area, one notices that the private water tanker business in the village is a striking example, but hardly the only place that has to deal with this issue. The pumping up and selling of groundwater occurs in many peri-urban villages all around Hyderabad (Singh, 2010). Supposedly, they will have similar situations because they have similar availabilities of water resources, a similar urbanization trend and similar political constructs. Further research could be done to verify this.

If you take a broader perspective and looks at the situation in other South-Asian cities, the case of Chennai as researched by Niels Zoeteman can shed some interesting light on the issues discussed above. In 2010, this South-Indian metropolis was the only Indian city where the Metropolitan Water Supply and Sewerage Board had made a contractual agreement with the private water tanker business. A large part of the city cannot be serviced by the CMWSSB, so the board has started to negotiate private sector participation. Although there is still significant informal water extraction, about half of the tankers have been regulated through this program. According to Zoeteman, privatization can help to achieve effective water governance in Chennai, on the condition that the authority manages to maintain regulation over the private sector (Zoeteman,

2010). Investigating the possibility for similar regulations and reforms in Hyderabad would make for a very interesting follow-up on my research.

## Conclusion

### **What laws and policies govern the informal water tanker business in Mallampet and how does this affect the other stakeholders to the water resources?**

The informal water tanker business in Mallampet has grown because there was a demand for water in the peri-urban and newly urbanized regions around the city. The public water supply is currently unable to fulfill it, because it is struggling to keep up with the rapid expansion of the Hyderabad urban area. This market gap was filled eagerly by former farmers in Mallampet, who sold most of their lands, built pumps, and started selling water to small entrepreneurs from nearby urban areas. This water tanker business has over the years become responsible for the majority of the groundwater consumption in the village. Since groundwater resources are coming under increasing pressure, affecting the livelihoods of farmers and villagers in Mallampet, the sustainability of the practices of the water tanker business can be questioned.

The character of this business is informal; both the pump owners and the tanker companies have no registration with any government agency, do not adhere to guidelines and pay no taxes. The main law that governs the informal water tanker business in Mallampet is the APWALTA act. According to this document, the responsibility for the management of the groundwater resources is given to a central authority, but devolved to a designated officer, in this case the revenue officer of the Quthbullapur sub-district. He has the power to close down wells, or take a variety of other actions, if groundwater supplies are threatened or if wells are sunk illegally. The designated officer relies on the local authorities to diagnose such issues.

However, there is a clear difference between policy and practice in this instance. The local awareness regarding the effect of the water tanker business is low, and protests from villagers or local authorities do not seem to change the situation. The revenue officer receives regular complaints about the tanker business, but chooses not to act on these. The current dependence of local industries and consumers on the tankers is so large, that he feels he has no option but to let the current situation continue. Furthermore, there is no larger government organization that can diagnose the problem, assess the size of it and coordinate a joint effort to take steps to solve it.

A continuation of the current situation is arguably inequitable for the villagers of Mallampet, and in the long run likely unsustainable. A

promising suggestion for further research is to investigate the possibilities for city-wide regulations and reforms that would incorporate the water tanker business in the current system.

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