

Water Scarcity in Chennai, India

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Introduction

The coming of the summer months, from May to August, heralds the arrival of high temperatures and humidity, along with a plethora of water problems for the city of Chennai. During these months, the citizens of Chennai not only suffer from the almost unbearable weather, but also from a constant lack of access to water. The cause of these problems range from insufficient infrastructure and poor management, to a simple lack of usable water. And for a city with a daily water demand of 900 million litres, water problems top the list of concerns of city and state government officials.

Chennai's water troubles begin with its geographical location-the city lies on the coast of the Bay of Bengal around the 13th north parallel, yet there are few major freshwater bodies nearby. In Chennai's favour, the city has historically received between 1200 and 1300 mm (47" - 51") of water annually, as compared to the significantly smaller 800 mm (31.5") average of the remainder of India. However, only recently have steps been taken to harness this large quantity, and years of poor management have allowed precious rainwater to flow into the sea.

It is not uncommon to look through the newspaper daily and read articles on sewage overflows, water pipes bursting, or even complete failure to provide water, and nary a day goes by when a Chennai citizen does not register a complaint about his or her water woes in a newspaper. One A.K. Pattabiraman recently lamented in *The Hindu* of having been cut off from Metrowater for the past five years and having to employ a borewell, which has now dried up.¹

Civil water projects, after finally getting off the ground, are plagued by continuous delays and slow construction, leaving inconvenienced citizens to wonder when, if ever, these projects will be completed. For example, a photo in *The Hindu* depicts a construction site of a storm drain in Perambur where slow construction has forced drivers to share only half the road-the other half having been dug up for construction.²

The purpose of this study is to provide a holistic view of the cause of, as well as public and private responses to, Chennai's water problems, which will be accomplished, first by determining the cause and the extent of Chennai's water scarcity. Second, the intention is to chronicle how the government of Chennai and the government of Tamil Nadu have failed and succeeded in their efforts to provide the citizens of Chennai with access to an adequate supply of water. From there, the aim of this study is to hopefully provide suggestions as to how the two governments can ameliorate their mistakes.

¹ From the May 23, 2005 issue of *The Hindu*, published in Chennai

² From the May 28, 2005 issue of *The Hindu*, published in Chennai

Brief History of the CMWSSB

Until 1870, Chennai citizens received water only from household wells and tanks, when J.W. Madeley, a civil engineer, designed and oversaw the construction of the diversion of the Kortalayar River into the Redhills Lake. From there, water was provided through pipes to the city of Chennai. For roughly three decades after Independence, the government of Tamil Nadu, through the Tamil Nadu Water and Drainage Board, controlled the water supply in Chennai. Even now, in areas like Nanganallur that lie on the outskirts of Chennai, the TWAD Board, rather than the CMWSSB, provides water.

Eventually, the Chennai Metropolitan Water Supply and Sewerage Board was created by the CMWSSB Act, 1978, and was given the responsibility of ensuring water quality, planning for Chennai's water needs in the future and taking action to meet these expected needs, providing adequate water resources to citizens, and to correct customer complaints as quickly as possible.

The CMWSSB was granted numerous powers, including but not limited to the power to take control of all water supply, distribution, and control facilities, to improve existing facilities or authorize the construction of new ones, to regulation the extraction and use of groundwater in Chennai, to prevent pollution in water sources within the city as well as those sources outside but employed by the city, and to levy fees for its services.³

When discussing Chennai's water problems, it would be a simple matter to remark that Chennai's problems stem from a lack of water and to just leave the matter there. However, that simply opens a new question of why Chennai has a lack of water. Why does Chennai suffer from water scarcity when other cities that are more highly populated do not?

It was mentioned above that Chennai's problems begin with its geographical location. While cities like Mumbai and Bangalore have numerous freshwater resources in close proximity, Chennai does not. Moreover, although Chennai has historically been blessed with heavy rains, this has not been the case in recent years. Chennai depends on the Monsoon for the vast majority of its precipitation, and the near failure of the Monsoon to provide water from 2000 to 2004 has only exacerbated the water scarcity.

Year	Rainfall (in milimetres) ⁴
1995	864.9
1996	1231.9
1997	1205.1
1998	1034.7
1999	784.2
2000	873.1
2001	785.4
2002	723.4
2003	925.5

Geographical location and declining rainfall only address the issue of lack of water. But even in times of higher water levels, the CMWSSB has failed to provide water to some areas of

³ From the CMWSSB Act, 1978

⁴ Collected from *Statistical Abstract: India 2003*

Chennai. When the CMWSSB actually does provide water through pipes, it often only pumps water for a few hours once every alternate day or even once a week. Citizens have to watch out constantly so that they know when they can pump water. The CMWSSB claims: “Wherever a water main and wastewater main is available, we will provide a connection to your home within 30 days after registration of your application. We will be unable to provide a connection where water or wastewater mains are not available.”⁵ From this simple phrase, one could easily infer what is perhaps the second greatest cause of water scarcity and insufficient infrastructure: Chennai expanded too quickly for the CMWSSB to keep up.

In the place of single family homes, there now stand multifamily flats; small buildings were demolished and quickly replaced with larger ones. The upshot of all this is that though living space for Chennai citizens has greatly increased, water infrastructure could not expand at an equal rate, thus leaving areas of Chennai without water provision. According to data provided by CMWSSB officials, 96% of Chennai is serviced through pipes, and while this appears to be a rather high percentage, the remaining 4% of Chennai represents a vast area. Let us produce an example to illustrate how large this remaining 4% is. Keeping in mind that the population of Chennai numbers six million (60 lakhs), then 4% falls just short of a quarter million people. It is astounding that in Chennai alone, nearly a quarter million people lack Metrowater access entirely. Even more remarkable is the nonchalant attitude with which the CMWSSB procured these percentages; this attitude drove the point home that in the CMWSSB headquarters, with the officials so detached and removed from the symptoms of the water scarcity, hardly anyone fathoms the extent of the water troubles faced by Chennai citizens everyday.

What has happened is that citizens have begun employing borewells in large numbers in order to obtain sufficient water; in the years following Independence, the use of borewells increased manifold. As a result of the poor water management and increased stress on groundwater, underground water levels in and near Chennai have fallen by more than four metres between 1993 and 2004. Citizens now have to dig deep and deep to obtain water that is present in smaller and smaller quantities. The result is that this once plentiful source of water is dwindling at such a high rate that it may soon become economically infeasible to obtain groundwater. The CMWSSB has been granted the authority to control all extraction of groundwater within Chennai, meaning that all who employ borewells must first register with the CMWSSB; however, according to CMWSSB estimates, while up to 98% of structures in Chennai possess borewells, only about 94% of them are legally registered.

More importantly, the remaining quantity of water, significantly smaller than it used to be, mixes with compounds in the ground, so that potentially harmful compounds are present in greater quantities. For example, in the groundwater near Chennai chloride is present in quantities of 1000 milligrams per litre, fluoride is present in 1.5 milligrams per litre, and nitrate is present at almost 45 milligrams per litre.⁶

According to water quality standards, acceptable groundwater should contain no more than 500 milligrams of chlorine per litre, or else it imparts a highly saline taste. Moreover, the Bureau of Indian Standards (BIS) has concluded that 1.5 milligrams of fluoride per litre is the maximum permissible amount, meaning that the level of fluoride in the water is already at the highest level that is considered safe. With increased groundwater usage, citizens of Chennai can expect to see the

⁵ Collected from CMWSSB webpage on the services it provides

⁶ From the *Groundwater Development Scenario in Tamil Nadu*

level of fluoride increase. The BIS has deemed that 45 milligrams of nitrate per litre is the maximum permissible quantity, so again, since the groundwater in Chennai has already reached that amount, citizens of Chennai can expect to see nitrate quantities rise to unsafe levels. Electrical conductivity contour maps of Tamil Nadu show that groundwater in and near Chennai has an extremely high electrical conductivity (measured in microsiemens per centimetre). An electrical conductivity of this level implies a high number of Total Dissolved Solids in the water (including all ions, inorganic and organic impurities). The maximum safe level of Total Dissolved Solids per litre is 500 milligrams per litre, but estimates show that the level of Total Dissolved Solids per litre in Chennai most likely exceeds 500 milligrams per litre.⁷

Because of the poor water infrastructure, the CMWSSB and the TWAD Board cannot always use pipes to distribute water to all areas of Chennai; so the Tamil Nadu government and the Chennai government often employ a system where lorries and tankers would carry water, around 12,000 litres each, and distribute the contents to citizens on an equal basis. During the summer, over 2,000 lorries can be seen on the streets at any given time, says V. Rama Rao, General Secretary of the United Forum of Nanganallur Welfare Associations.

Whether water is provided through pipes or by lorry, it is generally known that citizens do not receive nearly enough water to fulfill their daily requirements. International standards say that a person requires 190 litres a day to meet all their needs.⁸ The TWAD Board, however, has lowered that amount to 40 litres of water a day.⁹ Yet, says V. Rama Rao, the Metrowater hardly provides 25 litres a day per *family*. According to CMWSSB data, the Metrowater provides roughly 340 million litres per day, which is only slightly more than one-third the total daily demand.

Citizens of Chennai regard the CMWSSB with a high level of distrust, and one citizen, when asked his opinion of Chennai and Tamil Nadu’s handling of the water management, scornfully replied that he had never seen water actually being managed here in Chennai. Even the government of Tamil Nadu recognizes Chennai’s poor water management. When rating the quality of water agencies throughout the state, the government refused to grant the CMWSSB a rating of “good” but relegated it to “average”.¹⁰ As we will see, Chennai’s water troubles mostly stem from failed government projects in the past, which could have helped correct Chennai’s water scarcity.

Financing the CMWSSB

From both CMWSSB printed data and interviews with CMWSSB officials, it is concluded that the CMWSSB provides much of its income for itself, anywhere between 50% and 90% in a given year. The following table shows annual income from 1999 to 2003.

Year	Income in crores ¹¹
1999	207.01
2000	248.05
2001	283.51
2002	250.18
2003	351.45

⁷ From *Principles and Techniques of Water Treatment Methods*

⁸ Lenntech Water treatment & air purification Holding B.V.

⁹ From the TWAD Board webpage on rainwater harvesting

¹⁰ From *Tamil Nadu: An economic appraisal*

¹¹ Taken from CMWSSB Annual Reports, 1999-2003

The sharp drop between 2001 and 2002 can be attributed to a fall in water usage, as there was a sharp decline in the quantity of water that was available for use. From 2002 to 2003, the vast increase in income resulted from an increase in government subsidies, from Rs. 15 crore in 2002 to Rs. 101 crore in 2003. In 1999, outlay of the CMWSSB equaled 181.51 crore, and this steadily increased every year, skyrocketing to 242.43 crore in 2002, then dropping to 227.98 crore in 2003. The majority of these outlays was spent on maintenance of pipes and construction of civil projects, but a large portion was also spent on maintenance of lorries. This needless expenditure could easily be avoided if the CMWSSB would only allow an outside private company to contract out the service of providing water through lorries. Thus, public funds need not be spent on maintenance.

According to CMWSSB officials, the agency finances itself in two ways: connection charges and water supply charges. The connection charge is a one-time fee paid when the CMWSSB connects a structure to Metrowater infrastructure. Water supply charges are measured by utilizing a water metre and measuring the amount of water actually used. Using these two charges, and these two charges only, the CMWSSB claims to provide the majority of its income.

The truth, however, is far different than what the Metrowater claims. Based on interviews with citizens in Ashok Nagar, T. Nagar, and Perambur¹², it is found that citizens generally agree that the government, regardless of what it claims, does not implement these water metres. Moreover, many domestic homeowners contradicted the CMWSSB's statements regarding its payment methods. The citizens all agreed that they paid the one-time connection charge, yet rather than being charged according to their usage they were charged a flat monthly rate, anywhere between Rs. 500 and Rs. 1000. Or when going to make payments at the local CMWSSB branch, they would not be told the quantity of water supplied, but were simply given a number and told to make payment. The citizens in this situation had no choice but to comply, or else be cut off entirely from Metrowater. Also as part of this broken and corrupt payment plan, those who owned homes mentioned that they also paid a yearly water tax, based upon what they paid for their property tax. Many commercial structures, in Ashok Nagar especially, regardless of whether they were connected to Metrowater or not, were compelled to pay this water tax.

To fix this confusing system of payments, the CMWSSB should make it clear to local branches that the only fees to be levied are the initial connection charge and the water supply usage fees. Any water taxes based upon property rather than use should be abolished, since these taxes unfairly hurt businesses that may not even require water connections. Moreover, the CMWSSB must make an effort to root out corruption in its system and to ensure that its agents only levy the correct charges.

Structure of the CMWSSB

The CMWSSB is headed by the Chairman of the Board, under whom is the Managing Director. The MD is responsible for controlling the day-to-day operations of the Metrowater Board, and ensuring that all water supply facilities operate smoothly.

Immediately beneath, and reporting only to, the Managing Director are the General Manager, Financial Director, Executive Director, Engineering Director, and the four Co-Chief Engineers. Each of these people controls a different department; however, the duties of each of these

¹² The names of the sources have not been, and will not be, provided in this report, as per their request

departments overlap, and even after meeting with various CMWSSB officials, it was still unclear what was the difference in the duties between the Engineering Director and the Chief Engineers.

To improve efficiency in the CMWSSB, several changes need to be implemented in the structure of the Metrowater Administration. First, the offices of the four Chief Engineers should be consolidated into one single office. The duty of one Chief Engineer is to oversee only the Second Chennai Project (New Veeranam Project), which certainly appears a superfluous department now that the project has been completed for over a year. Another official controls the Chennai City River Conservation Project, a long delayed project which for all intents and purposes appears to be abandoned. Under this one engineering department, one administrator would oversee operation and maintenance of current infrastructure and design and construction of new projects. Rather than devoting resources to separate departments for each project, the consolidated department would be better able to share information, since one engineering official would have to be knowledgeable regarding every aspect of infrastructure.

Next, there is no reason that the CMWSSB should manage its own finances. As a government agency, the CMWSSB should hold no secrets regarding what money comes in and how much money is spent. By managing its own finances, the CMWSSB unnecessarily spends money by training and paying workers to do what an outside company could do less expensively, more efficiently, and more accurately. Thus, the CMWSSB should do away with its finance department and contract out all financial work to a private auditor to handle.

Prominent Failures in Water Provision

Perhaps one of the most prominent failures when considering water provision would undoubtedly be the original Veeranam project. The project commenced in 1968 with the intention of drawing water from the Veeranam tank, located 225 km south of Chennai. The goal of the endeavour was to draw 40 million litres of water per day to Chennai. From the beginning, however, the project was plagued by construction troubles; pipes along the route began to leak, and eventually the contractor for the project, Mr. Sathyanarayana, committed suicide. As costs mounted the Tamil Nadu government decided to scrap the project by the mid-1970s. Expenditures for the project had already been made, and so hundreds of concrete pipes laid unused for the next three decades, either in warehouses or simply along the route where the construction company laid them. Only in 2003 did the Tamil Nadu and Chennai governments allow the Chennai Metrowater Development Authority to dig up the old pipes and put them for sale.¹³ Perhaps out of fear of political repercussion, the Tamil Nadu government in the mid-1970s allowed the taxpayer money to go to waste by simply abandoning the project. Rather than taking up the project again and providing a steady source of water for Chennai, the government allowed politics to enter into the picture.

In 1993, the Tamil Nadu government secured assistance from the World Bank and the permission from the Government of India to prepare plans and begin construction for a new Veeranam project. However, by 1995 the government of Tamil Nadu had changed hands with DMK rising to power. Unfortunately, the DMK government decided to table the Veeranam plans and so Chennai would have to suffer for several more years from exacerbated water scarcity. Current Chief Minister Jayalalithaa has accused the DMK of tabling the New Veeranam plan for political reasons, and out of fear that the new project would fail just like the original. This means that the former DMK government feared that it would lose upcoming elections if it were to take up the project and it

¹³ From the December 13, 2003 issue of *The Hindu*, published in Chennai

failed, so it lost the opportunity to curtail Chennai's water shortage in the future.¹⁴ In hindsight, the people of Chennai might have fared better in recent years had the government of the 1970s not abandoned the project entirely, but rather chosen different contractors to undertake the project.

The other most notable failure in Chennai's history of water provision would be the Krishna Water Project. The project commenced on February 15, 1976 with an agreement between Andhra Pradesh, Karnataka, Maharashtra, and Tamil Nadu, in which the first three states promised to provide Chennai with five TMC of water annually. Eventually, the Karnataka and Maharashtra left the agreement so only Andhra Pradesh was left to provide Tamil Nadu with the water. The Andhra Pradesh portion of the project, known as the Telegu Ganga Project, cost Rs 2180 crore, of which Tamil Nadu paid Rs 520 crore.

The Tamil Nadu aspect of the project was termed the Krishna Water Supply Project, as part of which the government of Tamil Nadu tried to raise the capacity of three reservoirs nearby Chennai.

Reservoir	Old Capacity (in Mcft) ¹⁵	New Capacity (in Mcft)
Poondi	2750	3460
Chenbarambakkam	3120	3645
Redhills	2850	3300

Also as part of the project, the government of Tamil Nadu constructed a 700 kilometre long canal to the Krishna River. In the agreement between Andhra Pradesh and Tamil Nadu, it was decided that Andhra Pradesh would provide 12 TMC¹⁶ annually.

As of the fiscal year 1995 – 1996, the government of Tamil Nadu spent Rs 182 crore on its end of the project. The projects, commenced in 1983, were completed all during the period of the Tamil Nadu Eighth Five Year Plan (1992 to 1997).¹⁷ Yet for all the time and money spent, Chennai has only seen a small fraction of the promised twelve TMC per annum. The following table shows how much water Chennai has actually received since the project began providing water:

Year	TMC
1996	.076
1997	2.292
1998	2.812
1999	1.830
2000	3.591
2001	3.437
2002	3.342
2003	Nil
2004	1.341
2005 (Thus far)	1.583

¹⁴ From the June 2, 2001 issue of *The Hindu*, published in Chennai

¹⁵ Mcft = Million cubic feet

¹⁶ TMC = Thousand million cubic feet

¹⁷ From Tamil Nadu's Ninth Five Year Plan

Knowing that in each year from 1996 to 2004, the city of Chennai should have received 12 TMC, and assuming that since half the year in 2005 has passed the city should have received at least six TMC, we take the sum to determine that the city of Chennai should have received **114 TMC of water in total**. We find, however, that Chennai has only received a total of 20.304 TMC since 1996. This means that over the course of almost one decade, Andhra Pradesh has gone back on its agreement and left Tamil Nadu with a water deficit to the effect of **93.694 TMC of water**. Because of incredibly poor water management in Andhra Pradesh, the city of Chennai has not received anywhere near the quantity of water owed to it, and yet nothing is done by the government of Tamil Nadu to force Andhra Pradesh to fulfill its end of the agreement.

Success in water provision

The greatest success regarding water provision in Chennai in recent years is the New Veeranam project, undertaken since the AIADMK returned to power in the Tamil Nadu government, and without which Chennai's water scarcity would have reached untold levels in 2004 and 2005. Originally the project was estimated to cost Rs 464 crore, but ultimately the project ended up costing Rs 720 crore. Unlike the original Veeranam project, which ended in abject failure, this new project was completed in May 2004 and began pulling in 205 million litres per day into Chennai. This success tempered the near total failure of the Monsoon in 2004.

The Veeranam Extension Project, which would have cost Rs 300 crore, would have enabled the city to take excess water from the Coleroon river bed when the Veeranam lake dropped in level; it was hoped that the pipes would be able to bring 150 million litres per day from the source to Chennai.¹⁸ Unfortunately, while the government estimated that the project would have been completed between 2005 and 2006, farmers nearby the area filed a lawsuit against the Tamil Nadu government, claiming that they would be adversely affected by the withdrawal of water. The Madras High Court gave permission for the project to continue, stating that the government had approached the project with all necessary consideration. Scientists and engineers were brought into the area to explain to these farmers that they would in no way be affected by the extension, yet a large number still continued to protest because they did not believe the government. Thus, by mid-April, the AIADMK government decided to drop the project in order to respect the farmers' wishes. The Chief Minister also mentioned that instead, Chennai would begin receiving water from a desalination plant that is yet to be designed or constructed.¹⁹

In this situation, simple cost-benefit analysis would show that since the farmers in the area will not be adversely affected, the only costs to consider would be the costs of construction. If the government were to go to each Chennai citizen and measure the value they place on the amount of water they would receive from the extension project, this benefit would almost certainly outweigh the costs of the project. So the project was not dropped because of economics concerns, nor did the government abandon the idea due to legal concerns, since the Madras High Court gave permission to continue. The purpose of this study is not to infer what the rationale behind the government's decision was, and whether or not it was politically motivated, but only to comment that the choice to abandon the Veeranam Extension Project was not at all forward-thinking. After all, the benefit to Chennai would have been vast; a better solution here would be to go ahead with construction of the New Veeranam Extension Project, and not wait on the construction of the desalination plant while hoping that the Veeranam lake has enough water for the city.

¹⁸ Tamil Nadu Budget 2005-2006

¹⁹ From the April 19, 2005 issue of *News Today*, published in Chennai

Rainwater Harvesting

The coming of the monsoon used to be a boon for Chennai, but as the city expanded further and further, rainwater could not penetrate the ground, so the vast majority of rainfall in Chennai went to waste, merely flowing from the city into the Bay of Bengal. However, in light of the growing water scarcity in Chennai, the current government of Tamil Nadu realized that Chennai's heavy rainfall could be harnessed to alleviate some of the city's problems. The government devised an extremely forward-thinking scheme implemented a mandatory rainwater harvesting plan for all buildings. The basic premise of this program is for each building to have a collection apparatus on the roof, which will take rainwater and purify it through a sand and gravel filter, then pipe it down into an underground sump. The water will then flow from the sump up to a tank on the roof from where it can be distributed to the remainder of the building. Another method would be for the collected water merely to flow down into the ground where it will recharge groundwater levels. The government even called upon the aid of banks to offer loans to building owners too poor to afford the rainwater harvesting equipment on their own.

However, there are many problems present even in this extremely forward-thinking scheme. First of all, while authorities used to demand implementation and threatened prosecuted those who did not abide, that fervency has now given way to mere insistence. However, there is no operating branch of the CMWSSB that monitors Chennai to ensure implementation of the scheme. Thus, there are areas where citizens do not choose to spend the Rs 6000 to 10000 to construct the infrastructure; many contractors have decided not to implement the infrastructure in new building designs out of fear that prospective buyers will find the increased cost to be too high to purchase. Thus, the CMWSSB estimates that 3% - 4% of the city still does not possess rainwater harvesting equipment, and while Metrowater access has been denied to most of this segment, there is no other punishment enacted for the disservice done to their fellow citizens.²⁰

Additionally, the rainwater collection mechanisms only collect water that falls on rooftops. Water that falls on the road either flows into storm drains, to be taken away as waste, or flows into the ocean. Water is not collected from these roadside drains for use, since the water is considered unsanitary; if there were a means of collecting this rainwater which has been written off as unusable, then the total quantity of water collected would be increased manifold.

To improve upon the current approach to rainwater harvesting, the CMWSSB should first adopt a financial penalty **at least equal to, but no less than**, the current fair market value of the total water that could have been collected by each structure from the time the government made RWH mandatory to the present, based on rainfall in Chennai for those years. In this way, the owner of each building is assessed a fair economic penalty for the exact numerical disservice done to fellow citizens. To collect even more water during rainfall, it should fall to government's responsibility to construct roadside water collection mechanisms, filters, and holding tanks, from which water could be pumped into lorries and then driven and distributed. Following this course of action, the government should only contract out the project to private engineers and contractors. Should the government undertake these civil projects on its own, the inevitable constant delays and half-completed construction, would be both dangerous and a nuisance to the general public. Another course of action would be for the government to compel the owners of structure to construct roadside rainwater collection tanks outside their premises, so as to prevent precious rainwater from falling into the streets and flowing away.

²⁰ From the June 20, 2001 issue of *The Hindu*, published in Chennai

Desalination

As Chennai lies on the coast of the Bay of Bengal, it is in a perfect position to employ a desalination plant. There are two main designs for a desalination plant: reverse osmosis and multistage flash (MSF) distillation. In either process, the goal is to take seawater and remove the salt and impurities, thus producing freshwater. The major concern regarding desalination plants are the near-prohibitively high costs. Not only is there the fixed cost, or the up-front cost of equipment, but there is also the cost of hiring workers to maintain the plant, and the cost of electricity. A reverse osmosis plant requires up to 12,000 kWh/AF, because of the high-pressure pumps involved, while MSF distillation plants require up to 33,000 kWh/AF (7,000 for the pumps and 26,000 in thermal energy needed to heat the seawater to high temperatures). Despite the extremely high costs, desalination plants possess incredible potential to produce vast quantities of freshwater. For example, one single desalination plant in Saudi Arabia produces roughly 484 million litres of water a day, which is more than half of Chennai's daily water demand.²¹

The government of Tamil Nadu, noting that Chennai's location is extremely conducive for a desalination plant, has taken steps towards the construction of such a plant. The state currently runs five desalination plants, at Nochikuppam, Velachery, and Ayodhyakuppam and two plants running at Kasimedu, which pump brackish groundwater and produce pure water. Although none of these plants use seawater as an input, state government officials do not believe that has affected the success of the plants to a high degree. These combined plants only provide water for approximately 40,000 citizens, but the Tamil Nadu government believes it can construct a plant on a much larger scale, capable of solving the water needs for all of Chennai. The state proposed the creation of a desalination plant, capable of producing 300 million litres of freshwater per day, and then created and registered the Chennai Desal Company on June 21, 2004. This company will possess the authority to control all manners of desalination plants in and around Chennai.

In his budget speech for the year 2005-2006, the state Minister of Finance commented that the state had received numerous responses to the tender floated for the desalination plant. More recently, Chief Minister Jayalalithaa proclaimed that the state will soon commence the construction of a desalination plant, from which the city could obtain water as early as next year. The greatest hurdle to the construction of the desalination plant in Chennai lies in the fact that both the state government and the Central government claim credit for the idea of constructing such a plant and thus providing Chennai with a long-term solution to its water scarcity. Both governments plan to authorize money for a desalination project, yet neither government is willing to allow the other to proceed. In March of 2005, Union Finance Minister P. Chidambaram declared that the Central government would set aside Rs 1000 crore for the construction of a desalination plant. In response Chief Minister Jayalalithaa has claimed that the Centre is attempting bestow undue credit upon itself.

Amid the confusion caused by this political wrangling, the process of constructing the desalination plant has been delayed. Because of politics, the citizens of Chennai are once again being deprived of a long-term solution to its water scarcity. The city of Chennai and the government of Tamil Nadu should not delay the construction any longer, but should instead demand that the Centre respect the authority of Tamil Nadu to construct this plant on its own. Rather than using tax money, the CMWSSB should charge higher fees for Metrowater users to fund the maintenance of the project. This way, those who truly value Metrowater will continue to use it, but those who find private water cheaper will turn to private companies to satisfy their water requirements.

²¹ From *Seawater Desalination in California*

Private Sector

Since many citizens lack access to Metrowater, they have turned to another source: the private sector. The private water provision industry is rapidly expanding throughout India and especially in Chennai; the private sector provides an adequate alternative to public water because water is purified and packaged at private plants. While Metrowater may or may not be available, private water will almost certainly be available – as long as the customer is willing to pay the higher price.

On the surface, the private sector merely performs a beneficial and much-needed service, but beneath the surface, the private sector produces an unfortunate consequence, which is that the private companies unabatedly consume water from lakes in Tamil Nadu, with the effect that these freshwater resources are quickly drying up. For example, indiscriminate pumping from Ambattur Lake all but assures that within a few years, the lake will be gone. Here, the government of Tamil Nadu has already declared such pumping to be illegal, yet it does nothing to prevent it except erecting signs to ward off encroachers.²²

Because the government of Tamil Nadu has already given the property rights of this lake and many others to municipalities, or the farmers live beside them, the government should take adequate steps to uphold this promise. While private corporations should be allowed, it should be mandatory that these companies reimburse the farmers or municipalities for the use of the water, instead of simply being allowed to pump water. By forcing companies to reimburse the property owners, eventually the most efficient quantity of water will be pumped from the lakes. Moreover, the government of Tamil Nadu should take greater steps to prevent illegal pumping by actively prosecuting those companies that try to pump illegally.

Potential Solutions to Chennai's Water Problems

When discussing the problems above, simple solutions have been provided, such as beginning construction of a desalination plant immediately or making sure the private sector does not take advantage of poor farmers, these solutions merely attack the symptoms, not the cause. However, there are diverse ways in which the current model can be altered so that proper water supply is ensured for all citizens. The following solutions do not intend to attack the water scarcity problem from a political perspective, since all that could be said is that politicians should put aside petty bickering and work for the good of the citizens, without any actual solution being provided. Rather, the following suggestions are meant to elucidate various methods in which the management of water in Chennai could potentially be altered.

Under the current system, the CMWSSB is a government agency, under the auspices of the city of Chennai and the government of Tamil Nadu. This agency retains authority over water supply and sewerage in the city of Chennai, even though it contracts out certain functions, such as pumping stations. Despite the efforts of the CMWSSB to provide the citizens of Chennai with an adequate water supply, most citizens would agree that the system has its flaws.

Very rarely, if ever, does one ever read a complaint in a newspaper regarding privately provided or bottled water. The reason is that the very survival of a private water provision company depends on it providing high quality water to its customers; should a company alienate its customers,

²² From the May 23, 2005 issue of *The Hindu*, published in Chennai

it would lose all revenue and cease to exist. This is in contrast to the CMWSSB, which would exist whether or not the water it provides is of adequate quantity and quality.

A different model for water provision in Chennai might be for the governments of Tamil Nadu and Chennai to convert the CMWSSB into a private corporation that would have to compete on the same level as the other private water provision companies that currently exist; the only advantage it would possess would be a staff that already had a thorough knowledge of the city's infrastructure.²³ Currently, the CMWSSB does raise the vast majority of its own funds through connection charges and water supply charges, yet it still receives annual grants from the government of Tamil Nadu. Under the new model, this private version of the CMWSSB would be a publicly traded corporation that would have to fend for itself completely. Besides having an incentive to promote efficiency, this privatised CMWSSB would have another important advantage; current water projects are often hindered or delayed due to political motives. However, this private CMWSSB would not be hindered by politics, and so could undertake and complete projects without fear of political interference.

Furthermore, in order to compete with the privatised CMWSSB, other private companies would likely lower their prices; should this new company be unable to provide a water supply which satisfies its customers, they would then have the option of turning to private water at lowered prices. In this way, the customers' surplus would increase, while the most efficient outcome could be reached.

Another possible option is for the CMWSSB to be fractured into smaller pieces, each with autonomous authority, and responsible for maintaining water supply and sewerage only for a section of Chennai. Currently, there is one location for the headquarters, and small local branches, from where all orders are given and all grievances are redressed. The benefit of changing to a system of several semi-autonomous outposts rather than one headquarters and several branches is that each outpost would handle a much smaller area of Chennai, and would thus be in a better position to handle requests and complaints. Comparatively, the current CMWSSB handles a vast number of requests and grievances from all over Chennai. As a result, many of these requests, grievances, or civil projects are not completed in a timely manner simply because the central location does not have the manpower to satisfy all the requests. Nor does there exist any obligation to act as quickly as possible, since the single location of the headquarters seemingly protects officials from pressure and criticism from outlying citizens.

Under the several semi-autonomous headquarters system, the staff of each outpost would handle only a fraction of Chennai, and would thus be constantly exposed to pressure and criticism. Resulting from this fractionated CMWSSB system would be an increased sense of obligation to address grievances and complete civil works in a timely manner.

If these different models are not chosen, another option is for the CMWSSB to stick with the current model, but increase the number of functions that it privatises. At present, the maintenance of pumping stations is contracted out to private companies; however, other aspects, such as carrying water in lorries or management of purification plants should be contracted out to private companies. This way, the CMWSSB would only have to pay for the services rather than paying for maintenance of the equipment. At the very minimum, functions which do not relate to the purpose of the

²³ This model only takes into account the water supply functions of the CMWSSB. For the sake of simplicity and brevity, I am assuming that the sewerage functions of the CMWSSB would still be controlled by a government agency

CMWSSB, such as finances and accounting, should be taken care of by an outside company, thus freeing up government resources for other uses.

Yet another solution which could potentially ease Chennai's water problems would be to remove private water companies from under the control of the CMWSSB. Currently, the CMWSSB has the authority to provide and revoke licenses to these private companies. In fact, the private companies are allowed to exist only because the Metrowater cannot meet Chennai's water demand on its own. Removing private companies from under the control of the CMWSSB is not contradictory to the above suggestions that the government set limits to private pumping activity. Private companies should only be licensed by a section of the government that does not have the ability to revoke the licenses arbitrarily or for political reasons. Although this has not happened yet, history has shown that the private sector functions best when unnecessary government influence is kept to a minimum.

In conjunction with the above recommendation, the government should also take the step to grant property rights to those who live, and have lived, along the shores of lakes in Tamil Nadu since it is these people, rather than local municipalities, who will be most affected by pumping water from the lakes. Previously it was mentioned that the government should provide payment to the owners of the lake, and this can only be accomplished once property rights are granted to those whose lives and livelihoods depend on the freshwater resources.

Although many of the above solutions appear *prima facie* to call for extremely reduced government intervention, it is not recommended that there be no authority concerning water supply. That is to say, it is not intended that the government lie completely outside the picture and that the public be forced to fend for itself entirely when procuring water.

It is necessary that there be some regulatory agency that sets standards for water quality and ensures that water supply meets these standards. While a government agency may not necessarily take part in procuring water and managing distribution, one should at least exist to ensure water quality for the protection of the public.

Responsibility lies with citizens to conserve water, and since the cry is often raised to involve the public in water management, another potential method utilizes a community-based ownership of water supplies in the city. It is commonly known that there are welfare associations throughout the city which serve as tools for citizens in various geographical regions to complain to authorities, who might not redress grievances from citizens alone. Through the power of these organizations, citizens can pool their resources acquire water supplies that would be collectively managed. Then, the distribution of this water could be controlled by the association, to ensure that everyone in the area receive his or her fair share of water, no more and no less. Currently, although the CMWSSB claims that all structures have water metres, based on which the Metrowater would charge its consumers, Chennai citizens have generally accepted that very few buildings actually have these metres implemented. Meanwhile, the CMWSSB meanwhile charges an arbitrary flat rate. However, under the community-based approach, the organization would undoubtedly make an effort to monitor water usage so as to prevent water from being wasted. This communal-based approach to local water management does not require any effort on the part of the government, but is simply a means for citizens to practice proper water management.

Most importantly, the CMWSSB or the government of Tamil Nadu should produce a curriculum that teaches citizens proper water management and the importance of not wasting water. The CMWSSB should then distribute pamphlets or hold seminars, through which citizens can learn how they can conserve water and use water most efficiently. No matter how much water the government or private companies can procure, ultimately the citizens must bear the responsibility of careful water management. If citizens cannot manage water properly, and allow waste and leaks to occur, then even the most meticulous government planning will be in vain.

The above suggestions have been made after reviewing what is the extent of Chennai's water scarcity problems and how those problems came to be. Although these suggestions are certainly not all-inclusive, they do provide the potential to ease Chennai's water woes.

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