Water crisis: a case of Chennai

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Abstract

The increasing demand for water supply, coupled with an ever-increasing population, rapid urbanization, and unplanned measures, put excessive pressure on the water resources. water scarcity is expected to become a major source of national political conflict in the future. The Chennai metropolitan area (CMA) comprising Chennai city, with a population of 4.9 million is the fourth-largest urban agglomeration in India. Frequent water supply crises and unreliable water supply are common phenomena in Chennai city. The 2019 Chennai water crisis in India resulted in severe disruptions to social order and daily life. This water crisis is attributed to rapid land-use change and consequent loss of water bodies, not having a proper water management system and irregularities in monsoon. In this research, an in-depth examination of the water policy of 1994 in light of the provisions in the National Water Policy of 2012 has been carried out which revealed that several important features of the National Water Policy of 2012 are lacking in Tamil Nadu's policy. For example, it makes no mention of ecological water needs, managing water requirements through cropping patterns changes, and so on.

I. Introduction

The 2030 Development Agenda of the United Nations is a compilation of globally accepted goals that include a holistic strategy for direct actions and policies toward sustainable development (United Nations Sustainable Development Summit, 2015). The 17 Sustainable Development Goals (SDGs) have been adopted as a framework for accomplishing an enriched as well as sustainable future. Goal 6 of the Sustainable Development Goals aims to improve the quality, availability, and management of freshwater resources in order to facilitate long-term water and sanitation access.

The increasing demand for water supply, coupled with an ever-increasing population, rapid urbanization, and unplanned measures, put excessive pressure on the water resources. At present, the process of urbanization, in less developed countries is faster than the developed countries. Water resource which is one of the main components of livelihood is predicted to face severe stress on account of this growing population in India. Therefore, water scarcity is expected to become a major source of national political conflict in the future (UN-Water, 2022). Delhi, Bengaluru, Chennai, Hyderabad, and 17 other cities in India are quickly moving to achieve zero groundwater levels as revealed in the Niti Aayog's 2018 Composite Water

Management Index (CWMI) report. This will threaten access for 100 million people.

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However, due to excessive groundwater extraction, a poor water management system, and inadequate rainfalls, 12 percent of India's population is actually residing in a 'Day Zero' situation (NITI Aayog, 2018).

The total usable water resource of India is calculated to be 1086 km^3. The average annual flow in the river systems of the country is 1953 km^3, but the usable flow is 690 km^3/year, according to the National Commission for Integrated Water Resources Development. The country's total replenishable groundwater resource is 432 km^3/year, however, the utilizable groundwater resource is only 396 n km^3/year. The mismatch between exploitation and replenishment of India's water reserve is the primary matter of concern. The amount of usable surface water per person has declined significantly, from 1911 m^3 in 1951 to 672 m^3 in 2001, and is projected to fall even further to 421 m^3 by 2050.

The water should also be free from microbial contamination, which is the second concern. E. coli, the primary indicator of contamination in surface and ground waters, should not be measurable in a 100-ml sample of water as accepted by the Government of India, according to WHO criteria. Water with fewer than ten coliforms is thought to be of little better quality. The Indian government accepts the recommendations but has yet to ensure their implementation. One of the country's most serious public health risks is waterborne diseases induced by fecal pollution. According to estimates, India spends 90 million days each year dealing with waterborne diseases, costing the country Rs. 6 billion in production losses and treatment expenditures (Chaudhuri et al, 2002).

Chennai, a city in southern India, is dealing with water and climate change-related issues due linked to a depleted supply. Chennai was selected as the site for this research to look into the causes of water shortages, policy changes, and policy and adaptation remedies.

II. Chennai

Tamil Nadu is a state with a severe water shortage. In 2011, the state's per capita water availability was 654m3, compared to 1545m3 for India as a whole (Anushiya & Ramachandran, 2015). From October to December, when the average figure grows to 1254 m3, the situation improves. Chennai supplies tap water for only 4 hours on average each day and have a slum population of roughly 400,000 people, yet tap and tanker services cover 97 percent of the city's populace (MIDS, 1995). Tamil Nadu's entire surface water potential has been estimated at 853 tmcft. This includes a 261 tmcft contribution from neighboring states. The state has various river basins, the most notable of which is the Cauvery. However, it is an inter-state agreement.

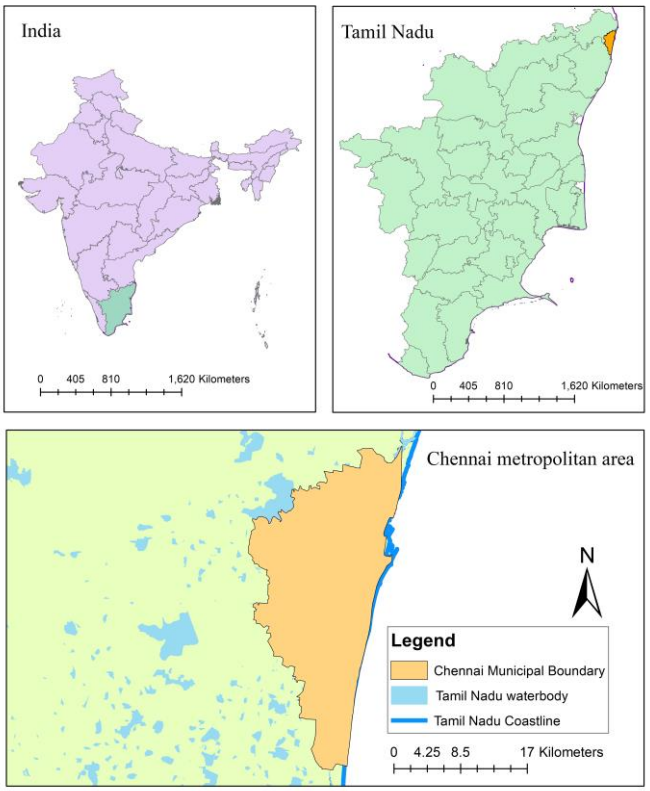

Figure 1: Location map of Chennai metropolitan are

The Chennai metropolitan area (CMA), which encompasses Chennai city and its surrounding suburbs, has an estimated number of 8.6 million people and is India's fourth-largest urban agglomeration (Sekar & Kanchanamala, 2011) (Figure 1).

Almost 90% of Chennai's water supply derives from res ervoirs such as Red Hills, Cholavaram, Poondi, and Che mbarambakkam, which are all dependent on monsoon rainfall. During the dry season, the city's water needs are mostly fulfilled by groundwater resources. Heavy demand for domestic, industrial, and agricultural sectors

However, due to the over-exploitation of groundwater resources for all possible purposes, groundwater's contribution to Chennai's water supply has also dropped, from a high of 25% in 2000 to around 6% in 2000. In March 2013, the percentage of groundwater was as low as 1%. This indicates that Chennai's water supply is excessively reliant on all available sources. In addition, the drop in groundwater levels has led to seawater intrusion along the coast.

Frequent water crises and undependable water supply are common phenomena in Chennai city. In the year 2011, the per capita water supply in Chennai city was compared to the major metropolitan cities of India (Ruet et al 2007). Because of this dwindling water resource, the water supply to households in Chennai city is often restricted to every alternative day. It further deteriorates in the drought condition (Agarwal & Narain, 1997).

The 2019 Chennai water crisis in India adversely affected social order and disrupted daily life in the city. The Chennai water crisis began on June 19, 2019, due to a late start to the monsoon season and dried-up water reservoirs (Watts, 2019). All these reservoirs have been totally dried up. People relied on water tankers once tap water stopped running, although supply was severely constrained. With the arrival of trucks and trains stocked with water about a month after "day zero," some alleviation for the situation was offered.

The cost of bottled water has reportedly increased fourfold, while packaged water can only be afforded by the wealthier class. Employees in the IT industry have been asked to work from home. Several restaurants have closed their doors. 'Don't waste water' bills, stickers, and banners abound across the city. Private firms provided 5,000 trucks to the drought-stricken neighborhoods when the demand could not be met by the provision of 9,000 tankers each day by the city. This and other water crisis-related politics give rise to a shadow economy.

The Indian summer monsoon (ISM), or the southwestern monsoon, and the northeastern monsoon (NEM), or the winter monsoon, have both undergone considerable changes in recent years (Mishra et al 2012, Rajeevan et al 2012, Roxy et al 2015, Singh et al 2019). The severely low northeastern monsoon (NEM) in 2016–2018 over much of southern India is accountable for the drought and resulting water scarcity. In 2018, Chennai received just sixty percent of its annual average rainfall of 1.4 meters. That is probably the only reason that can be attributed to nature.

In the last decade, Chennai has lost 33 percent of its wetlands and 24 percent of its agricultural land due to fast urbanization. Both of these resources were critical to the groundwater reserve's improvement. The Centre for Climate Change has blamed road building, like highways and flyovers, for depleting water resources in Chennai.

These development initiatives, according to their assessment, were carried out on reclaimed water bodies. Pallikaranai Marsh, Pulicat Lake, Kattupalli Island, Madhavaram and Manali Jheels, and the Adyar Estuary Creek have all been encroached upon to allow for new urban communities. Except for a few places here and there, three main rivers and the Buckingham Canal do not have water today.

Along with around 3000 water bodies, Chennai had many environmental assets. However, water bodies had not been considered environmental assets, they had been viewed as sources of irrigation and drinking water. As a direct consequence, lakes, and rivers that do not provide water for irrigation or drinking are frequently reclaimed as wastelands, with hardly any consideration of their ecological significance. Over 40 years, these water bodies have shrunk due to various reasons. They are depleted due to the mismanagement of the government without knowing the ecological and hydrological value and also to a great extent because of the negligence of the public.

When tweets were obtained for a study, it emerged that people were far more positive towards the government in terms of assistance for the protection, and conservation of water bodies. When discussing human behavior and the consequences of water shortages on daily life, it looked to be more negative (Xiong et al 2020). Great awareness for avoiding wastage of water at the grassroots level is extremely signification as found in the perception studies (Bhatia et al 2006).

Another study reveals that most of the residents reported that they have been affected by waterborne diseases. The most common are Diarrhoea, Typhoid,

Paratyphoid, Cholera, Dysentery, Protozoal, viral infections, and Helminthic (worm) ailment. These diseases are caused by the use of unsafe water. Sometimes flood creates penetration of saline water into the fresh sources and groundwater sources and contaminates them.

III. National and State Water Policy

In September 1987, India's National Water Policy was launched for the first time. In 2002, a revised version of the National Policy was released. Afterward, the most recent version of the National Water Policy was released in 2012.

Which put emphasis on the role of climate change in the context of water resources distinctively (Cronin et al, 2014). This was in consideration of the significant influence that climate change is anticipated to have on people's socio-economic lives. In 1994, Tamil Nadu was one of the first states to implement a state water policy that was aligned with the national water policy. However, the state policy has not been updated since then. The policy proposal, which was made in 2014, has yet to be implemented.

Following a detailed assessment of the 1994 policy in light of the provisions of the National Water Policy of 2012, it was determined that the National Water Policy of 2012 comprises a number of critical elements not found in Tamil Nadu's policy. It essentially makes no reference at all to climate change and required policy adaptation. For example, ecological water demands, regulating water demand through cropping patterns, and so on have been largely disregarded.

The water crisis in the city is not purely due to the lack of water. Chennai is affected by both drought and flood. It's hard to believe that devastating flooding struck Chennai less than four years ago, killing at least 422 people and causing up to $14 billion in damage in Tamil Nadu. The majority of the rains washed into the sea, resulting in limited water retention and a drop in the groundwater table.

After the drought of 2000, Chennai made it mandatory for homes to have rainwater harvesting systems (RWH). The vast majority of citizens still do not take RWH seriously and merely give it due respect. Lack of management policy is one of the key causes behind exacerbating crisis conditions in Chennai.

Considering the monsoonal vagaries an effective water resource management plan will be policy adaptation in response to future climate conditions with necessary awareness.

Chennai Metro Water at its Anna Nagar Rain Centre has structured an RWH facility which has produced a few positive impacts in reducing water shortages in recent dates. The New Veeranam project became functional in September 2004. The earlier Veeranam Lake project, which failed to augment the city's water supply, has been revived as the New Veeranam project. It has also lessened the dependency on distant sources for water to a large extent.

Telugu Ganga project is a newer initiative under which water is obtained from inter-State rivers like the Krishna River in Andhra Pradesh. The city has also developed two saltwater desalination facilities to supplement its water supply, one of which has been active since 2010 and the other since 2013. A third one now is in progress. However, Chennai's capacity for planning and administration still seems insufficient to meet the demand. In 2026, a 713 million liters per day (MLD) gap is expected, with demand forecast as 2,248 mld and supply estimated as 1,535 mld.

Chennai can become a water-secure city by taking a holistic approach which may include controlling fast urban growth, guaranteeing a safe and reliable piped water supply, strict action against irresponsible groundwater extraction, and crushing the parallel water industry.

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