Disposal of Waste and Preservation of Natural Water Resources: A Perspective on The Laws and The State of Implementation In Delhi NCR

A Thesis submitted to the

UPES

For the Award of

Doctor of Philosophy

in

Law

By

Rakhi Ruhal

June 2024

Supervisor

Dr. Shikha Dimri

School of Law (SOL)
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Dehradun - 248007: Uttarakhand

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DECLARATION

I declare that the thesis entitled "Disposal of Waste and Preservation of Natural Water Resources: A Perspective on The Laws and The State of Implementation In Delhi NCR" has been prepared by me under the guidance of Dr Shikha Dimri, Professor of School of Law, UPES. No part of this thesis has formed the basis for the award of any degree or fellowship previously.

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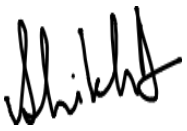
CERTIFICATE

I certify that Rakhi Ruhal has prepared his thesis entitled "Disposal of Waste and Preservation of Natural Water Resources: A Perspective on The Laws and The State of Implementation In Delhi NCR" for the award of PhD degree of the UPES, under my guidance. She has carried out the work at the School of Law, UPES.



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ABSTRACT

This thesis examines various state policies on water in India, including consumption patterns, sources, and the urgent need for legal reforms to manage underground water resources and enhance conservation efforts.

The study aims to identify regulatory gaps in water disposal and conservation, comparing the implementation of existing regulations. By analyzing water regulations across different Indian states and comparing them with international best practices, particularly those in the United States, this research seeks to propose improvements for India's water conservation legal framework.

The research methodology combines doctrinal and non-doctrinal approaches. Primary data was collected from industry operators, government agencies, and the public, utilizing separate questionnaires for each stakeholder group. This data covers aspects such as water availability, quality, usage permissions, compliance levels, and the costs and benefits of current disposal practices. The collected data is presented in charts and tables, analyzed using legal principles, and the adequacy of existing laws is assessed based on identified needs.

The thesis focuses on water availability in Delhi/NCR, exploring both natural and artificial water resources, their historical and current usage, and depletion trends. It extends the analysis to other Indian states for comparative clarity and includes a discussion on water demand, consumption types, and related issues.

Additionally, the research covers constitutional aspects, the fundamental right to water, judicial pronouncements, international legal frameworks, and relevant policy documents. A comparative analysis of water conservation and waste disposal policies between India and the U.S. identifies best practices for potential implementation in India.

The study also evaluates the Delhi Jal Board rules, the availability of water, potential improvement options, and the roles of the public and government. This analysis is supported by primary and secondary data, presented in tables and charts, and examined through legal logic.

The long-term protection of the environment and improvement of human health and well-being hinge on sustainable waste management and resource conservation. By assessing the roles of the administration, legislature, and judiciary, this thesis aims to highlight areas needing improvement, promoting a fair and equitable future for both the environment and society.

The findings suggest that enhancing the legal framework, raising awareness, improving enforcement mechanisms, investing in sustainable infrastructure, and fostering stakeholder collaboration can significantly advance waste management and water resource preservation in Delhi NCR. Policymakers and authorities must recognize the gravity of these issues and prioritize implementing effective solutions. Strengthening legislation, enhancing enforcement, building institutional capacity, and promoting public participation are essential steps toward sustainable and equitable water and waste management. Implementing these recommendations will protect natural resources, improve public health, and enhance the quality of life for Delhi NCR residents.

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This thesis has been possible only with the help, support of inspiration and academic assistance from various people. I would like to express my special thanks and gratitude to my supervisor, and other professors for their support and guidance and support throughout.

I also extend my heartfelt thanks to my family and friends who provided me with moral support and stood at my side all the time. Lastly, I want to thank my late father in law for motivating my journey to begin Thesis.

Rakhi Ruhal

TABLE OF CONTENTS

List of Figures

List of Tables

List of Cases

List of Abbreviations

CGWB-Central Ground Water Board

CPCB-Central Pollution Control Board

CPHEEO- Central Public Health and Environmental Engineering Organisation
CTE-Consent to establish

DJB-Delhi Jal Board

GPCD-gallons per capita per day

IWRM-Integrated Water Resource Management

LPCD-litres per capita per day

NGT-National Green Tribunal

SPSB-State Pollution Control Board

List of Appendices

CHAPTER 1

INTRODUCTION

Previously, the management of water at the international level was mostly approached from the standpoint of individual states. The emphasis of the argument, however, has since changed due to the adoption of human rights accords. Although there is no universally agreed-upon treaty regarding water rights, the United Nations has implemented many measures to acknowledge the significance of this matter (Danielopol et al., 2003). Furthermore, the inclusion of the right to water has been incorporated into the recently established Sustainable Development goals. The right to water, as established by international law, is the subject of this investigation. The study delves into the origins of international law using a traditional legal methodology. The study focuses on the conceptual and historical development of the right to water within several international legal frameworks, such as international humanitarian, environmental, and water law. This paper investigates the legal basis of the right to water, assessing its likely interpretation as either a customary norm or an independent right. There is a noticeable trend towards recognizing and respecting the independence of rights, as evidenced by the changing interpretations of Indian law, international law, and human rights instruments. The right to water has received some attention, but whether or not it has been formally acknowledged as an independent human right remains unclear. This problem is complicated already, and the fact that different countries have different water rights laws and legal standards just adds to it.

As a result of rising demand and dwindling supplies, a global water catastrophe is imminent in the next years. Climate change and rising populations are only two

of many causes, provide a substantial threat to the availability of water in many countries. Similar to air, water is a necessary ingredient for human existence. In addition, many human needs, like education and personal growth, depend on it. Without it, the well-being and advancement of individuals would be greatly affected (Gain & Wada, 2014).

Approximately 800 million individuals worldwide lack access to potable water. Moreover, every 20 seconds, a youngster falls victim to a waterborne sickness (Balha et al., 2020). Historically, the control of water resources at the international level was primarily focused on the interests and perspectives of individual states. This was consistent with the overarching ideals about the utilization of natural resources of extraordinary beauty. However, due to the increasing number of global water-related issues, the scope of international control has expanded. There has been a change in focus from the state to the person about water resources due to the growing number of international water challenges. As a consequence, multiple international agreements regarding water rights have been created. The current inquiry is to the legal recognition of these rights and the ensuing ramifications. (Grönwall & Danert, 2020).

Water is widely recognized as one of the most crucial natural resources. Nitrogen is the primary component of the Earth's atmosphere and is essential for human survival. Water is essential not just for sustaining a good standard of living but also for fostering the growth of social and economic endeavors (Manivannan et al., 2017). An imbalance in water availability, either in the form of a shortfall or surplus, can cause a number of problems, like as pollution and the spread of disease. Due to the scarcity of water, In order to address both human and environmental demands, we must exercise caution when utilizing it. Water, being a natural resource, possesses inherent usefulness (Li et al., 2020). Approximately 97% of the Earth's

water consists of salt water, with only about 3% being fresh water. More than two-thirds of it is solidified in polar ice caps and glaciers. The majority of unfrozen freshwater is mostly located in groundwater, with only a negligible amount found in the atmosphere or on the Earth's surface (Wada, 2015). Although the world's water supplies are limited, there is a consistent decrease in their availability. This phenomenon can be attributed to the escalating utilization of groundwater, predominantly concentrated in Asia, North America, South America, and Africa. A framework is a structured and organized system that provides a foundation for developing and implementing various processes or applications.

The process of distributing the existing resources is referred to as water rights, and it is employed to assign water to consumers.

1.1. Sources of Natural Water Resources

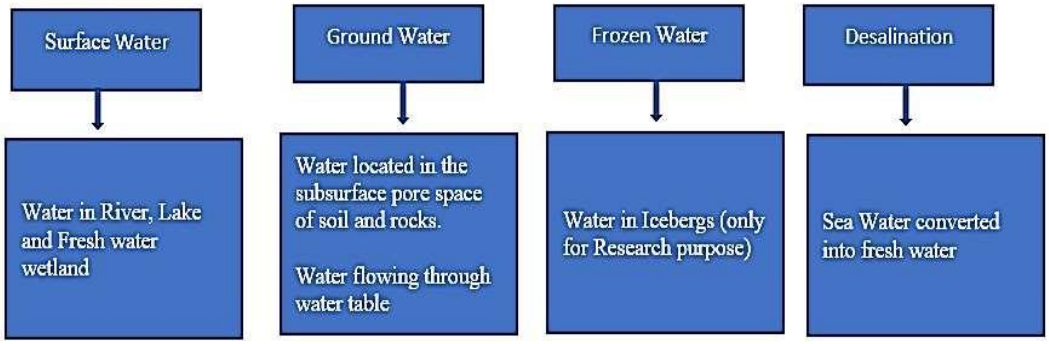

Fig 1.1. Natural water resources

The presented data represents the average amount of water stored in the hydrosphere over a long period of time. The hydrosphere encompasses the dynamic processes of water exchange between the land, ocean, and atmosphere on Earth. Within shorter time frames, such as a span of a few years, the water properties in the

hydrosphere can display significant fluctuations. Any time water moves from one part of the Earth to another, it is part of the hydrological cycle, which is also known as the water cycle. The majority of the world's potable freshwater comes from rivers, making them an integral part of the water cycle. The role of water storage in the Earth's water cycle can fluctuate due to its dynamic nature and significance.

In India, the Constitution does not explicitly ensure the right to access water. However, basic human right to exist, as enshrined in its founding document, Article 21, has been confirmed (de Oliveira, 2017).

Figure 1.2 depicts a basic overview of global population dispersion and water resources ((2012), 1990).

Continent	% Global population	% Fresh water available
Africa	14	10
Asia	60.5	36
North and Central America	7.3	15
South America and Caribbean	6.4	26
Oceania	0.5	5
Europe	11.3	8

Figure 1.2 A basic overview of global population dispersion and water resources (Masago et al., 2018).

Since increasing food production to fulfill future population demands will necessitate the utilization of the same water resources, this issue assumes paramount importance. Human population expansion and climate change are exacerbating the water crisis. (D. Sharma & Kansal, 2011) (R. Sharma et al., 2022a) (R. Sharma et al., 2022b). Worldwide, almost 2.6 billion people require basic sanitation services,

and over 1.1 billion people do not have access to safe drinking water. (Braae & Steiner, 2013) (Lenka & Lenka, 2024). Particularly in emerging nations, water scarcity is on the rise. The United Nations reports that during the past century, water consumption has doubled, outpacing population growth (Cullet, 2007a) (Sopper, 1992). Therefore, there is insufficient water to meet the demand in areas where almost 1.2 billion people reside, a condition known as physical water shortage. Economic scarcity is a significant contributor to water insecurity, alongside physical shortage. Economic water shortage, which occurs when individuals cannot afford to use the water that is already accessible, is already affecting over 1.5 billion people (Majumder, 2015). An avoidable human tragedy, the lack of access to safe drinking water has devastating consequences for people's health, employment prospects, and overall quality of life for millions of people throughout the globe (Hanjra & Qureshi, 2010).

Figure 1.3 depicts the primary water resources in India (Water Security in India: Hope, Despair, and the Challenges of Human Development - Vandana Asthana, A. C. Shukla - Google Books, n.d.).

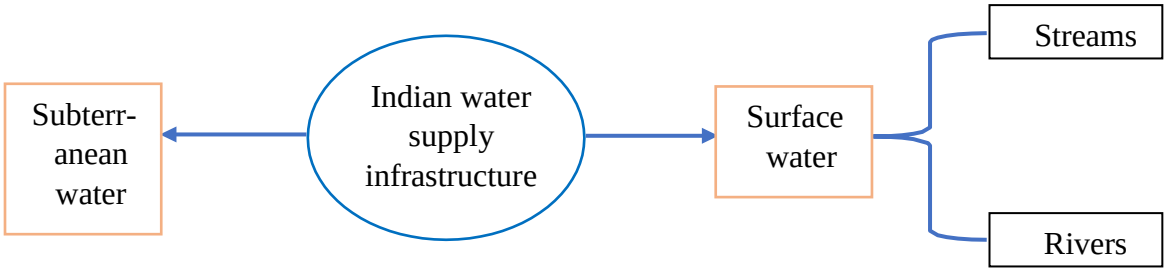

Figure 1.3 Principal water resources of India.

The quickly expanding metropolis of Delhi, which is part of the National Capital Territory (NCT), is encountering problems with the amount and quality of its groundwater. A number of reasons are contributing to this, including increasing

urbanization, a growing population, and intensive agriculture. Groundwater must supply half of the city's water needs. With an annual loss of approximately 0.8 meters, The groundwater level in Delhi has experienced a decline of around 8 meters over the course of the last ten years. Conversely, groundwater contamination is a serious problem in a number of NCT areas. Previous research found that groundwater recharge sites in the NCT are dispersed throughout different areas. (R. Kumari et al., 2018).

Given the current rate of water demand and the scarcity of available supplies, a global water crisis is imminent. The fundamental cause of this problem can be ascribed to a confluence of factors, encompassing climate change and the burgeoning world population. Everyone needs water to live, and it's also important for people's growth and health. Poverty and health problems might worsen in its absence (Balha et al., 2020).

Approximately 800 million individuals worldwide lack access to potable water. Every 20 seconds, a child dies as a result of contracting a waterborne sickness. Water rights were recently developed and imposed on a global scale as a result of poor water resource management. This is due to the increasing recognition of the global community regarding the need of addressing the issue (Grönwall & Danert, 2020).

With the increasing population in areas facing water scarcity, the global society has shifted its focus from the government to the individual. Water rights have been developed through several international legal frameworks (McIntyre, 2013).

The government can regulate the private sector, according to the Supreme Court. Humans are powerless to turn nature's blessings into a curse, according to the Supreme Court. The court ruled that other uses of water, such irrigation, should not take precedence over drinking water because it is the most efficient use of this resource (Water Management – Law And Policy In India, n.d.). This necessitates

protecting people's right to utilize water for their own homes. Indian water law is primarily dependent on state statutes. This is because the country's constitution gives the states the power to enact legislation regarding this area. This includes the regulation of water supplies, canals, fisheries, dams, irrigation, and hydropower (McIntyre, 2013).

Restriction on the use of interstate rivers persists notwithstanding constitutional provisions. The Union can also regulate the navigation and shipping operations on national waterways. It has the power to control the use of territorial and tidal waters (Yang et al., 2023).

In 1956, a specific legislation was passed to address conflicts about rivers that flow through many states. The objective of this approach is to address these difficulties by means of negotiations. Human rights are an essential component of the legal framework concerning water. (Meshel, 2018).

Case law has construed Article 21 to encompass the right to water, even though the right to water is not specifically provided in the Constitution (Article 21 of Indian Constitution- A Mandate To Pollution Free Environment, n.d.).

Furthermore, Article 39 stipulates that the government has the responsibility to guarantee the equitable distribution of the community's resources for the betterment of society as a whole. Protecting and improving the nation's natural environment is a fundamental obligation of every person, according to another important clause of the Constitution (Article 39 in The Constitution Of India 1949, n.d.).

The NCR region in Delhi is endowed with several permanent rivers, including the Kali, Hindon, and Yamuna. The U.P. Sub-region possesses ample groundwater resources, Unfortunately, the groundwater is inadequate on the western bank of the river, which includes parts of Haryana, the districts of Jhajjar and Alwar, and makes

the items grown there unfit for human consumption. The water supply of the NCR region comes from the Western and the Upper Ganga canal systems, as well as from the ground water supply coming from the tube wells and the outer belt of the Yamuna(H. R. Sharma et al., 2010). Due to the increasing population and the depleting ground water resources, the NCR region is considered a water-scarce region. As a result of both population growth and an increase in water consumption, this area is struggling to meet its water needs. As the summer heats up, the NCR region's water shortage is likely to worsen. The all-encompassing plan for managing water should include this issue. In addition to supply and demand, it is crucial to consider numerous aspects, including system losses, in order to effectively conserve the region's water supply (Alsubih et al., 2021).

The National Capital Territory of Delhi gets a lot of its water from groundwater. People in the cities are using this resource to meet their needs as the city's population grows quickly. There was a full study of Delhi's groundwater resources in 1997 using the ground water resources estimate method (Dynamic Ground Water Resources Of Nct, Delhi As on March 2022, n.d.).

Evaluation of Delhi's groundwater supplies used empirical standards and information on changes in water levels. Evaluation of Delhi's groundwater supplies used empirical standards and information on changes in water levels. It also figured out the yearly withdrawal and put the data it gathered into groups (Jiménez et al., 2019).

The data collected during the assessment process were used to calculate the water level trend and the groundwater utilization in the NCT Delhi. The city's yearly groundwater extraction amounts to approximately 480 million cubic meters, but the annual replenishable volume is approximately 297 million cubic meters. Over-exploitation of the available resources has affected the supply of water to seven out

of the eleven districts of Delhi. Delhi, situated in India, serves as the nation's capital. Geographically, it lies between latitudes 76 and 77 and longitudes 28 and 56. The size of the territory is about 1,480 square kilometers. Fifteen areas are in charge of running it. (Impact of Land Use Change on Groundwater - A Review by Shirley Wang - Issuu, n.d.).

Delhi is likely to keep growing because of how quickly it is becoming urbanized and how land use has changed. An essential consideration for Delhi in developing its infrastructure is the management of its water resources. The city's yearly water requirement is roughly 1,435 million cubic meters, as stated in the Central Ground Water Board's 2006b report. Of the total, only 1,044 million cubic meters is provided by the Delhi Jal Board.

Based on the population growth estimates for 2021, the city's annual water requirement was expected to be around 2,269 million cubic meters. However, 1,367 million cubic meters of water will be accessible in the future from many sources, including underground. There will be a dramatic shift in the water supply and demand dynamic now (Biswas & Gangwar, 2020).

The city has eleven districts. It is constantly changing its land use pattern and demographic profile. One of the most critical factors that the city needs to consider when it comes to infrastructure development is water. Current estimates place the demand for water at approximately 1,435 million cubic meters, covering domestic, industrial, and recreational uses. Though the whole amount is 1,044 million cubic meters, only the Delhi Jal Board is supplying it. This comprises around 166 million cubic meters of groundwater. According to the projected population growth, the city's water demand is anticipated to increase to approximately 2,269 million cubic meters. However, the availability of water from other sources is expected to be only

1,367 million cubic meters. This leaves a huge gap between the supply and demand (Planning Journal & Acey, 2016).

The term dynamic groundwater refers to the annual recharge of the resource or the replenishing of it. It is estimated using the guidelines issued by the GEC 1997 under the Indian government. The assessment unit for this resource is based on the water level trend and utilization status. The future management of Delhi's groundwater resources has been planned based on the current state of the situation and the hydrogeological outlook of the area (Union. Minister. Of. Jal. Shakti. Releases. Report. Of. Dynamic. Ground. Water. Resource. Assessment. For. The. Country. For. The. Year. 2022, N.D.).

The fast urbanization and growth in India have negatively impacted the quality of its water resources, leading to an increase in water pollution. Interestingly, most people agree that 70% of India's open water is not safe for people to drink. Merely a fraction of the daily influx of 40 million liters of untreated wastewater into rivers and other bodies of water undergoes adequate treatment. This article examines the current water pollution problem in India and emphasizes the critical state of its freshwater resources.

For agriculture, food production, and human existence, freshwater supplies are essential. Groundwater from wells and tube-wells is also one of these. Surface water comes from rivers, lakes, ponds, and streams. Nevertheless, despite their significance, these sources are becoming more contaminated and dangerous for consumption by humans as well as for the survival of the ecosystem. Poor sanitation and untreated sewage discharge are two factors that greatly contribute to the degradation of freshwater habitats and the consequent decline in biodiversity worldwide. Emerging pollutants, including cosmetics, pharmaceuticals, and

industrial chemicals, exacerbate the issue of inadequate water quality and possess the capacity to cause lasting impacts on ecosystems and human well-being.

In India, contaminated drinking water has serious negative health effects. Waterborne infections are increasing as a result of the elevated levels of biological contamination in the water. Every year, a substantial number of Indians suffer from waterborne diseases, resulting in significant economic burden and productivity losses due to missed workdays. Common causes of mortality, particularly among young individuals, include typhoid, viral hepatitis, cholera, and severe diarrheal diseases.

To address India's water pollution problem, Making more potable water as well as toilets available is of the utmost importance. With the use of cutting-edge physical, chemical, and biological techniques, Netsol Water offers a wide variety of treatment facilities for water, wastewater, sewage, and effluent. Water quality is still a major issue in the twenty-first century, therefore protecting this priceless resource is crucial for maintaining ecosystem services, human health, and economic development. Only through coordinated efforts and sustainable methods can India address its issues with water pollution and ensure a cleaner, healthier future for its people (What Is the Current Scenario of Water Pollution in India, n.d.).

In (The Supreme Court of India Civil Appellate Jurisdiction Civil Appeal No. 4795 Of 2021, n.d.) this appeal is being brought in line with Section 22 of the National Green Tribunal Act of 2010, in response to a verdict dated June 3, 2021. The ruling said that enterprises cannot operate without obtaining previous Environmental Clearance (EC). The main legal question in this appeal is whether a business with about 8,000 employees that was given permission to open and operate by the proper regulatory body and has now applied for retroactive environmental

clearance (EC) can be shut down while waiting for EC to be issued, even if it doesn't pollute or meet the required pollution standards.

In (The Supreme Court of India Civil Appellate Jurisdiction Civil Appeal No. 4795 Of 2021, n.d.) To prevent, regulate, and reduce pollution, the Central Government is authorized to take measures to safeguard and enhance the environment by the Environment (Protection) Act, 1986. These regulations were revised in response to the 1972 United Nations Conference on the Human Environment. The Act establishes rules for the upkeep of environmental standards, limits the places that specific types of businesses, activities, or operations can be located in, and requires the control of pollutants released into the environment from various sources.

The EP Act gives the Central Government a lot of power, such as coordinating the actions of State Governments, creating and implementing a national program to stop, control, and lessen environmental pollution, setting standards for the overall quality of the environment, dealing with dangerous substances, inspecting manufacturing facilities, and making rules and precautions to stop accidents that cause environmental pollution. The Central Government can make one or more authorities by putting an order in the Official Gazette. These authorities will carry out the government's duties and powers under this Act and do things related to the things listed in subsection (2). According to the EP Act, the Central Government can take any action that is fair and doable to safeguard the environment, make it better, and stop, manage, or lower pollution.

In (The Supreme Court Of India Civil Appellate Jurisdiction Civil Appeal No. 4795 Of 2021, n.d.) Permission from the Central Government and the steps outlined in the Environmental Impact Assessment Notification, which was released on January 27, 1994, are required before any activity or new project listed in Schedule

I to the notification can be expanded or updated in any part of India. The Environment (Protection) Rules, 1986, made this rule law. The Central Government gave the State Pollution Control Boards and Committees the power to make sure that no business, municipality, or other group breaks the rules under the EP Act.

Producing and distributing formaldehyde is one among the several business activities of the appellants. On or about March 31, 2014, the first appellant, M/s Pahwa Plastics Private Limited, sought permission to set up a CTE so that it could produce formaldehyde. The Haryana State Pollution Control Board (HSPCB) gave applicant no. 1, M/s Pahwa Plastics Private Limited, permission to open the Yamuna Nagar Unit.

Follow these steps to understand the rules of CTE :

1) The officer or official of the Board is allowed to check out the industry and see how it handles different processes and treatment facilities at the same time while buildings and machines are being built.

2) Prior to turning on the plant, the business must make the necessary plans for dealing with air pollution.

3) Sections 25 and 26 of the Water (Prevention and Control of Pollution) Act of 1974 and sections 21 and 22 of the Air (Prevention and Control of Pollution) Act of 1981, as changed up to the present day, say that the applicant must get permission before starting trial production.

4) The Water Act and the Air Act say that the Electricity Department can only make a temporary or permanent link after making sure that the Board agrees.

5) The location of the business or unit in question does not fall within any prohibited zones as per the laws, rules, regulations, orders, and policies

of the Central Pollution Control Board and the Haryana State Pollution Control Board. Industry should use water conservation methods to cut down on the amount of water they use in their processes. Before any groundwater-based projects can scientifically produce historical resources, they need to get permission from the Central Ground Water Authority. The toxic Waste Management Rules explain how to build non-leachate pits that are safe for storing toxic waste. Within 30 days of getting the consent to create, the unit must guarantee that it will follow all of the general and specific requirements set out in it.

With their Yamuna Nagar Unit, Appellant No. 1 was granted CTE by HSPCB due to their daily formaldehyde production capacity of 80 tons. From April 1, 2016, to March 31, 2026, the CTO will be in place for a longer period of time. In addition to the industry's pledge to adhere to the regulations, the candidate has ninety days to request fresh authorization before the current one expires.

The Central Government has let the public know that project proponents can now seek ex post facto EC if they began, either proceeded with or finished a project without EC as required by the EP Act/EP Rules or the Environmental Impact Notification issued under those provisions. The Appellants argued that obtaining prior Environmental Clearance (EC) was not required for Formaldehyde manufacturing units. The announcement outlines strategies for the augmentation of natural and community resources, the assessment of ecological harm, and data gathering and analysis for these goals. A legitimate legislative notification, the Notification of 2017 by the Central Government complies with Sections 3(1) and 3(2)(v) of the Climate Environmental Impact Assessment Announcement (EIA), 2006, making it effective and The law 5(3)(d) of the EP Regulations. In accordance with the General Clauses Act of 1897, Section 21, the authority has the power to

revise, alter, or cancel notifications, orders, regulations, and bylaws. The Puducherry Environment Protection Association filed a Writ Petition challenging the 14th March 2017 notification, however a High Court Division Bench decided not to intervene.

In order to assess cases of notification violations in relation to environmental clearance (EC), the Ministry of Forestry, the Environment, and Weather Change (MoEF &CC) issued a draft notice on March 23, 2020. Subsection (2) of the third section of the EP Act grants the authority to handle notice violation cases, and all notifications pertaining to EC must be given in accordance with these provisions.

The Government of Haryana's Department of Environment and Climate Change issued an order on November 10, 2020, allowing about fifteen formaldehyde manufacturing plants to open or operate in the State of Haryana. This was done without obtaining the required Prior Environmental Clearances. However, other units went to the government and explained how difficult it was for them after their consents were abruptly revoked. They begged for more time to get the necessary EC from the right agency as well. The government has granted the request of these units to continue operating for an additional six months without risking any legal action related to the offenses they committed, after giving it due consideration.

Cases involving breaches of the Environmental Impact Assessment (EIA) Notification 2006 were subject to SOP revisions by the MoEF & CC from 14 March 2017 through 13 September 2017, and again from 14 March 2018 through 13 April 2018, in response to court rulings. In order to address the gaps in the current laws and practices, the National Green Tribunal and the NGT have mandated the establishment of a suitable standard operating procedure (SoP) for the granting of environmental clearance (EC) in such cases. In response to the Hon'ble NGT's orders, a SOP has been established to deal with cases of disobedience. The Ministry

is handling a wide variety of unresolved matters without a solid mechanism that follows the Polluter Pays Principle and the Principle of Proportionality. The ideas of proportionality and polluters pay, as articulated in the decisions and observations of distinguished judges, inform the SOP. After a breach has occurred, the environmental clearance (EC) request is assessed using the principles of proportionality and polluters' liability, taking into consideration the request in light of its potential future impact.

In November 2020, a non-governmental organization (NGO) called Dastak filed a petition with the National Green Tribunal (NGT) requesting that units lacking EC be closed. In its decision on Dastak's application, the NGT issued the challenged ruling on June 3, 2021. The office memo was the subject of public interest litigation due to allegations that it was exceeding the respondent's authority under the Environment (Protection) Act, 1986, completely inappropriate, and contrary to numerous principles established by the Hon'ble Supreme Court. The administration has challenged an office memo dated 19.02.2021, through a writ petition. In accordance with the Coastal Regulation Zone (CRZ) Notification of 2011, this document laid out the steps to take when approving a project after the fact. In deciding whether the memo could have substituted it, the court took into account the government's capacity to execute the Standard Operating Procedure for dealing with violators who did not acquire prior environmental clearance as mandated by the Environment (Protection) Act, 1986 and the Environment Impact Assessment Notification 2006.

The Supreme Court's decision in Alembic Pharmaceuticals Ltd. upheld the NGT's authority to investigate the circular's legitimacy and vires since it was determined that the measure did not fall under Section 3. Ministry of Environment, Forest, and Climate Change office memorandum effectively nullifies the

effectiveness of the Environment (Protection) Act and the Environment Impact Assessment Notification. The admission of the writ petition results in the issuance of a temporary stay order. The court ruled that there could be a one-time exemption to the general rule that a judgment cannot be construed as a statute. A notification or order can be changed or relaxed as many times as needed if it can be edited, modified, or relaxed. Even if the attorney testified that the changes were protocol-compliant, the relevant authorities could nonetheless proceed with the work. (In The Supreme Court Of India Civil Appellate Jurisdiction Civil Appeal No. 4795 Of 2021, n.d.).

The current rules concerning garbage disposal and water usage are the target of this effort. Efficient use of the water supply is another important aspect that is addressed, along with the regulations that govern it. In order to determine which water resources may be used for sustainable development, a thorough investigation was required. Groundwater should not be overused in order to preserve social justice and recharge opportunities, according to India's National Water Policy (2002), even though the exact definition of these resources differs from one region to another.

1.2.Literature Review

Books

Water and sanitation are intertwined with all aspects of sustainable growth. Accessibility to these basic services is a human right. A well-managed water cycle is vital to both human society as well as the environment's preservation. A well-managed water cycle underlies development across the 2030 Agenda for Sustainable Goals, especially in terms of poverty, gender equity, nutrition, literacy, employment, sustainability, and biodiversity. Water is also important to global warming adaptation, acting as a vital link between the climate system, human civilization, and the nature(Agrawal et al., 2010). Without adequate water administration, there is

likely to be greater rivalry for water between industries and an amplification of water crises of numerous type, generating crises in a range of water-dependent enterprises (Sippi & Parmar, 2022) (Pattanayak et al., 2024).

Contamination of water sources is a major concern in India as it impacts a substantial amount of the country's groundwater supplies and 70% of its surface water. These pollutants might be biological, toxic, chemical, or inorganic. (Carmeli et al., 2012). During periods of exceptionally high water demand, the wastewater treatment plants sometimes halt operations. When half of India's population moves to cities by 2050, water poisoning will be a major issue for public health (A Gathering Crisis: The Need for Groundwater Regulation - The Hindu, n.d.).

Most Indians get their drinking water from bodies of water including rivers, lakes, ponds, and canals, especially those who live in urban areas and smaller towns. Pollution has reached the springs. Water treatment plants generate drinking water using a number of purifying techniques, including sedimentation, filtration, and chlorination, though not on a regular basis. As water and sewage pipes connect, the water becomes contaminated with sewage. Untreated wastewater flows into rivers, ponds, lakes, and streams. Riverine water pollution to the point of toxicity is a major concern in India.

There are high concentrations of chloride, nitrate, sulphate, and cation in the alkaline groundwater of NCT, which has a pH of 7.1 to 9.2. Research into the groundwater by the National Environmental Engineering and Research Institute, Nagpur (NEERI) found elevated concentrations of fluoride and nitrate on behalf of the Ministry of Environment and Forests (MoEF) in New Delhi. Manganese and iron are two of the many metals found in high concentrations (Biswas & Gangwar, 2020).

The groundwater at NCT is highly alkaline (pH 7.1 to 9.2) and contains significant amounts of chloride, nitrate, sulphate, and cation (D. Sharma & Kansal, 2011). Research into the groundwater by the National Environmental Engineering and Research Institute, Nagpur (NEERI) found elevated concentrations of fluoride and nitrate on behalf of the Ministry of Environment and Forests (MoEF) in New Delhi. Manganese and iron are two of the many metals found in high concentrations (Biswas & Gangwar, 2020) (Bhuyan & Deka, 2024).

The dispersion of polluted groundwater is quite variable, and it is unusual to have data on the concentration of pollutants for every conceivable spot in a given region. It is not always feasible to evaluate pollutant concentrations at each site due to the time and money needed for data collecting. Therefore, estimating values at other locations using selectively collected data is one potential approach. Predicting the concentration of contaminants in unmeasured areas is possible in this situation using geostatistical approaches. Geostatistics relies on the fundamental premise that, up to a particular lag distance, there is some spatial continuity of Earth's attributes (Adhikary et al., 2010).

The Yamuna River is vital to the livelihood of many Indians who reside at or near its banks. The catchment area of this river is enormous, extending across multiple provinces in and around Delhi; it serves various agricultural, industrial, and residential needs. Considering how quickly the population is increasing. The industrialization and human interference in this river over the last several decades has made it one of the most polluted rivers in India. The present deplorable condition of this river is mostly due to the pollutants that have been washed into it from marshes and industrial waste streams. The dirty water is dumped into the Yamuna River by 22 underground sewers and drains in the Delhi area. This river regularly receives massive amounts of pesticides from fields, hazardous chemicals from

industries, and landfills. In addition, the river has become a dump for toxic runoff from nearby farms, including manure from cattle (Cronin et al., 2014).

Specific heavy metals has the ability to stimulate several enzymes, which can be fatal to humans even in minute quantities. Due to the utilization of this river's water for agricultural reasons by numerous farms in the Delhi region, the presence of heavy metals in the water ultimately contaminates food supplies, leading to significant health risks and a range of ailments in both humans and animals. Moreover, the earth's crust contains a significant amount of heavy metals that can be introduced into water sources by natural mechanisms, such as intense rainfall. This rainfall can extract heavy metals from the soil and transport them into smaller streams, eventually flowing into the Yamuna River. Currently, the Yamuna River is experiencing the lowest water level ever recorded. This is due to the continuous injection of large quantities of pollutants into the river, as well as the depletion of alternate water sources in the area caused by environmental mismanagement (Cullet, 2007b).

Water laws and regulations have the following objectives: ensuring universal access to safe drinking water, promoting fair allocation of water resources across different population groups, protecting the fundamental human right to water, and ensuring that all water users have access to water of sufficient quality. Water law in India is currently in development, but it remains largely influenced by colonial legislation and has not yet undergone any substantial revisions or modifications. Current water laws and regulations are failing to adequately handle the specific water needs of different sectors. (Remedies Available Under Indian Legal Framework Vis-à-Vis Environmental Protection: An Overview - Clean Air / Pollution - India, n.d.)

Journals/ Articles

Water legislation in India

The control, ownership, and use of water are the primary concerns of water law. It also addresses water's transboundary and interstate dimensions, the imbalance of power among federal, state, and municipal governments, as well as public and private entities, and the problem of water quality and the damage it does to ecosystems and human health. Community water ownership, usage, and management are regulated by water law. There are separate sovereign governments that control water legislation (Panickar, 2007).

In terms of environmental and water law, India is severely underdeveloped. (Anderson, n.d.). There are a lot of different rules, principles, and statutes that have been put in place over many decades that make up India's current water legal system (IUCN Environmental Law Programme Water as a Human Right? n.d.). Colonial statutes, constitutional provisions, judicial decisions, legislative acts, and established norms and precedents are the main sources of water law. Across international borders, the following agreements are part of India's water law:

1) Farakka Treaty (1996) with Bangladesh over Ganga river,
2) Indo Nepal agreement over Mahakali River.
3) Indus Water Treaty (1960) between India and Pakistan.

The human rights to water

All life depends on water, according to attendees at the 2000 World Water Forum in The Hague. However, it did bring to light the tragic truth that a lot of people do not have enough access to safe water to meet their fundamental needs. (Comparative International Water Research: Urban and Rural Water Conservation Research in India and the United States, n.d.) (Anderson, n.d.). Various issues, like as pollution,

unsustainable utilization, alterations in land use, climate change, and other influences, provide a threat to the accessibility of water resources. Water security is a shared objective in the 21st century. The following are some of the stated objectives: fostering long-term growth and stability in politics; preserving and improving coastline, clean water, and interrelated ecosystems; ensuring that everyone can affordably access sufficient, safe water for daily needs; and safeguarding vulnerable communities from the dangers presented by water-related disasters (World Water Forum, 2000).

The historical development of water law in India prior to British rule

Water holds significant religious significance in various faiths. In ancient India, water management was carried out by small communities that were organized according to caste, social hierarchy, and division of labor. India underwent a significant transformation at the departure of the British (Raman Bai et al., 2009).

I. In the Mahabharata, the great being and natures are the same thing. So that marine, plant, and animal life could be protected more easily, rules and guidelines were made.

II. Manus's Code of laws says that it is the king's job to protect public water works. Makes it clear that people who pollute, steal, or change the course of water bodies will be punished.

III. Arthashastra, a work by Kautilya, talks a lot about protecting natural resources and the earth.

History of evolution of water law colonial state emerges in India during British rule

In the year 1858, the colonial state emerges. In addition to imposing taxes on land, it seized control of all-natural resources. According to (Jha and Sinha 2008),

The major goal was to make as much money as possible by selling land, forests, and water. Because of this, irrigation works like ditches, barrages, and dams were built. The state controlled the water supplies, and their job was to help the British achieve their goals. The main objectives of the colonial government were to exercise jurisdiction over water and other natural resources, exploit India's natural wealth for economic gain, and use India's resources for the benefit of the British Empire. A significant number of individuals profited considerably from the public irrigation projects during the era of the East India Company. The main goal of colonial design was to make as much money as possible, so water management methods were an important part of the design. Between 1670 and 1950, European countries had a huge effect on natural resources around the world through usage, political power, and damage to the environment. This took place in the present tense. This process led to the loss of traditions that were good for the environment and had governed the connection between people and nature in the past. Scientific resource management was the name of this job. For one thing, the British ruled over the Indians. For another, nature was tamed so that people could get as much work done as possible.

Laws made on water during colonial period

Below is a compilation of the legislation that was implemented concerning water during the colonial era:

I. Act of 1873 Concerning the Northern India Canal and Drainage

II. Act of 1905 Concerning the Punjab Minor Canals

III. The Bombay Irrigation Act, approved in 1879

IV. Act of 1920 Concerning the Minor Canals of Uttar Pradesh

Even though these statutes didn't directly provide the state ownership of surface water resources, they did recognize the state's authority to manage the waters of all rivers for public use.

For these and other reasons, the state could regulate surface waters such as rivers, streams, water systems, and lakes. It was within the British government's purview to acquire and distribute water. The colonial water law of India had a profound impact on the pre-colonial water resource legal system and local customs. Water management in the past was the subject. This marked the beginning of the state's monopoly on water resources. A paper titled "The Status of Heavy Metal Concentration in Water and Sediment of the Ganga River at Selected Sites in the Middle Ganga Plain" was published not long ago. In the course of their duties, canal irrigation officials could access any area, clear any blockages, and close any channel they come across. No government is currently looking into the matter of groundwater ownership.

History of evolution of water law in India after Independence

Two prominent features have been observed regarding the advancement of water resources in postcolonial India (Tortajada et al., 2018) (M. Singh et al., 2002).

I. Several significant hydroelectric projects and dams, including as Tehri Dam, Hirakund, Bhakra Nangal, and Damodar Valley, have been constructed to guarantee the accessibility of energy, water, and food. The ownership of that property was held by the state.

II. Following the introduction of new technology, the consumption of groundwater experienced a significant increase in the subsequent decades. The state was responsible for the distribution, control, and delivery of water in cities. The public sector retained control over water resource management,

and the constitution explicitly assigned the responsibility to the states for providing urban water supply.

Cases

The case of Municipal Council, Ratlam against Vardhichand (AIR, 1980 SC, 1622)

The court determined that the municipality is accountable for upholding the water supply and delivering sanitation services in the area. Revise Article 21 of the Constitution to specifically affirm that every person has the right to obtain clean water and sanitary facilities.

MC Mehta Vs Kamal Nath (1997)

Based on Public Trust Doctrine (Panickar, 2007) even though the government can handle and keep an eye on resource water. It does not own the materials that are given. The following places can give you groundwater rights and surface water rights.

I. The Indian Easement Act of 1882 transferred the ownership of groundwater from individuals to the owners of the land. Consequently, the landowner possesses the legal right to extract subterranean water from their property. The owner will not bear legal liability if the water is diverted or intercepted. The Indian Easement Act of 1882 transferred the ownership of groundwater from individuals to the owners of the land. Consequently, the landowner possesses the legal right to extract subterranean water situated beneath their property. The owner will not bear legal liability if the water is misdirected or intercepted (IUCN Environmental Law Programme Water as a Human Right, n.d.).

II. The Forest Act of 1894 granted the state the authority to acquire both land and water resources. Both individuals and the government now possess the authority to grant individuals access to water as a result of these two legislations.

Case of Delhi Jal Board v. State of Haryana & Others (2002)

When it comes to resolving disputes over water between Indian states, the decision of Delhi Jal Board v. state of Haryana & others (2002) is a major factor. This report does a thorough job of breaking out the case's essential components and their implications. Problems arose because of a disagreement over the distribution of Yamuna River water between the Delhi Jal Board (DJB) and the Indian state of Haryana... Delhi Jal Board (DJB) officials have claimed that water shortages in the Delhi region are due to Haryana's insufficient water flow. A case was filed at India's highest court.

Recognizing water's importance as a vital resource, the Supreme Court stressed the need to ensure equitable distribution for the benefit of the people in its decision. The court recognized that states must work together to resolve disputes over water. A specific amount of water must be released from Haryana to Delhi under the court's direction. Both regions' water needs can be adequately met by ensuring that the Yamuna River flows at a sufficient rate, as highlighted by this verdict. In addition, the court ordered the federal government to form a monitoring committee to make sure everything is doing according to plan.

It is vital that governments engage in communication, encourage cooperation, and apply negotiation methods to resolve interstate water problems, as shown by the ruling. Because of this incident, the federal government is now more involved in facilitating and overseeing water allocation agreements between states. Maintaining rivers' ecological balance and protecting their natural hydrological patterns are both

emphasized by the case. It is generally agreed upon that taking environmental issues and maintaining ecological integrity into account are necessary for the sustainable use of water resources. Impacting water management policies in India, the verdict was substantial. In order to adequately and fairly address the growing needs for water, the statement stresses the significance of strong water governance, infrastructure development, and cooperation between states.

Case of Delhi Jal Board v. National Thermal Power Corporation Ltd (NTPC) (2005)

The National Thermal Power Corporation Ltd (NTPC) was the target of a petition lodged by the Delhi Jal Board (DJB) in 2005's case of Justice Delhi v. NTPC. As a result of the NTPC thermal power plant releasing hot water and contaminants into the Yamuna River, the DJB voiced their disapproval. The argument centered around reducing pollution in rivers and protecting the environment. This report does a thorough job of breaking out the case's essential components and their implications.

Near Delhi's Yamuna River, there is a thermal power plant run by the National Thermal Power Corporation (NTPC). It was discovered that the facility's operations release warm water and contaminants into the river. There would be negative environmental impacts and perhaps harmful effects on the river ecosystem, according to the Delhi Jal Board (DJB), which is in charge of the region's water supply and management.

The court recognized that the Yamuna River is an important water resource for Delhi and that conserving it and reducing pollution are important. The significance of the NTPC taking the necessary steps to reduce the discharge of hot water and contaminants into the river was highlighted by the ruling. To prevent the contamination of the Yamuna River, the court ordered the NTPC to treat its wastewater before discharging it into the river. This would be accomplished by the

development of treatment plants and the use of appropriate technology. Our goal was to ensure that the released water meets all the required standards and won't harm the environment or people.

This case highlighted the need for environmental protection measures and the duty of businesses to lessen their impact on water bodies. The NTPC was charged with the duty of adopting effective wastewater treatment strategies to forestall the contamination of the Yamuna River. The court's decision underscores the need for a legislative framework to restrict and monitor industrial wastewater discharge into rivers. In light of the precedent set by this case, businesses are now legally liable for the harm they cause to the environment and must use appropriate pollution control measures.

Among academics, this case has added a lot of weight to the topic of river conservation in India. To recognize rivers for what they are—crucial water reservoirs and ecosystems—the declaration emphasized the need of keeping rivers clean and maintaining their biological balance. Polluted water sources posed a threat to public health, which this case explored in a roundabout way. By deciding to cleanse wastewater before releasing it, the authorities hoped to protect the health and welfare of people who depend on the Yamuna River as a source of water.

Delhi Jal Board v. Municipal Corporation of Delhi & Others (2006)

It was the Delhi Jal Board (DJB) that petitioned the Municipal Corporation of Delhi (MCD) and others in the 2006 case of Delhi Jal Board v. Municipal Corporation of Delhi & Others. The appeal was about the illegal colonies in Delhi that were set up with water and sewage connections. Important infrastructure and services provided to these colonies were at the heart of the lawsuit. This report does a thorough job of breaking out the case's essential components and their implications.

This situation arose in an illegal community in Delhi because of the city's poor water and sewage infrastructure. Residents of these areas have a lower standard of life and inadequate sanitation due to the DJB's contention that the MCD and other relevant authorities failed to cooperate in building water and sewage pipelines. The court's verdict recognized clean water and sanitation as fundamental human rights. The statement further asserts that it is the responsibility of legitimate governments to guarantee access to vital infrastructure in all regions, including unincorporated areas.

The court has ordered the MCD and other affected organizations to work together with the DJB to immediately begin laying water and sewage lines throughout the colonies. Coordination and collaboration among different authorities is crucial for infrastructure projects to be executed effectively and on time, as stressed in the text.

Providing basic infrastructure, including water and sewage systems, to informal communities is crucial, as highlighted by the case. The legislation made it clear that relevant institutions, including municipal corporations, were obligated to ensure that citizens had access to clean water and adequate sanitation facilities. It was clear from the decision that different branches of government needed to work together and coordinate their efforts. In order to overcome administrative hurdles and finish infrastructure projects on time, it is commonly recognized that joint efforts are necessary.

Access to safe drinking water and sanitation was reaffirmed as a basic human right in the case. The statement emphasizes that the government must protect and defend fundamental rights, irrespective of how residential areas are legally classified. The objective of the ruling was to enhance the living circumstances and overall quality of life for the inhabitants of illegal settlements. Our objective was to address the sanitary requirements and construct fundamental infrastructure in these

regions by supervising the building of water and sewage pipelines. This case study highlighted the challenges of informal settlements as an area for urban planning and development. The statement emphasized the need for a thorough plan to address infrastructure deficiencies and efficiently control urbanization.

Delhi Jal Board v. Delhi Development Authority (2008)

In 2008, the Delhi Jal Board (DJB) petitioned the Delhi Development Authority (DDA) over the construction of water and sewage lines in unapproved colonies in Delhi. This case was known as Delhi Jal Board v. Delhi Development Authority. The lawsuit centered on the cooperation between the DJB and the DDA, as well as the supply of essential infrastructure and services within these colonies. What follows is an analysis that delves deeply into the case's essential components and consequences. The illegal communities in Delhi didn't have enough water and sewage facilities, which led to the legal dispute. The DDA is responsible for urban development and planning; the DJB said that it was uncooperative when it came to helping to establish water and sewage lines. This led to a decline in the quality of life for the people living in such areas and inadequate sanitation facilities.

The importance of providing a decent and safe living environment for the occupants of illegal colonies was recognized by the court as crucial. The court's decision highlighted the DDA's responsibility to work with the DJB and other relevant parties to expedite the construction of water and sewage pipelines. To help with the provision of essential infrastructure in unapproved colonies, the court ordered the Delhi Development Authority (DDA) to work with the Delhi Jal Board (DJB) and take the necessary steps. It was stressed in the statement that in order to complete infrastructure projects on time, it is crucial to coordinate efforts, plan thoroughly, and allocate resources correctly.

Delhi Jal Board v. State of Haryana & Others (2016)

Regarding the distribution of water from the Munak Canal—a water supply for Delhi—the Delhi Jal Board (DJB) petitioned the state of Haryana in the 2016 case of Delhi Jal Board v. State of Haryana & Others. The two states of Delhi and Haryana were involved in a water conflict with each other. In what follows, we will examine this legal case in detail, focusing on the main points and their implications.

Conflicting views on how to divide up Munak Canal water supplies between the Delhi Jal Board (DJB) and Haryana state gave rise to the lawsuit. There was a water shortage in Delhi and it was affecting people's needs for water, according to the DJB, who blamed Haryana's activities for the problem. In light of the gravity of the matter, the court maintained Delhi and Haryana's rights to a proportional share of the available water. An efficient resolution of the dispute and assurance of adequate water resources to meet the needs of both regions were the goals of the verdict.

In a recent ruling, the court ordered Haryana to meet a certain deadline by releasing a certain amount of water to Delhi using a specific formula. Additionally, the Haryana government was to receive payment for the canal's construction costs from the DJB.

The verdict highlighted the need of water management measures that have been proven beneficial. Using water resources in a sustainable way and putting in place strong systems to regulate and oversee water distribution across states were also emphasized in the statement. This case was financially significant since it forced the DJB to foot the bill for building the canal. As a result, it became clear that water agencies needed to shoulder the financial burden associated with building water infrastructure.

Laws

In July 2010, the United Nations General Assembly passed a resolution that confirmed the status of access to safe and clean drinking water and sanitation as an essential human right (Cronin et al., 2014) (Cullet, 2007b).

In addition, India has officially approved numerous international accords and treaties that specifically focus on the basic entitlement to water, utilizing various methods. There are various laws relating to water.

Constitution of India

I. Article 14 2(h) Among the most basic human rights guaranteed by the 1981 Declaration on the Elimination of All Forms of Injustice against Women is the right of every woman to adequate shelter, cleanness, energy, water, delivery, and connectivity. Providing a synopsis of the environmental protection measures accessible within the Indian legal framework, with an emphasis on pollution and clean air in India (Clean Air / Pollution - India, n.d.).

II. Article 24 (2), According to the Right to Equality clause in the Constitution, no citizen shall be discriminated against, held legally liable for, or otherwise restricted from using public domain resources (such as wells, tanks, bathing ghats, or highways) that are maintained with state funding for the benefit of the public. Public domain resources, such as wells, tanks, bathing ghats, or roads, are to be accessible to all citizens without regard to their race or religion, as stated in Article 15 of the Constitution, which guarantees the Right to Equality.

III. Article 39 (b), According to Article 39 (b) of the Directive Principles of State Policy, the community's material resources are distributed in a manner that maximizes their use for the common welfare.

IV. Article 51 A (g) Acknowledges the intrinsic worth of the environment and the entitlement of its inhabitants to safeguard and improve it. According to General Comment No. 15, 2002, issued by the United Nations Committee of Economic, Social, and Cultural Rights, one of the most essential human rights is the provision of safe drinking water for household use, which should be readily available, easily accessible, in good shape, and affordable. India's national constitution and regulations do not explicitly recognize the right to water, despite its involvement in several declarations and accords. Only Articles 14, 15(2), 17, and 21 have acknowledged, supported, and reaffirmed the judgment and interpretation.

The concept that access to water is an essential entitlement is not adequately and persuasively expressed in significant policies such as the National Water Policy 2012 or the "National Rural Drinking Water Program (NRDWP)". Critics contend that the government is intentionally evading accountability by transferring obligations, in an effort to circumvent legal repercussions for its inability to ensure widespread availability of uncontaminated and secure water. Advocates and members of civil society have been advocating for the inclusion of this right in the legal framework.

I. Water is encompassed within Entry 17 of List II (State List) in the Indian Constitution. This article is governed by the provisions of List I, specifically Union List article 56.

II. Entry 17 List II-Water, irrigation, canals, drainage, embankments, water scarcity, and water are all included in Entry 56 of List I. All of these rules have to do with water.

Entry 56 List I- Administration of federally-funded rivers and river valleys within the bounds of what Parliament has declared to be in the public interest by legislation on Progress along rivers and river valleys under federal jurisdiction. With the exception of situations in which an issue of public interest emerges, water is essentially a state concern, and the center is only allowed to intervene little in its policies that pertain to water.

I. National Water Policies

II. National Water Policy 1987

The growing number of water-related issues necessitated the establishment of the Ministry of Water Resources in 1985 (Ocampo-Duque et al., 2006) (Shiklomanov, 2000).

Key Features:

I. Since water is an important part of our nation's resource, national perspectives should control its development.

II. Prioritizing water distribution should normally be done in the following order: drinking water, irrigation, hydropower, industrial uses, and so on.

III. There are a lot of nuanced concerns with social justice and equity around water distribution.

IV. To cover fixed costs, a share of operating and maintenance expenses, and to promote economical water use, water rates must be sufficient.

Critics:

I. There was a lack of clarity on the national perspectives it aimed to represent and whether or not the interests of excluded groups had been appropriately addressed.

II. None of the policy documents referred to private sector involvement.

National Water Policy 2002

The objective of the National Water Policy is to evaluate the existing conditions, establish the foundation for a framework of legislation and organizations, and develop an actionable strategy with a cohesive vision (R. Singh & Bhatia, 2016) (D. Sharma & Kansal, 2011)

Key Features:

I. The private sector should be actively sought after and encouraged to participate in water resource planning, development, and management. This could be useful for introducing new ideas, making money, establishing corporate management, improving service efficiency, and holding users accountable, among other things.

II. Prioritized corporate management over community management. When discussing the need of considering community interests in water resource development, the word "community" was mentioned just once.

III. Using a participatory approach to water resource planning, development, and management is the best way to ensure that water is managed for their many intended purposes.

IV. Maintaining the current infrastructure's physical and financial sustainability must be a top priority. It is only fair that water rates be changed to cover part of the expense of major projects.

Critics:

I. A combination of centralized decision-making, expert-based guidance, and private sector involvement characterized the enacted policies.

II. The purpose of the NWP was not to complete water infrastructure improvement projects or to ensure that everyone could obtain water.

III. could not stand up for what was important or show any care for environmental or social justice issues.

National Water Policy of 2012

States like Chhattisgarh, Madhya Pradesh, Uttar Pradesh, and Kerala voiced their concerns about the cost of water, the entity responsible for regulating it, and the establishment of unified water legislation before the National Water Resource Development Committee granted its license in December 2012 (A. K. Rai et al., n.d.).

Key Features:

I. A complete plan that understands how important water is, how limited it is, and how it supports environments and life.

II. This report suggests amendments to the current groundwater statute.

III. It recognizes that everyone has the basic right to water, but it doesn't include the right to get enough potable water for health and comfort.

IV. With this method, panchayats and municipalities are involved in water planning alongside community management and engagement.

V. For better resource usage and financial sustainability of water recycling, this project prioritizes required water budgeting and audits.

VI. It is recommended that authorities be set up to regulate water pricing and management.

VII. Desalination is a technological potential that could be implemented.

Critics:

I. This makes it such that no one from the business world can get involved.

II. Problems arise when trying to define who gets what, how much power each agency has, what the Water Disputes Tribunal does, and how agencies currently overlap.

Legislative Frameworks

Surface water legislation

Several governments have passed laws to protect the availability and quality of groundwater by limiting certain activities and regulating groundwater development. This trend indicates that concern about groundwater contamination is on the rise, and that users of groundwater are becoming more competitive and violent with one another. The original intent of this statute was to handle water use and related issues as they emerged, and its implementation was piecemeal. Recognizing that pollution of groundwater sources can potentially affect surface water sources has led to a convergence of water resource legislation (Chaudhary & Walker, 2019).

I. Much of the irrigation law is at the state level because water is still primarily a state issue.

II. Worries centered on water pollution and low water quality.

III. To fix the issue of too much pollution, the Water Cess (Prevention and Control of Pollution) Act of 1977 and the Environmental Protection Act of 1986 worked together to change the Water Prevention and Control of Pollution Act of 1974 (which was last updated in 1988).State pollution control boards (SPCBs) are in charge of making sure that these laws and rules about protecting water safety and stopping pollution are followed. According to Section 17 (1)(a) of the Water Act, it is the job of State Pollution Control Boards to stop, control, and lessen pollution in streams and wells in their own states. In addition, it is their job to make sure that these plans are carried out properly.

IV. The first serious effort to restrict pollution, the Water Pollution Act of 1974, was the product of federal and state talks that lasted more than ten years. For the establishment of a uniform code to be possible, the first constitutionally required step was for the state to approve a resolution authorizing the federal government to do so. This was essential because the state has control over water.

V. A wide variety of physical, chemical, and biological pollutants that endanger not just humans but also flora and fauna were all encompassed by the pollution statute. The amendment made in 1988 strengthened the execution measures of the statute. When a company fails to pay its bills or stops receiving water, the board can now shut down the facility or cut off its water supply by an administrative order. Strict and harsh punishments are myriad. As far as laws go, I thought the act was fantastic.

VI. In order to ensure that all government institutions and companies bear a proportional cost for each unit of water they utilize, the Central Government enacted the Water Cess Act in 1977. Furthermore, the

legislation permitted a reimbursement of 70% for pollution treatment facilities that are fully functional. In 1991, the objective was to promote resource conservation by decreasing reimbursement to 25%. Implementing the cess required a smaller financial investment compared to establishing pollution control plants.

VII. The Environmental Protection Act of 1986, commonly referred to as the "Umbrella Act," was passed by the National Parliament. By enacting this legislation, the federal government will possess the authority to undertake any necessary measures to safeguard and enhance the environment, as well as to restrain, oversee, and eradicate pollution. According to the Act, the Ministry of Environment and Forests (MOEF) of the Indian Government is the supreme authority in the country for addressing environmental issues. This legislation surpasses prior statutes in its comprehensive scope, encompassing land, air, and water, as well as their interdependencies and the interconnectedness of all living organisms. The National Environment Policy 2006 (NEP 2006) expands on previous efforts. The development of water laws and regulations has made significant progress in achieving the objective of minimizing pollution. However, due to the complexity of the key stakeholders involved, implementing these measures may be challenging despite their apparent effectiveness in theory.

Groundwater legislation

I. At the present rate of extraction, around 60% of India's aquifers would reach critical levels, threatening 80% of the country's potable water supply within the next 20 years. In doing so, it compromises the "right to

water" of future generations by making it more difficult to use water resources consistently, cleanly, and without pollution.

II. Water scarcity became more of an issue as a result of rising demand brought on by both urbanization and population growth. More water was pumped out than ever before since the public infrastructure for irrigation and drinking water was underfunded.

III. States like Gujarat, Uttar Pradesh, Punjab, and Haryana see a dramatic spike in groundwater use as a consequence of the distribution of cheap energy to farmers. Given the political sensitivity of the issue, authorities often turn a blind eye to over pumping. But half of the water utilized for irrigation is due to excessive pumping.

IV. To regulate and monitor groundwater ownership and development, the federal government proposed a model bill in 1970. Knowing how crucial it is to utilize freshwater, we went ahead and accomplished this. There have been three revisions to this measure: in 1992, 1996, and 2005. The "Central Ground Water Authority (CGWA)" was founded by the Environmental Protection Act of 1986 to supervise the progress and upkeep of groundwater resources.

V. Andhra Pradesh, Tamil Nadu, Kerala, Goa, West Bengal, the Himachal Pradesh state, the state of Bihar Chandigarh, Dadra & Nagar Haveli, and Lakshwadeep were among the many states that passed the Ground Water (Control and Regulation) Act and set up groundwater authorities. All users of groundwater, with the exception of those who draw water from wells or pumps by hand, are required by law to get a permit from the appropriate government agency before they can do so. Based on the

intended use, water quantity, and quality, the state decided whether to grant approval.

VI. Some states—The states of Arunachal Pradesh, Nagaland, the state of Punjab, Sikkim, the Manipur, the and Tripura—rejected the proposal. The legislative assembly of Maharashtra and Uttar Pradesh is now waiting to enact their groundwater bills.

VII. Irrigation uses groundwater for forty to fifty percent of its overall water supply. An official government survey found that Delhi, Haryana, Gurugram, Rajasthan, Daman, and Puducherry had all used groundwater.

VIII. Groundwater usage is given special attention in the 2002 National Water Policy. Neither rural nor urban areas are exempt from the necessary regulatory framework for these locations. The implementation of groundwater statutes by a number of states has not, in all likelihood, resolved the concerns raised. Reason being, water rights and land rights are treated as one entity under the Indian Easement Act of 1882. While this law was in force, electric pumps were the exclusive means of extracting groundwater; but, since then, other methods have been developed.

IX. Among the many responsibilities that come under this umbrella include monitoring the groundwater for indicators of contamination, vetting projects that use groundwater as a source, educating the public, and registering enterprises that drill wells and sell mineral water.

Model groundwater bill, 2011

I. Although the groundwater situation is quickly deteriorating in some states, there is new legislation that states can follow as an example: the

groundwater law model created by the Ministry of Water Resources, River Development, and Ganga Rejuvenation.

II. The existing legislative framework is insufficient to handle the bulk of states' concerns on groundwater usage and conservation.

III. Uncertainty about the future of water supplies and widespread public distrust

IV. Limiting the aquifer's susceptibility to unjustified groundwater exploitation is a fundamental concept of the Model Bill. Protecting the resource ensures that it will be available to meet people's fundamental requirements for the foreseeable future.

V. A public trust status for groundwater is recognized in the model legislation.

VI. Groundwater protection is one area where panchayats are given a chance to have a say.

VII. Any new project that will affect the management of water resources must first get environmental approval.

VIII. The challenge of rehabilitating locals in the vicinity of the project site, meanwhile, remains unresolved. As a result, the National Resettlement and Rehabilitation Policy was developed. Compensation pertaining to the possession of property

IX. Because Madhya Pradesh is so land-rich, alternatives to land-to-land compensation were considered in the Narmada water Disputes, but ultimately, financial compensation was approved.

National water framework law-features

To preserve, oversee, safeguard, and exert control over water use, this bill was introduced. The idea cannot be passed into law without the approval of the Indian government, since water is considered a state subject according to the Indian Constitution.

I. Right to Water- Everyone has the right to a basic supply of water for personal hygiene and health maintenance. Whether water is privatized or corporatized, the state's obligation to guarantee access to its citizens will remain constant.

II. Water Pricing- Setting water rates according to volumetric usage and regularly reviewing them is necessary to follow the principles of equity, efficiency, and economics. An incentive scheme based on tariffs will be put in place to promote water reuse and recycling. Perhaps the government will supply some free water, but only in small quantities. Over that threshold, a levy would be instituted to curb water wastage.

III. Efficient and coordinated administration of river basins- Basins of interstate rivers must be established, maintained, and controlled by the government per the relevant statutes.

IV. Ground Water- Protecting, preserving, and managing groundwater will be possible after the relevant laws are put into effect.

Issues related to water laws

The availability of water is seen as an issue pertaining to the states on the State List. The responsibility for developing water policy, however, lies with the federal government, even though it lacks a constitutional mandate in this area (water is a state affair). As a result of various laws being applied to different users and authorities, the water law has grown fragmented and convoluted. As a result, water

sector laws have become more difficult to implement and enforce. Regulations that were in existence prior to independence still form the basis of numerous water rules. There is a direct correlation between the 1873 Northern India Canal and Drainage Act and the state irrigation legislation.

The precedent for groundwater rights is the Indian Easement Act of 1882, which states that landowners are the only ones allowed access to water. They are no longer relevant in modern India. The ELRS Report 2012 also notes that encouraging economic development has been the primary objective of water usage management. Unaccounted for are other considerations, like as consumption and home usage.

Water quality is not addressed by the Water Prevention and Pollution Control Act of 1974, which is one of its flaws. As of right now, the water is not up to par. There is no effort to preserve the water's quality at the site of consumption; rather, the focus is on the water's origin, which may be a river or stream in motion. As an added bonus, it gives no credence to arguments that lack a supporting source. The problem of groundwater contamination is not solved by it. Also, the issue of cleaning up contaminated water sources is not dealt with in this act, and there are no penalties, monetary or otherwise, for violators of its provisions. A head of an institution is exempt from punishment if he can prove that the violation did not occur under his watch.

1.3.Research Gaps

India's reliance on water is crucial due to its extensive agricultural sector, the water requirements of its population exceeding one billion, and the recent patterns of economic growth. This thesis examines the policy framework governing the utilization of water resources in India. It also highlights the intricacy in the framework of laws caused by differences in

their execution at various levels, such as international, national, state, municipal, and panchayat levels.

The water legislation in India remains fragmented, contradictory, and insufficient to effectively address the current intricate water scenario, marked by shortage and depletion of this renewable yet finite resource, as well as rising demand. A fundamental change in approach is required. The text explores several State Policies on Water in India, including water usage and the numerous sources of water.

It displays the ratio of water demand and supply among different countries worldwide, including India. If no water reforms are implemented, there would be a significant gap in water availability by 2030, affecting several aspects such as social, economic, political, scientific, and legal domains.

The allocation of surface water among riparian states is regulated through multiple Memorandums of Understanding (MoUs) signed by these governments, which are based on their respective entitlements. The discussion focuses on the economic implications of water, the management of waste disposal, the decline in groundwater levels, and the presence of polluted ponds and lakes in the vicinity. The document emphasizes the importance of regulations to ensure the effective utilization of water resources in Delhi NCT and the enforcement of these regulations.

1.4.Hypothesis

1) The legislative framework governing the utilization of water resources in India is insufficient.

2) The legislative framework for water conservation and Pollution in India is inadequate.

These hypotheses suggest that reforms and enhancements to the legal framework are needed to address the challenges related to underground water resource utilization and water conservation in India.

1.5. Research Questions

I. What are the key legal frameworks for regulating underground water use in Delhi?

II. How effective are the existing legal frameworks and policies on water Conservation in India?

III. What are the gaps in the current laws governing waste disposal in water and how it impacts its implementation?

IV. What are the main impediments to the effective implementation of water conservation laws in India, and how can these challenges be addressed to improve water management?

1.6.Research Objectives

I. To study and evaluate the law regulating underground water use, in Delhi NCR

II. To study and evaluate the law on water conservation in India

III. To identify the gap in laws on waste disposal in water and its effective use and its implementation

IV. To study the impediments in proper implementation of Water Conservation Laws in India

1.7. Scope of the Study

The Scope of the Study would be help us to know the gap in the regulations of disposal of water and its conservation viz a viz the implementation of the regulations. This will help us to know how to reduce the gap and the proper way to implement the regulations. We would be able to know the comparison between water regulations among few states of India and the best practices to be adopted to conserve water. We would also be able to compare the water regulations of India with some foreign countries and adopt the best means to adopt towards eater conservation.

The research report includes an executive summary, methodology, findings, conclusions, and recommendations, all of which explicitly acknowledge the data sources used and the contextual information supplied throughout the study.

1.8.Significance

Significance of the study is to identify the gaps in existing legal framework and its implementation for water conservation and disposal of waste in water. It will help us in identifying best practices followed in foreign countries versus the best practice we could adopt in India. Existing laws may lack comprehensive coverage of various aspects of water conservation and waste disposal. There might be ambiguities, outdated provisions, or insufficient regulations to address emerging challenges. Even where laws exist, their implementation may be weak due to lack of enforcement mechanisms, inadequate resources, or bureaucratic inefficiencies. Water management laws and policies might be fragmented across different states and sectors, leading to inconsistencies and inefficiencies. There may be a lack of public awareness and engagement in water conservation efforts, which hinders the effectiveness of legal measures. Identifying these gaps will highlight

the specific areas where legislative reforms and improved implementation strategies are needed. This will provide a clear roadmap for policymakers to strengthen the legal framework and its enforcement.

Many countries adopt an integrated approach that considers the entire water cycle and involves all stakeholders in water management decisions. By studying these best practices, the research can offer concrete examples of effective policies, technologies, and management strategies. These examples can serve as a benchmark for India to develop and implement more effective water management practices. By identifying existing gaps and learning from global best practices, the study will provide actionable recommendations to enhance the legal framework and its implementation for water conservation and waste disposal. This, in turn, will contribute to sustainable development, environmental protection, and improved quality of life in India.

1.9.Research Methodology

The methodology for the present research is both doctrinal and non-doctrinal.

Adequacy of the law was tested by first studying the need of law and then evaluating the existing law on the need parameter. This required doctrinal, illustrative, analytical, critical and comparative studies. The comparison was done at two levels. Firstly, at Indian level comparing Delhi with two more Indian states. Secondly, comparing it with some other country. For this, the Law of United States was the benchmark for comparison because of implementation policy which are strong there.

The implementation of law, conservation of resources and disposal of waste and its linkages with the conservation of water resources, essentially required non-doctrinal inputs. Primary as well as secondary information were utilized for this

purpose. The researcher acquired secondary data from several sources, including governmental publications, non-governmental works, publications by NGOs, previously published research, studies on international resolutions, and online sources.

For the primary data requirement, data was collected from industry operators, governmental agencies and local public. For each stakeholder, a separate questionnaire was used for collecting data regarding the availability, sources, general quality, permissions and limitations on water uses, compliances, stringency of measures, costs, benefits of unsustainable disposal etc. In each category minimum 50 will be the sample size.

All this data so collected, including primary and secondary data, is presented in charts and tables and analyzed using legal logic relevant principles of law, to conclude on the proposed hypothesis.

I. Design of the Study: Quantitative and Qualitative Analysis: To collect comprehensive data and insights, this study took a mixed-method approach, integrating quantitative and qualitative methodologies.

II. Data Gathering: A comprehensive literature review done to collect existing information on India's legal framework for subterranean water resource usage and water conservation. Academic journals, government reports, and pertinent publications will be used as data sources.

III. Surveys and Questionnaires: To collect quantitative data on the effectiveness of current laws and regulations, surveys and questionnaires were disseminated to relevant stakeholders such as government officials, environmental specialists, and water management professionals. The

survey included questions about the respondents' jobs and duties to set the stage.

IV. In-depth interviews performed with key informants, including policymakers, legal experts, and environmental activists, to acquire qualitative insights and expert perspectives on the sufficiency and implementation of the legal framework. These interviews were structured in order to elicit contextual information about their experiences and observations.

V. Data Examination: Quantitative Analysis: Survey responses were statistically analyzed to determine perceptions of the appropriateness and efficacy of the existing legal system. The context given by the respondents was considered in the analysis.

VI. Qualitative Analysis: Interview data was thematically analyzed to uncover major themes, patterns, and expert viewpoints on the legislative framework and its application. The context supplied during interviews was considered in the study.

VII. Examples of Case Studies: Case Studies: Several case studies of specific locations or projects were conducted to assess the practical implementation and impact of the legal framework on the exploitation and conservation of subterranean water resources. Each case study's context, including location, stakeholders, and important details, was thoroughly explained.

VIII. Analysis of Policy and Law: Review of Legal Documents: To evaluate the provisions of the legal framework, an in-depth analysis of key legal documents, such as laws, rules, and policies, was performed. This

analysis includes context and a clear reference to the relevant legal documents.

IX. Considerations for Ethical Behavior: Ethical considerations, such as getting informed consent and respecting participants' privacy, was handled throughout the research. Within the framework of the research, ethical considerations was described.

X. Conclusion and suggestions: Findings and Conclusions: The research was concluded by summarizing the findings and drawing conclusions about the legal framework's sufficiency. Contextual insights gleaned from case studies, interviews, and surveys were very crucial in reaching these conclusions.

XI. Policy suggestions: Based on the research findings, policy suggestions and legislative reforms were developed to address the identified gaps in India's legal framework for underground water resource usage and water conservation. These recommendations were closely related to the research context and data sources.

CHAPTER 2

WATER RESOURCES AND WATER POLLUTION IN INDIA; TYPES, EVOLUTION, USAGE AND ISSUES OF SURVIVAL- AN OVERVIEW DIFFERENT INDIAN STATES WITH EMPHASIS ON DELHI/NCR

Environmental deterioration is a widespread issue in India and is brought on by a variety of actions. As a result of the nation's economy's fast expansion and urbanization, greenhouse gases have been released into the environment. This has accelerated global warming and climate change. Forests and other natural habitats have been destroyed as a result of urbanization and population growth. Various animals and plants have been in danger of extinction because of this. One of the nations with the quickest growth rates in the globe is India thanks to its economy's rapid expansion. By 2025, it is anticipated to be the third-largest economy in the world. Regrettably, the COVID-19 epidemic has led to a deceleration in the world economy (Talyan et al., 2008).

India is facing numerous environmental issues due to its rapid population growth and increase in automotive traffic. These include sewage overflows, industrial effluents, automobile emissions, and contamination of both air and water. The nation's environmental degradation is attributable to deforestation, soil and water pollution, agricultural land degradation, and other factors. Additional issues that contribute to the degradation of the environment encompass food insecurity and a deficiency in energy security (R. Kumari et al., 2018).

The nation's consumption patterns have led to a growth in energy-related issues such as greenhouse gas emissions and chemical pollutants. India is facing challenges in managing solid waste due to its growing population and the need for

infrastructure. Air quality is one of the most significant environmental issues. In order to effectively address these concerns, it is imperative that we alter our lifestyle and establish partnerships with other countries (Gude, 2018).

2.1.Forecasted situation of NCR Delhi

The water supply in Delhi and the National Capital Region (NCR) is a pressing issue due to the ongoing population growth and rising demand for water. The area has restricted availability of both natural and artificial water resources. The situation is worsened by challenges such as climate change, pollution, and unsustainable water management techniques (Mukherjee et al., 2015).

The Delhi/NCR region has a variety of natural water resources, including (Gola et al., 2020):

I. Yamuna River: The Yamuna River, which draws its water from the Yamunotri glacier in the Himalayas, is Delhi's main water supply. However, untreated sewage and industrial effluents have severely contaminated the river.

II. Groundwater: The Yamuna River and rainfall are the main sources of groundwater recharge in the area, which is another important supply of water. However, unsustainable methods of extracting groundwater have resulted in the depletion of groundwater supplies in numerous locations.

III. The Bhakra, Yamuna, and Ganga canal systems are only a few of the region's reservoirs, which provide water for cultivation, drinking supplies, and industrial use.

In addition to natural water resources, there are also non-natural sources of water in the Delhi region, such as (S. C. Rai & Saha, 2015) (Gola et al., 2020):

I. Water supply from other states: Through a number of canals and pipes, Delhi receives water from nearby states like Uttar Pradesh and Haryana.

II. Recycled and utilised water: Delhi is home to a number of wastewater treatment facilities that recycle and treat waste water for non-potable purposes like irrigation, industry, and firefighting.

III. Desalination: Although not in use in Delhi right now, desalinating seawater has the potential to become a source of freshwater in the future.

Overall, the availability of water in Delhi/NCR is a complicated issue that calls for a multifaceted strategy that includes sustainable water management techniques, the preservation of natural water resources, and the investigation of alternate water sources.

This chapter examines Delhi's water supply problem and how the city's water and sewerage agencies manage it. The study investigated the different facets of Delhi's water supply, discovering problems with its availability, quality, coverage, and disposal. It also provided suggestions on how to increase the city's people' access to clean, safe water (R. Sharma et al., 2022a).

There is a discrepancy between the availability and demand of basic services like clean and safe water in cities with high population concentrations and scarce resources. The absence of governance makes this problem worse. This study tries to give a general overview of Delhi, the capital city of India's water production and distribution infrastructure. The goal of this research is to comprehend the many facets of the Delhi government's capacity to give water to its residents. The study's main goal is to pinpoint the most important elements influencing Delhi's water supply and offer suggestions for how to make things better (Ghosh et al., 2019).

Delhi's infrastructure and services are being overtaxed by the city's growing population. Numerous cities that have close functional relations to the capital, such as Gurugram, Delhi, and others, surround the metropolis. There is also a significant influx of people into and out of the city, particularly during working hours. The people of Delhi, who make up a sizable portion of the population, need a variety of services. By 2028, the Delhi region is anticipated to overtake Tokyo as the world's most populous urban region.(Joshi et al., 2020).

Despite offering a wide range of services, the city administration is still unable to supply its residents with enough water and effective wastewater reuse. There are still many parts of Delhi that lack basic sewerage and piped water supplies. These concerns are made even worse by the regular supply and quality issues that these regions encounter. Therefore, it is crucial that both the public and private sectors collaborate to address these concerns. The Delhi Jal Board website, the Economic Survey of Delhi, the Delhi Jal Board (DJB) Act, and the Master Plan for Delhi 2021 were some of the materials that were used to perform the study (Delhi Jal Board Policy , n.d.).

2.2.Water level in Delhi's National Capital Region

Based on the needs of Delhi's numerous residents and the amount of water used for various uses, the city's daily water requirement is determined. According to the Delhi Jal Board (DJB), the city requires around 172 liters of water per individual per day to cater to its residential consumers (Rawat et al., 2018).

The city needs about 274 LPCD to fulfil its daily water needs. The supply norms established by the CPHEEO for large cities and metropolitan areas are the foundation of this figure 2.1.

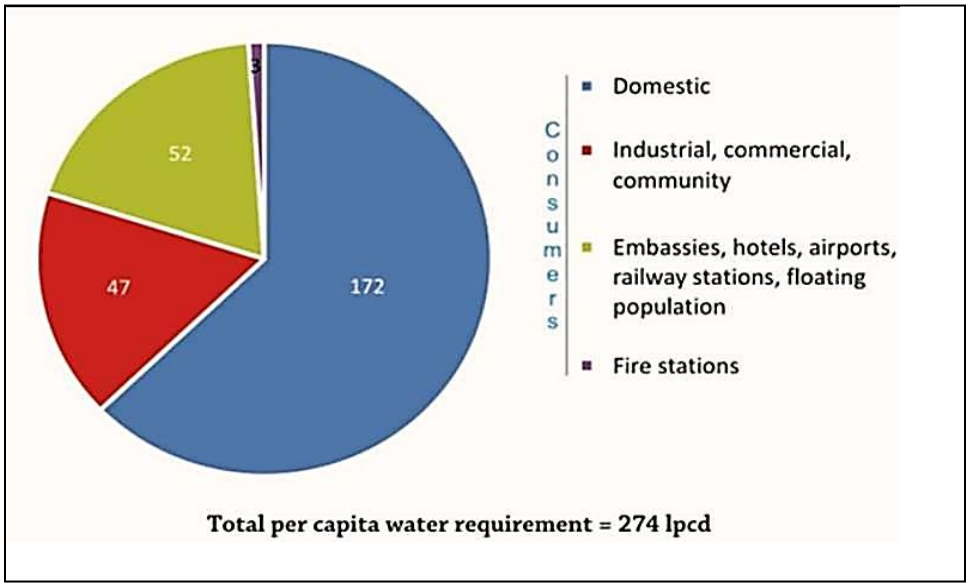

Fig 2.1. Planning Department, Economic Survey of Delhi 2019-20.

Delhi's daily water demand for its population of almost 21 million people in 2019 was estimated at 1,260 million gallons based on a per-capita use of 274 litres per day. By 2021, it is anticipated that this demand would rise to 1,380 million gallons.(Acharya et al., 2018).

The amount of water that the Delhi Jal Board (DJB) was able to produce overall in 2019 was close to 74% of the total demand for the city. However, more than 50% of the generated effluent was treated. This information demonstrates that both the production and consumption of water experienced gaps.(P. Kumari et al., 2019).

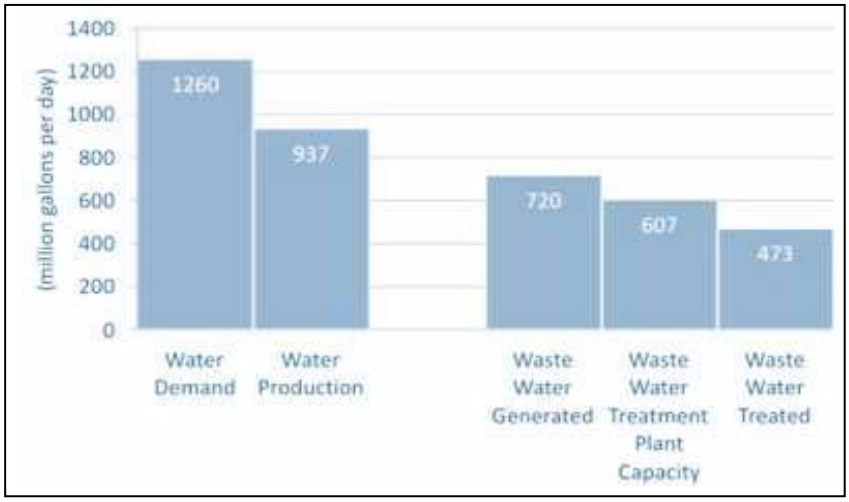

Fig 2.2. Graphical chart of Consumption of water.

For the purpose of producing drinking water, the DJB is in charge of acquiring and processing raw water. Data show that rivers, canals, and other surface water sources provide around 91% of the city's raw water, with subsurface sources providing the remaining 9%. Several facilities have been constructed to guarantee that the water supply is secure for consumption (Parween et al., 2017).

The river is a significant supply of raw water for the city and reaches Delhi from the adjacent state of Haryana. Five riparian states, including Delhi, Haryana, Rajasthan, Uttar Pradesh, and Himachal Pradesh, signed an MOU on May 12, 1994, to share the river's water (Vijayaraghavan, 2023). In addition to this, other surface water sources beyond the city's administrative limits include the Munak canal, the Bhakra storage facility, and the upper Ganga canal (Sandhu et al., 2019). Delhi was able to obtain raw water from various sources thanks to these arrangements. Additionally, pipes have been installed to carry this water to the city's wastewater treatment facilities. The requirement for raw water in Delhi is dependent on the adjacent states, it is crucial to mention (Lamba et al., 2018).

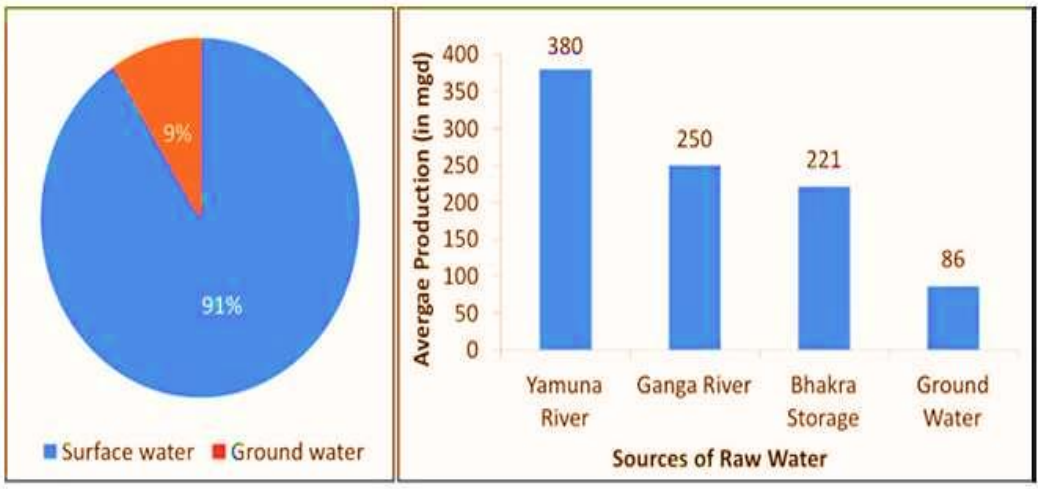

Fig 2.3. Water requirement completed by various sources.

There are several key issues related to water in Delhi, including:

I. Delhi suffers from severe water shortages as a result of its dense population and quick urbanisation. The city's water supply is constrained, and there is a much greater demand for water than there is water to supply it.

II. Groundwater Depletion: Delhi's water table has rapidly dropped as a result of excessive groundwater extraction. Due to this, the ecosystem has suffered significant harm, including soil erosion, groundwater depletion, and land subsidence.

III. Delhi's water is of low quality, with high concentrations of toxins and pollutants in both the surface water and the groundwater. Without proper treatment, the city's water supply is dangerous to drink since it is tainted with sewage, industrial waste, and other pollutants.

IV. Water management: Due to leaks, theft, and wastage, Delhi's water management system suffers from substantial inefficiencies and failures. Poor distribution and ineffective use of water are the results of inadequate infrastructure and technologies for managing water resources.

V. Climate Change: With rising temperatures and shifting rainfall patterns affecting the quantity and quality of water resources, climate change is escalating Delhi's water issue. The city is particularly vulnerable to extreme weather conditions, including as floods and droughts, which have an additional effect on the distribution and availability of water.

Delhi's planning and growth have been facilitated by a number of master plans. The initial one was released in 1962 (Master Plan for 1962 | DDA, n.d.). Even though the city's growth has largely been planned, some inconsistencies have not been kept under control. Within Delhi, people can frequently be found residing in various locations. Resettlement colonies, slums in undeveloped areas, unplanned colonies, and colonies that were constructed without authorization are some examples of these. Service delivery organisations may find it difficult to keep up with the demands of a developing city like Delhi. About 93 percent of Delhi's population, according to the DJB, is serviced by either a piped network or water tankers. The DJB bills its home, commercial, and industrial clients separately for the water they provide. For usage of up to 20 kiloliters per month, those who have functional meters are exempt from paying any additional fees. Any consumption that exceeds this cap must be paid for. Unmet connections incur fees (Delhi Jal Board Policy , n.d.). Based on the typical consumption of clients from villages and unlawful colonies, water fees are recovered. For the treatment and collection of sewage, a monthly maintenance fee is additionally assessed. The billing and

payment procedure has been improved with the use of a revenue management system. Additionally, it will increase collection efficiency.

2.3.National Water Policy 2016

It is crucial to encourage community and individual engagement in the ongoing improvement and maintenance of water and sanitation systems in order to protect and improve public health and water quality. By encouraging the adoption of best practises and adherence to topical and appropriate standards, this can be accomplished. A cooperative strategy including multiple governmental entities, groups, and stakeholders in charge of water management, supply, and monitoring will be used to manage water resources successfully. Communities, the commercial sector, civil society organisations, and other pertinent stakeholders will all take part in this concerted endeavour.

Key Features:

I. preventing water supply pollution in any manner attainable.
II. a holistic, inclusive, and sustainable management strategy for water resources.
III. an increase in the supply of drinkable water that is clean.
IV. maintaining and enhancing public health.

Critics:

I. Lack of participation from stakeholders.
II. lack of concern for the environment's long-term sustainability.
III. inadequate analysis of climate change's effects.
IV. inadequately enforced mechanisms for compliance and adherence.

2.4.Water tariff for domestic consumers in Delhi

The volume of water consumed affects the water tariff for household customers in Delhi. For domestic customers, the Delhi Jal Board (DJB), which is in charge of water supply and distribution in the city, has a four-tiered rate structure. The cost is Rs. 4.5 per thousand litres for consumption up to 20,000 gallons per month. The cost is Rs. 9 per thousand litres of use each month between 20,000 and 30,000 litres. The cost is Rs. 12 per thousand litres of use each month between 30,000 and 50,000 litres. The cost is Rs. 15 per thousand litres of consumption over 50,000 gallons per month. It is important to keep in mind that these prices are subject to change and may vary depending on the consumer's location and kind of connection, among other things. Additionally, for customers that pay their water bills on time, the DJB provides a 10% discount on the entire amount of the payment.(Revised Water Tariff (w.e.f 01-02-2018) | Delhi Jal Board |, n.d.).

2.5.Delhi faces a shortage of raw water

Delhi is currently experiencing a scarcity of raw water, which is the primary source of water for the city's water supply system. The Yamuna River, which the city shares with the states of Haryana and Uttar Pradesh, is the primary supply of untreated water for the metropolis. The raw water supply of the Yamuna River is affected by various factors, such as precipitation, snowfall, and the discharge of water from upstream dams. The discharge of raw sewage and industrial waste into the river also affects the river's hydrodynamics. Furthermore, the population of Delhi is expanding, resulting in increased urbanization. Consequently, this has caused a depletion of the city's groundwater reserves and a surge in water requirements. Consequently, the Delhi Jal Board (DJB), responsible for managing the water supply and distribution in the city, has faced challenges in meeting the increasing water demand. The DJB has implemented various measures to address this issue, such as water conservation programs and the construction of additional water treatment

facilities. To provide a reliable and sufficient supply of untreated water from the Yamuna River, the DJB has also been engaging in cooperation with the neighboring states. Nevertheless, the city still has a significant problem with the scarcity of untreated water, necessitating continual endeavors to ensure an ample supply of water resources for the growing population (Water Supply in Delhi: Five Key Issues | ORF, n.d.).

According to data, Delhi has a 323 mgd water supply deficit. It suffers throughout the summer due to a lack of supply from its neighbouring states. During this time, these states typically limit their supply. The Delhi government has reached an agreement with various states that share a river basin, including Uttarakhand, to construct three upstream storage dams on the Yamuna in order to alleviate this problem. These dams are Lakhwar Vyasi in Uttarakhand, Kishau in Delhi, and Renuka in the Himachal Pradesh state. The water table in Delhi has been drained by unrestrained and unregulated exploitation. For instance, the groundwater is used to maintain the lawns in farm houses that are situated in peri-urban settings. Private companies' mining of groundwater from these areas has resulted in a 20 to 30 metre depletion in some areas of the city (Water Supply in Delhi: Five Key Issues | ORF, n.d.). The water table in Delhi has been impacted by unauthorised development of constructions on the surface of the ground. This happens because encroachments block the passage of rainwater to the natural depressions. A CGWB committee has been established to control the number of tube wells in the city in order to address this problem.

The CPCB has suggested charging an environmental compensation cost of up to 100,000 Indian rupees to homeowners, business owners, and industrial property owners who engage in illegal extraction as a solution to the problem. The Delhi Jal Board (DJB) has also made a number of improvements to the city's water features.

These consist of creating additional bodies of water, deepening lakes, and constructing check dams.

Potential groundwater sources for Delhi are the lands close to Najafgarh Lake and the floodplains of the river, which are situated downstream of Wazirabad. Numerous reservoirs have been built close to the river to store the seasonal rains. The Delhi government is proposing to recycle wastewater and collect rainwater in order to raise the city's water table. Unfortunately, there aren't enough plants and infrastructure for this purpose to add to the city's water supply. The government has mandated that all structures and business enterprises install rainwater collecting systems on their rooftops in order to promote the usage of this technique. In universities, colleges, and the DJB, more than 3,600 RWH systems have been deployed. Additionally, a few private housing groups have begun employing this process. A 10% refund on their water bills is available to these businesses. Consumers who violate this clause risk receiving a 1.5 times penalty.(Water Supply in Delhi: Five Key Issues | ORF, n.d.).

Important issues regarding water management, the reduction of pollution, and the preservation of Indian rivers were raised by the Delhi Jal Board v. State of Haryana & Others case from 2006, 2002. In its decision, the Supreme Court emphasised the need to implement sustainable practises in order to protect the environment as well as the significance of allocating water resources fairly across the states. The tragedy showed how important it is to address Delhi's increasing water demand as a rapidly expanding metropolis. The responsibilities of the concerned states to manage water resources effectively and meet the basic needs of their populations was underscored by the Supreme Court's directive to ensure Delhi obtains a sufficient supply of water.(Delhi Jal Board vs Workman Of The Erstwhile Delhi ... on 7 February, 2006, n.d.)(Desh Raj vs Delhi Jal Board 2002 [Along With ... | LegalData.In, n.d.).

The court's decision emphasised the urgent necessity to remedy the contamination of the Yamuna River. The Court advised the adoption of appropriate measures to limit the discharge of household and industrial waste in order to restore the natural balance of the river. By resolving these issues, the case set a benchmark for the management and preservation of India's rivers and highlighted the importance of environmentally friendly water usage practises.

2.6.Poor quality of Delhi water

Due to the high concentrations of toxins and pollutants found in both surface and groundwater sources in Delhi, the quality of the city's drinking water is a significant public health concern. The Yamuna River, which is extensively contaminated with untreated sewage, industrial waste, and other toxins, serves as Delhi's main water supply. The demand for water has also outpaced the availability due to the city's rapid development and population increase, which has resulted in excessive groundwater extraction. Since the groundwater is also contaminated by industrial effluents, pesticides, and fertilisers, this has further led to the poisoning of water sources (Sarkar, 2019).

Residents of Delhi face serious health hazards due to the city's poor water quality, including cholera, typhoid, and other waterborne illnesses. The World Health Organization (WHO) predicts that hazardous bacteria, viruses, and pollutants are present in Delhi's water supply at a rate of above 70 percent. (Sperling & Ramaswami, 2013).

The Delhi Jal Board (DJB) has implemented various measures to address this problem, such as constructing new water treatment facilities and installing state-of-the-art water filtration systems. To ensure compliance with the national standards for drinking water quality, the DJB conducts monthly testing of the water supply.

Nevertheless, further efforts are required to address the issue of water pollution and improve the quality of water in the city, ensuring that safe and uncontaminated water is accessible to all residents of Delhi. Prior to dissemination to customers, water agencies subject the raw water to treatment in their own treatment plants. Both government-affiliated and independent laboratories will examine the samples in accordance with this protocol. To maintain the purity of the water, the DJB established a quality control division consisting of nine plant laboratories and eight zonal laboratories (Delhi Jal Board Policy , n.d.).

Water chlorination is done in water tanks that are above or below ground to destroy hazardous bacteria. However, despite the efforts, Delhi's tap water quality is still a worry. The assessments are significantly impacted by the quality of the water flowing from different sources, including rivers and canals. The Delhi administration is concerned about the fact that industrial facilities in Haryana are known to discharge untreated effluents into the Yamuna river.

In addition to this, untreated sewage overflows from various drains in Delhi. The government has begun constructing interceptor sewers beneath the drain beds to address this problem. The sewage will subsequently be transported to the treatment facilities by these sewers. Making a separate connection between the western canal and the Wazirbad wastewater treatment facility is another option for resolving this issue. People who live in slums and illegal colonies close to rivers also contribute to the water's pollution. This practice frequently entails throwing trash into a river.

According to reports, the rising salinity is causing the levels of groundwater to rise. Additionally, the amounts of nitrate, arsenic, and fluoride are higher than permitted by official norms. The salinity level in Delhi's groundwater was over 3,000 micro metres per hectare, according to a report given to parliament. Additionally, it was discovered that other elements like nitrate, arsenic, and fluoride

were beyond the permitted levels. The human body, especially the bones and teeth, might suffer if poisonous water is consumed in large quantities. Water contamination is another frequent problem in the supply and manufacturing processes. This is due to the likelihood of leaks in the pipes that run parallel to the sewer lines.

The issue has prompted the government to begin upgrading outdated pipelines. In Indian cities like Delhi, a lot of individuals utilise water filtration devices to get hazardous substances out of their bodies. The poorest individuals are particularly impacted by the water quality because they depend on the river for their daily necessities.

2.7.Distribution of water in Delhi is not equitable

Delhi frequently has an uneven distribution of water, with some sections suffering a scarcity while others have an oversupply. Numerous factors, such as the city's topography, socioeconomic considerations, and the calibre and dependability of water infrastructure, contribute to this unequal distribution of water (A. Kumar et al., 2021).

Delhi's wealthier southern and western regions frequently have better access to water than the city's more economically disadvantaged eastern and northern regions. This is frequently caused by these areas' superior infrastructure, which includes water treatment facilities and pipes (A. Kumar et al., 2021)(Delhi Jal Board Policy , n.d.).

In addition, access to piped water supply differs significantly between Delhi's urban and rural areas. A sizeable section of the city's population lives in rural areas that frequently have poor access to piped water supplies and must rely on groundwater sources. The Delhi Jal Board (DJB) has been trying to upgrade the water infrastructure in the city's neglected neighbourhoods, notably by building new

water treatment facilities and pipelines. To make sure that all regions of the city receive an appropriate supply of water, the DJB has also been working to improve the distribution network.

However, the issue of unequal water distribution continues to be a major problem for the city, and ongoing efforts are required to guarantee that all Delhi residents have access to a consistent and fair supply of water.

The Delhi Jal Board (DJB) has put in place a number of efforts to enhance the city's water distribution system and guarantee that all neighbourhoods get a sufficient and equal supply of water. These initiatives include, among others:

I. Installation of bulk water metres: To monitor and control the distribution of water to various regions of the city, the DJB has erected bulk water metres at a number of different locations.

II. Water supply mapping: To pinpoint locations that don't get enough water, the DJB has mapped the city's water delivery infrastructure. The planning and execution of initiatives to enhance water delivery in these areas is aided by this information.

III. Building new water treatment facilities: The DJB has built new water treatment facilities to expand the water supply system's capacity and enhance the quality of the water provided to households.

IV. Old pipelines are being replaced with new ones by the DJB in order to reduce water losses and boost the effectiveness of the distribution system.

V. Water tankers: The DJB has made use of water tankers to deliver water to places that are experiencing severe water shortages or during emergencies.

VI. Online water supply monitoring: To follow the water supply and find any leaks or interruptions in the system, the DJB has put in place an online monitoring system. This aids in quickly detecting and resolving problems.

These projects have assisted in enhancing Delhi's water distribution infrastructure and guaranteeing an adequate and equitable supply of water for all districts. However, ongoing work is required to upgrade the infrastructure for the water supply and guarantee that all households have access to a safe and dependable water supply.

2.8.Economic Survey for the Planning Department of Delhi

The Delhi Planning Department has been working on a number of projects to enhance the city's water supply and management, according to the Economic Survey from the previous year.

In the Economic Survey from the previous year, some of the main topics of concentration for the Planning Department were as follows:

I. Water conservation is a crucial component of sustainable growth in the city, according to the planning department. To encourage water conservation, the department has been working on a number of initiatives, including rainwater gathering, water reuse, and wastewater treatment.

II. Infrastructure for the city's water supply: The Planning Department has been working to upgrade the city's infrastructure for the distribution and storage of water, notably by building new water treatment facilities, pipelines, and reservoirs.

III. Groundwater management: To address the issue of groundwater depletion, the Planning Department has been concentrating on groundwater management throughout the city. In order to promote sustainable groundwater management, the department has been working on programmes like promoting water-efficient irrigation techniques and regulating groundwater extraction.

IV. The Planning Department has been enhancing water quality monitoring in the city to ensure the safety of the water supply. The department has focused its efforts on projects such as the establishment of a centralized water quality monitoring system and the implementation of water quality monitoring equipment.

Overall, the Planning Department's programmes are designed to enhance Delhi's water supply and management while fostering sustainable urban growth. The activities of the department are essential to ensuring that all Delhi residents have access to a safe and dependable water supply.

2.9.Amendment in Water Policy India 2016

As of now last update in water policy in September 2021, the "Water Policy India 2016" was a significant policy initiative aimed at addressing the water challenges faced by different states in India. While I cannot provide real-time data beyond 2021, I can give you an overview of some of the water-related issues faced by specific states in India up until that point. Keep in mind that conditions and policies might have evolved since then.

I. Maharashtra: Maharashtra is a state in western India that has faced severe water scarcity issues due to erratic rainfall and overexploitation of water resources. Many regions in Maharashtra were prone to droughts, leading to acute water shortages in both rural and urban areas.

The state government has been implementing various water conservation measures, rainwater harvesting projects, and policies to regulate groundwater usage to mitigate these issues.

II. Tamil Nadu: Tamil Nadu, located in the southern part of India, has experienced challenges related to water availability and equitable distribution. The state has faced disputes with neighboring states over sharing river water, particularly with Karnataka over the Cauvery River. Water scarcity has also been a concern in Chennai, the capital city, with the city relying heavily on external sources for its water needs. To tackle these issues, Tamil Nadu has been focusing on water conservation, promoting rainwater harvesting, and implementing measures to manage its water resources more efficiently.

III. Rajasthan: Rajasthan is a state in northwestern India known for its arid and semi-arid regions. Water scarcity and droughts have been chronic problems faced by the state due to low rainfall and high evaporation rates. The government has adopted water management strategies such as constructing check dams, creating traditional water harvesting structures, and promoting water-efficient irrigation practices to address water challenges in the region.

IV. Karnataka: Karnataka has been grappling with water disputes with neighboring states like Tamil Nadu and Goa. The sharing of river waters, particularly the Cauvery and Mahadayi rivers, has been a contentious issue. Additionally, the state has faced water scarcity in certain districts, highlighting the need for better water resource management and conservation practices.

V. Punjab: Punjab, located in the northwestern part of India, is known as the "Granary of India" due to its significant agricultural contributions. However, the state has been facing water-related challenges, including overexploitation of groundwater for agriculture, which has led to declining water tables and water quality issues. The government has been implementing policies to promote sustainable irrigation practices and water conservation in the agricultural sector.

VI. Kerala: Kerala, a state in the southern part of India, has relatively abundant water resources due to its high rainfall. However, issues related to water quality and pollution have been a concern, especially in urban areas. The state has been working on improving water infrastructure, sanitation, and water quality monitoring to address these challenges.

Water management is a complex and evolving challenge in India, given the country's diverse geography, climate, and population. In recent years, the Indian government and various states have been working on implementing and updating water policies to address the growing concerns related to water scarcity, pollution, equitable distribution, and sustainable use of water resources.

Some common strategies and initiatives that might have been implemented or further developed after 2021 include:

I. Integrated Water Resource Management (IWRM): IWRM is a comprehensive and sustainable approach to managing water resources, considering many water users including agriculture, industry, and domestic needs. This method entails the synchronization of water-related policies and actions across several sectors to guarantee the optimal utilization and preservation of water resources.

II. Watershed Development Programs: Watershed development programs aim to enhance rainwater harvesting and soil conservation practices, especially in rainfed areas, to improve groundwater recharge and reduce soil erosion. These programs help in mitigating droughts and enhancing water availability.

III. Interlinking of Rivers: The Interlinking of Rivers project is a major undertaking that aims to connect rivers across the country to facilitate the transfer of surplus water from water-rich regions to water-deficient regions. This project has been a subject of debate and discussion, and its implementation would have significant environmental, social, and economic implications.

IV. Water Pollution Control: Addressing water pollution is a crucial aspect of water management in India. Measures to control industrial, agricultural, and domestic pollution are necessary to safeguard water quality and protect public health.

V. Climate Change Adaptation: Climate change impacts, such as altered precipitation patterns and increased frequency of extreme weather events, have significant implications for water resources. States may have been working on climate change adaptation strategies to cope with these challenges.

VI. Community-Based Water Management: Empowering local communities to participate in water resource management can lead to more sustainable and equitable outcomes. Community-driven water management initiatives have been gaining prominence in various states.

VII. Water Pricing and Regulation: Implementing appropriate water pricing mechanisms and regulatory frameworks can incentivize efficient water use and prevent wastage. States may have been revisiting their water pricing structures to promote responsible water consumption.

The Supreme Court of India addressed a number of issues relating to water sharing, pollution prevention, and the natural flow of the Yamuna River among the states of Delhi, Haryana, and Uttar Pradesh in its ruling in the matter of Delhi Jal Board v. State of Haryana & Others (2002). Following are some salient findings from the ruling(Delhi Jal Board vs The State Of Haryana on 13 January, 2021, n.d.):

I. Allocation of Water: The lawsuit concerned the distribution of Yamuna River water among the states of Delhi, Haryana, and Uttar Pradesh. In order to fulfil the rising demand for water in the nation's capital, Delhi, the Delhi Jal Board (DJB) requested an increase in the river's water supply.

II. Equitable Distribution: The Supreme Court underlined the idea of distributing water among the states in an equitable manner. It attempted to create a balance between Delhi's water needs and those of the surrounding states, especially Haryana and Uttar Pradesh.

III. Water Resource Conservation: The court acknowledged the value of water resource conservation and sustainable water management. It emphasised the significance of utilising water wisely and putting policies in place to lessen waste and encourage water conservation.

IV. Water pollution in the Yamuna River was also a topic of discussion in this case. The court emphasised the need of reducing pollution and taking action to raise the quality of the river's water.

V. Ecological Flow: The court's decision placed a strong emphasis on maintaining the river's ecological flow, which is the bare minimum of water that must pass through the river in order to support its ecosystem and other ecological functions. The court acknowledged the Yamuna River's ecological significance and ordered the relevant governments to make sure that an appropriate water flow is maintained to safeguard its environment.

Inter-State Cooperation: In addressing issues of water management and sharing, the Supreme Court emphasized the significance of cooperation and coordination among the relevant nations. It urged the states to cooperate in order to identify workable solutions and put policies into place that are advantageous to all parties involved.

2.10. Solution for Delhi water shortage and Inequitable distribution of water in Delhi

Delhi's water scarcity and unequal distribution of water are complicated problems that call for a multifaceted strategy. The following are some potential answers to these problems:

I. Improved water management: To boost Delhi's water availability, the government should put better water management methods in place, such as rainwater collecting, water reuse, and wastewater treatment.

II. Investment in water infrastructure is required to improve water distribution and storage, including the construction of pipelines, water treatment facilities, and reservoirs.

III. Reducing water losses: Actions can be done to minimise water losses brought on by leaks, unauthorised piping, and wasteful use.

IV. The government has the power to control groundwater extraction in order to avoid overuse and the depletion of groundwater resources.

V. Campaigns for public awareness: The government can start campaigns for public awareness to inform people about the value of water conservation and appropriate use.

VI. Water allocation that is fair: The government may make sure that water allocation is fair by putting in place policies like metering, reasonable price, and lessening the impact of political and social variables on water allocation.

In conclusion, a combination of these measures can aid in resolving Delhi's water deficit and unequal distribution of water. To guarantee that future generations have access to a sufficient and secure water supply, action must be taken immediately.

2.11. Changes required in the Delhi Jal board policy in future

To handle Delhi's expanding water issues, the DJB (Delhi Jal Board) needs a water policy for the future. One or more of the specifications of such a policy might be:

I. The policy should include specific objectives for managing water resources, such as reducing water loss, ensuring equitable distribution, and enhancing water availability.

II. Promoting sustainable water usage measures, such as rainwater collecting, water reuse, and wastewater treatment, will help the policy encourage water conservation.

III. In order to relieve strain on natural water sources, the policy should encourage the use of alternative water sources including recycled water, desalinated water, and rainwater collection.

IV. Assuring a safe and dependable water supply for all citizens, including those in underprivileged areas, should be a top priority for the policy.

V. Issues with pollution and water quality should be addressed by the policy by putting in place measures like better wastewater treatment and enforcement of pollution control laws.

VI. Increasing transparency and involving stakeholders: The policy should involve stakeholders in the development and execution of water management strategies, including the general public, civil society organisations, and private sector actors.

VII. To maintain a sustainable and fair water supply for all inhabitants, a thorough DJB water strategy that tackles Delhi's future water concerns is essential.

2.12. Water Sector in The National Capital Region

I. The National Capital Region's (NCR) Water Sector has various issues, especially water scarcity and the need for sustainable management and protection of water resources. The NCR, which comprises Delhi and its neighboring territories, gets its water from both surface and groundwater sources. The region has various rivers and canals, including the Yamuna, Hindon, Kali, and Ganga, which provide potential water supplies. However, groundwater supply varies, with some locations having brackish groundwater that is unfit for domestic consumption. Furthermore, water consumption in the NCR frequently exceeds available supplies, particularly during the dry summer months.

II. The Regional Plan-2001 established aggressive water supply regulations and standards, intending to attain 363 liters per capita per day (lpcd) by

2001, comparable to Delhi levels. However, a 1999 review found that these standards had not been met. Even in the national capital, Delhi, the average water supply remained about 225 lpcd, falling short of the Master Plan-2001 standards. The evaluation acknowledged that water resources were insufficient to support household demand, particularly during the summer months. As a result, there was a push for more attainable norms and standards.

III. Several methods and policies were proposed in the Regional Plan 2021 to address the difficulties and improve the water status in the NCR by 2021

IV. Blueprint for Regional Water Resources: Creating a comprehensive strategy for the long-term management and usage of water resources in the NCR.

V. Integrated Regional plans for Drinking Water Supply Augmentation: Implementing plans to increase drinking water availability, embracing both surface and groundwater sources, while treating the NCR as a unified unit.

VI. Protection of Land for Groundwater Recharging: Emphasizing land use and regulations that encourage aquifer recharge in order to maintain groundwater levels.

VII. Water-Consuming Industry Relocation: In order to manage water resources efficiently, companies that demand a lot of water should be relocated.Recycling of Wastewater for Non-Drinking Use: Promoting the recycling of wastewater for non-potable purposes, lowering the need for fresh water.

VIII. Creation of Mass Awareness on Saving Water: Encouraging public awareness initiatives to encourage water conservation and appropriate usage.

IX. Commercial Approach for Tariff: Implementing tariff structures that encourage water conservation and responsible consumption.

X. Institutional Capacity Building: Strengthening institutions responsible for water management and regulation in the NCR.

XI. Allocation of Land for Water Treatment Plants and Water Distribution Systems: Ensuring land availability for water treatment infrastructure and distribution systems.

XII. Funding of Water Supply Schemes Using Five-Year Plans: Allocating funds through a systematic planning procedure for water supply schemes.

These strategies and policies contained in the Regional Plan 2021 for the National Capital Region (NCR) exhibit a comprehensive approach to managing and enhancing the region's water sector. They are designed to solve the concerns of water shortage, quality, and the increasing demand for water resources in a holistic and sustainable manner.

I. Blueprint for Water Resources in the Region: The development of a comprehensive blueprint recognizes the significance of evaluating the current state of water resources and planning for their sustainable usage. This method highlights the significance of coordinated and strategic planning for water management in the NCR.

II. Integrated Regional Schemes for Augmentation of Drinking Water Supply: Treating the NCR as a single entity for water supply schemes underlines the linked nature of water resources in the region. This

integrated strategy guarantees that water is allocated more equitably and effectively to satisfy the demands of the entire NCR, taking into consideration surface and groundwater sources.

III. Protection of Land for Groundwater Recharging: Land use regulations that promote groundwater recharge are vital for maintaining and recovering groundwater levels. Protecting land for this reason adds to the long-term sustainability of groundwater resources.

IV. Water-Consuming Industry Relocation: The consideration of relocating industries that consume large amounts of water displays a commitment to optimizing water utilization. This strategy ensures that industrial activities do not consume water supplies unduly.

V. Wastewater Recycling for Non-Drinking Use: Recycling wastewater for non-potable usage reduces the demand for fresh water while minimizing the environmental impact of wastewater disposal. This strategy promotes water saving as well as environmental sustainability.

VI. Public Awareness Campaigns on Water Conservation: Public awareness campaigns are crucial in influencing water use practices. Educating the people on the value of water conservation and appropriate usage can result in large water savings.

VII. A tariff structure that fosters responsible water consumption incentivizes both consumers and businesses to utilize water efficiently. It can aid in demand management and water conservation.

VIII. Building Institutional Capacity: Strengthening institutions in charge of water management and regulation ensures effective governance and

enforcement of water-related regulations. Water resource management requires well-functioning institutions.

IX. Allocation of Land for Water Treatment Plants and Water Distribution Systems: Ensuring appropriate land availability for water treatment and distribution facilities is critical for providing households and businesses with safe and reliable water supply.

X. Five-Year Plans for Water Supply systems: Allocating funds through structured planning, such as Five-Year Plans, gives a methodical approach to financing water supply systems. It contributes to the availability of funds for vital water projects.

XI. These strategies and policies address the difficulties confronting the NCR's water sector as a whole, with the goal of achieving sustainable water management, equal access to water resources, and responsible usage. Their implementation and continued monitoring are critical to guaranteeing the future successful and efficient management of water resources in the NCR. (National Capital Region Planning Board. (2024). Regional Plan 2021)

2.13. Tracking Water Sources for Delhi

The demand for water in Delhi, a city of over 23 million people, surpasses the available supply. The Delhi Jal Board (DJB), which is in charge of water supply, claims a daily demand of over 1,150 million gallons per day (mgd), whereas supply is only approximately 935 mgd. Due to the scarcity of water, many inhabitants, particularly those living in informal settlements, have had difficulty obtaining appropriate drinking water.

To meet its water needs, Delhi uses water from a variety of external and internal sources. Among these sources are:

2.13.1. Sources of Surface Water

River Yamuna: The city gets its water from the Yamuna River, which runs through eastern Delhi. However, the river's water availability varies throughout the year. During the rainy season, water levels are high, but they fall dramatically during the dry summer months. Furthermore, the quality of Yamuna river water is impacted by untreated home and industrial wastewater discharge, making it a difficult supply.

2.13.2. Outside Sources

Upper Ganga Canal: This canal runs from the Ganga River in Haridwar, Uttarakhand, through the adjacent state of Uttar Pradesh, and supplies some drinking water to Delhi.

Western Yamuna Canal (WYC) and Munak Canal: These canals, located in Haryana to the north of Delhi, transport water from the Yamuna River to the city. However, there have been instances of water supply outages caused by a variety of factors, including canal infrastructure damage and rubbish disposal in the water.

Bhakra Storage: Through a canal network, Delhi obtains water from the Ravi and Beas rivers, which are derived from Bhakra Storage in Himachal Pradesh. This water eventually makes its way to Delhi via the Western Yamuna Canal and the Munak Canal.

2.13.3. Underground water

Groundwater is extracted inside the administrative boundaries of the city by tube wells and ranney wells. However, due to variables such as its semi-arid climate, little rainfall, and over-exploitation, groundwater levels in Delhi are limited. The presence

of hazardous metals over acceptable limits in groundwater is also a source of concern.

2.13.4. Rainfall

Rainwater harvesting (RWH) structures erected on government and private sites catch some rainwater. This rainwater is mostly used for non-potable applications such as gardening and car washing.

2.13.5. Reuse of Wastewater

The city government has built a sewerage system and wastewater treatment plants to clean wastewater for reuse. Approximately 70% of the generated wastewater is processed and supplied for non-potable applications.

More than 90% of Delhi's water supply comes from outside sources, notably neighboring states like Haryana, Uttar Pradesh, and Himachal Pradesh. Maintaining groundwater levels, resolving water quality concerns, managing wastewater, and fully realizing the potential of rainwater harvesting are all challenges for the city government. Resolving these concerns is critical to guaranteeing a continuous and dependable water supply for Delhi residents.

To summarize, the water supply situation in Delhi is complex, with numerous sources being used to meet the city's enormous water demand. The city government obtains water from both external and internal sources, relying mostly on surface water supplies in neighboring states. The following are the important takeaways:

1. Dependence on External Sources: Over 90% of Delhi's water supply comes from outside sources. This includes rivers such as the Ganga and the Yamuna, as well as canal networks from adjacent states. The fluctuating water levels in these sources, as well as worries about water

quality owing to pollution, make it difficult to maintain a consistent supply.

2. Groundwater Challenges: Due to the semi-arid climate and low recharge capacity, groundwater supply within Delhi's administrative boundaries is limited. Groundwater utilization is complicated by over-exploitation and worries about water quality. Rainwater harvesting is promoted, with policies in place for both government and private sites. Despite the fact that many structures have been installed, there is still untapped potential and difficulties with non-functional structures.
3. Wastewater Reuse: The city administration treats wastewater for reuse, with a large amount of it being treated. The purified water is used for non-potable uses, which helps to conserve water.

The city's water supply is a dynamic and diverse system that necessitates a coordinated effort to manage the issues of source availability, water quality, and supply dependability. Solving these difficulties is critical to ensuring that Delhi people have constant access to safe and adequate drinking water, especially as demand grows in this densely populated metropolis.

2.14. Laws existing in India to prevent and control water pollution

The state prioritizes access to a healthy environment, and water is a valuable resource for the country. Water pollution is a serious problem in India, and numerous laws and policies have been enacted to solve it. Some of the Indian legislation adopted by the Parliament to monitor and regulate water pollution are as follows bellow points.

Water Pollution Prevention and Control Act of 1974

I. This act's principal goal is to prevent water pollution, preserve water bodies, and promote their restoration.

II. To carry out the act, the Central Pollution Control Board and State Pollution Control Boards were established.

III. Individuals are required by Section 24 of the act to prohibit the release of harmful or noxious substances into bodies of water.

IV. The act's shortcomings include its silence on groundwater management and other issues such as rainwater collecting.

The Bombay and Kolaba Shore Nuisance Act

I. The purpose of this act was to make it easier to remove nuisances below the high water mark in Bombay and Kolaba islands.

II. It gave the land revenue collector the authority to issue notices for the removal of impediments.

III. Noncompliance with the notification may result in pollution fines.

River Pollution Act of Orissa, 1953

I. This statute focuses on regulating factory waste and wastewater dumping into rivers.

II. In Orissa, a board was formed to oversee the requirements of the legislation.

III. Pollution in rivers such as the Mahanadi and Brahmani in Orissa is a major concern as a result of sewage, industrial waste, and heavy metal disposal.

Water Pollution Prevention and Control Cess Act of 2003

This statute prohibits the discharge of industrial trash into rivers and levies a tax on enterprises that utilize more water than defined limitations.

Pollution and the Indian Penal Code

Individuals who voluntarily pollute public reservoirs or springs are punishable under the Indian Penal Code. For such actions, offenders may face imprisonment or fines.

River Boards Act of 1956

I. This statute creates river boards to regulate interstate water disputes, with a focus on public interest.

II. It empowers state governments to appoint boards and create awards and tribunals to settle disputes.

Damodar Valley Corporation Water Pollution Prevention Act, 1948

The purpose of this act is to control pollution in the Damodar Valley region, which has been impacted by waste discharge from mining and industry.

The Right to Safe Drinking Water: A Fundamental Right

I. The Indian judiciary has construed Article 21 of the Constitution to encompass the entitlement to unpolluted water and a pristine environment as a fundamental right.

II. Legal rulings, such as the Narmada Bachao Andolan case, have shown that access to clean drinking water is an essential part of the right to life.

III. The case of MC Mehta vs. Union of India serves as clear evidence that the state has an obligation to avoid water pollution, as demonstrated by its emphasis on preventing pollution in the Ganga river.

While various acts have been passed to reduce water pollution in India, effective implementation and monitoring are urgently needed to preserve streams, reservoirs, rivers, and lakes from contamination. The government must take an active part in maintaining these vital water resources for the sake of citizens' and the environment's well-being.

Pollution Control Acts & Rules

To address many areas of environmental pollution, including water pollution, India has adopted a comprehensive system of Pollution Control Acts and Rules. The following are some significant pollution control laws and rules that apply to water pollution.

Water (Pollution Prevention and Control) Act of 1974

I. The basic objective of this Act, which is India's main legislation on water pollution, is to prevent and regulate water pollution.

II. The Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) are established with the purpose of overseeing and regulating the quality of water.

III. The legislation grants authorities the power to establish criteria for the quality of water and to implement measures to prevent and control water pollution.

2016 Bio-medical Waste Management Rules:

I. These regulations are aimed at the safe and environmentally sound disposal of bio-medical waste, which includes waste generated in healthcare institutions.

II. Proper bio-medical waste management is critical to preventing contamination of water bodies and land.

2016 E-Waste (Management) Rules

I. Designed to control the generation, collection, and disposal of electronic trash, also known as e-waste.

II. E-waste contains dangerous materials that, if not properly managed, can pollute water.

Regulations governing the handling and transportation of dangerous and other types of waste, established in 2016.

I. These regulations govern the management of hazardous waste and other wastes, as well as their transboundary transportation.

II. If hazardous waste is not properly managed, it can represent a severe risk to water quality.

Guidelines for the Handling and Disposal of Construction and Demolition Waste, 2016

Aims to regulate the management of construction and demolition waste, which can leak pollutants into bodies of water if not properly managed.

Plastic Waste Management Regulations, 2016:

Dedicated to the management and control of plastic garbage, which can pollute aquatic bodies when it accumulates.

2016 Solid Waste Management Rules:

These laws include all sorts of solid waste management, including steps to prevent water pollution through garbage disposal and landfill management.

These Pollution Control Acts and Rules establish the legislative framework in India for regulating and preventing water pollution. They give recommendations and standards for various industries and types of waste in order to preserve water quality and the environment from contamination. Effective implementation and enforcement of these standards are required to combat water pollution and promote environmentally sustainable behaviors.

In the chapter "Water Resources and Water Pollution in India; Types, Evolution, Usage, and Survival Issues—An Overview of Different Indian States with Emphasis on Delhi/NCR," it is critical to emphasize notifications relating to water pollution or water conservation in India. These notifications are essential components of the legislative and regulatory frameworks intended to handle water-related challenges. Referring these notices throughout the chapter will provide a complete overview of the mechanisms in place to prevent water pollution and improve water conservation habits in various locations, particularly Delhi/NCR.

2.15. Notifications Related to Water Pollution in India

I. Central Pollution Control Board (CPCB) Guidelines:

The CPCB provides rules and directives on a regular basis to help prevent and control water pollution. These rules, which govern the discharge of

industrial effluents and municipal waste water, are crucial for ensuring water quality throughout states.

II. National Green Tribunal (NGT) Orders:

The NGT plays an important role in enforcing environmental regulations and has issued several notable orders regarding water contamination. These orders frequently require the cleanup of rivers and lakes and impose harsh penalties on polluters.

III. Bureau of Indian Standards (BIS) for Drinking Water:

The BIS updates and notifies drinking water quality specifications on a regular basis. These guidelines ensure that drinking water meets fundamental safety requirements.

2.16. Notifications Related to Water Conservation in India

Proposed legislation titled "Groundwater Conservation, Protection, Regulation, and Management Act of 2016" This model legislation offers a structure for states to create laws for the management of groundwater, with a focus on the significance of conserving and utilizing subterranean water resources in a sustainable manner.

I. Jal Shakti Abhiyan:

The Ministry of Jal Shakti launched this program to promote water conservation and security. Notifications issued under this effort encourage rainwater collecting, water conservation techniques, and the rehabilitation of traditional water bodies.

II. Smart Cities Mission:

Notifications under this goal include suggestions for incorporating sustainable water management methods into urban development. This

includes the implementation of advanced water recycling and reuse technology in smart cities.

2.17. Specific Notifications for Delhi/NCR

I. Delhi Jal Board (DJB) Water Conservation Notifications:

The DJB issues notifications that mandate the use of water-saving devices in households and industries. It also promotes policies for rainwater harvesting systems in all new buildings as a part of building regulations.

II. Yamuna River Cleaning Project:

Notifications regarding the cleaning and rejuvenation of the Yamuna River, which is crucial to reducing water pollution in the Delhi/NCR region. These require collaboration across numerous state governments and central agencies.

III. Ban on Single-Use Plastics:

Specific notices aimed at prohibiting single-use plastics, which contribute significantly to water contamination. The implementation of these regulations is critical for preserving urban water bodies from non- biodegradable garbage.

Chapter 3

RIGHT TO WATER

Due to the intervention of the judiciary, the protection and promotion of the right to food in India has made substantial progress. Every individual in India possesses the fundamental entitlement to exist, and this guarantee is safeguarded by Article 21 of the Indian Constitution. This entitlement encompasses the freedom to consume food. The right to proper nutrition is considered one of the fundamental human rights by India's highest court. The court's acknowledgment of the justiciability of the right to food not only reinforced its protection, but also provided state governments with guidance on how to effectively execute food programs and ensure that kids in public schools have access to lunches in the classroom. (Right to Food - a Fundamental Right | National Human Rights Commission India, n.d.).

The current information available is inadequate to determine whether the right to food can be expanded to encompass the right to water under the right to life. The present expansion is currently under evaluation as a viable alternative. The right to water can be enhanced by recognizing that its protection encompasses both preventative actions to avoid violations and proactive efforts to ensure access. This expansion would cause the state to breach its constitutional duty to actively provide water to areas lacking access to safe drinking water. Such a commitment would encompass a broader scope of issues beyond simply preventing access denials.

By employing the same reasoning that protects the Right to Food, we may extend the scope of the Right to Life to include the entitlement to water. Given this circumstance, it is the responsibility of the state to go beyond simply safeguarding

its citizens from water scarcity and actively take measures to ensure that individuals in areas with little or no access to water may obtain clean drinking water. (Right to Food - a Fundamental Right| National Human Rights Commission India, n.d.).

To summarize, if the Right to Life is understood to include proactive measures, the government would be obligated to pass laws ensuring access to water, just as it is required to give food to those who require it. This perspective argues that it is possible for the basic rights of each person, equitable allocation of resources, and the concept of social justice to exist together.

To incorporate the Right to Water into the existing framework of the Right to Food, the judiciary must undertake thorough legal research and analysis. It is essential to remember that many individuals can have differing interpretations of the law. Recognizing access to clean water and food as essential human rights could significantly aid India in protecting the welfare and dignity of its people.

The constitutional law of South Africa has significantly influenced my research. The Bill of Rights ensures the entitlement of enough sustenance and hydration for every inhabitant. A crucial consideration is the dependence on resources provided by the government and the implementation of this entitlement. Moreover, the study explores the issue of whether the government is obligated to guarantee a fundamental water supply even in times of limited financial resources. Additionally, it analyzes the duties of water-providing organizations in relation to reductions in water delivery. The main objectives of this chapter include providing answers to these questions. (Right to Food - a Fundamental Right | National Human Rights Commission India, n.d.).

The primary objectives of this study are to determine if the right to water is dependent on state resources and to assess the effectiveness of its enforcement in India. This investigation's methodology will be based on the constitutional

principles of South Africa. This comparative analysis aims to elucidate potential strategies for fortifying India's legal framework and enhancing the robust enforcement of the right to water. More precisely, the examination will concentrate on India.

The study examines the minimum criteria that water providers must satisfy prior to discontinuing water services, which is a crucial factor in assessing their legal responsibilities. This study examines the ethical and legal challenges associated with discontinuing water distribution, with a focus on ensuring that the most vulnerable individuals have access to this essential resource. It also outlines the necessary measures to overcome these concerns. In addition, the author contemplates the provision of a fundamental water supply by the state, even in situations of limited resources. Are state responsibilities immutable and rigid, irrespective of resource constraints? This is the question that it seeks to address. The objective of this study is to provide insights into potential remedies for water scarcity and to affirm the recognition of access to water as a fundamental human entitlement. An examination of previous instances in the Indian and South African contexts will facilitate the accomplishment of this objective. (Right to Food - a Fundamental Right | National Human Rights Commission India, n.d.).

This study seeks to explore the significant issues of water rights and social justice by analyzing relevant legal frameworks and case studies. By doing so, it wants to contribute to the ongoing discussion on these topics. It seeks to ensure that everyone, regardless of their socioeconomic level, has the right to obtain clean drinking water by advocating for strong legislative safeguards, equitable distribution of resources, and responsible governance. (Kothari, n.d.).

The right to water was acknowledged as a fundamental human right by United Nations General Assembly Resolution 194 in 2010. This right is vital for ensuring

people's safety and respect (Palmer et al., 2018). An uncontaminated, reasonably priced, and easily obtainable water source is essential for the survival, well-being, and progress of humanity. Pollution, water scarcity, and inequitable access are significant global issues that continue to disproportionately affect marginalized and disadvantaged populations. The global community continues to grapple with these issues. This chapter will present a comprehensive overview of the right to water, focusing on social justice, sustainable development, and human rights. It will discuss the origins of this right, its current legal status, and its significance.(Angel & Loftus, 2019).

Cases on Right to water

Subhash Kumar v. State of Bihar (1991)

This discussion is related to the Supreme Court of India's decision in Subhash Kumar v. State of Bihar, which recognized the right to a clean environment and said that Article 21 of the Indian Constitution includes the right to clean drinking water. The judge's major decisions are listed below (S. Kumar et al., 1991).

Cleaning up the environment: The case showed how important it is to keep the environment clean to protect Article 21 of the Indian Constitution, which says everyone has the right to life. The court stressed how important a healthy environment is for people's dignity and how it is part of the basic right to life.

The Supreme Court, in its ruling to broaden the definition of the right to life, incorporated the right to receive uncontaminated drinking water within its purview. Inclusion of this component in the package was a measure to ensure the right to access safe drinking water. Every individual possesses an inherent entitlement to obtain potable water in order to safeguard their well-being and contentment, and this agreement recognizes and affirms this fundamental entitlement.

Making sure that everyone can get clean water to drink: In the first hearing of the case, which took place in the state of Bihar, the court told the state it had to do what it needed to do to give the affected districts safe drinking water. This order makes it clear that the people of this country must have access to clean water so that they can meet their most basic needs.

The case of Subhash Kumar v. State of Bihar is an example of a PIL. In these kinds of cases, the court either decides to handle the matter itself or accepts petitions from people who have a stake in the result. When it comes to India, public interest lawsuits have been very important for protecting people's rights and fixing social and environmental problems.

People say that cases like Subhash Kumar v. State of Bihar set a very important standard. This decision specifically acknowledged the right to clean drinking water as a part of the more general right to life. This decision in India has had a big effect on individual rights, protecting the environment, and human rights. This event shows the court's role in protecting people's rights and putting pressure on the government to deal with environmental problems, like making sure everyone has access to clean water for drinking. In an unusually strong way, it says that the government must prioritize the well-being of its citizens and guarantee their basic wants, such as having access to clean water. The right to life and the dignity of each person rest on this.

Narmada Bachao Andolan v. Union of India (2000)

The Supreme Court affirmed that access to uncontaminated water is a vital concern, despite the primary focus of this case being the displacement of individuals due to the construction of the Sardar Sarovar Dam on the Narmada River. As per the court's ruling, it is imperative to promptly provide those impacted with an expedited

provision of potable water (Narmada Bachao Andolan vs Union Of India And Others on 18 October, 2000, n.d.).

Rural Litigation and Entitlement Kendra v. State of Uttar Pradesh (1985)

The authorities were told to make sure that the affected areas had access to clean drinking water by building reliable infrastructure for water supply. The case was mostly about environmental problems caused by mining in the Doon Valley. One of the rights at issue was the right to drink clean water, which is a part of the right to life.

The construction of the Sardar Sarovar Dam on the Narmada River led to the displacement of several individuals, which was the main cause for the Narmada Bachao Andolan to initiate legal action against the Union of India in 2000. During the hearings, the Supreme Court of India reiterated the importance of protecting the right to life, as stated in Article 21, which encompasses the right to access potable water. As per the court's ruling, individuals are entitled to access uncontaminated water, which is crucial for their survival and self-esteem. The court's verdict emphasized the importance for the relevant authorities to ensure that the displaced individuals impacted by the dam's development be granted access to facilities that offer them safe water. Individuals who have been forcibly transferred have the right to certain entitlements, including the fundamental right to access water. This order emphasized the cruciality of safeguarding those rights from any violation. Each and every stage involved in the process of developing and enhancing objects must adhere to this entitlement.

Rural Litigation and Entitlement Kendra v. State of Uttar Pradesh (1985)

A Legal Matter Involving Rural Entitlement and Legal Disputes In 1985, a dispute arose between the state of Uttar Pradesh and the Kendra group about environmental issues caused by mining activities in the Doon Valley. In addressing these environmental issues, the Supreme Court of India recognized that, in line with Article 21 of the Constitution of India, the right to life encompasses the entitlement to consume water that is devoid of harmful elements.

Pursuant to the court's decision, the government was obligated to take appropriate action to reinstate the water supply in the areas that had suffered environmental deterioration due to previous mining operations. This sequence revealed several significant concepts, among which the foremost was the state's responsibility to safeguard the well-being and security of its inhabitants, with a particular focus on ensuring that all residents, irrespective of their location, possess the entitlement to access potable water that is devoid of any impurities.

Narmada Bachao Andolan v. Union of India (2000)

The Narmada Bachao Andolan v. Union of India (2000) and the Rural Litigation and Entitlement Kendra v. State of Uttar Pradesh (1985) cases are significant legal judgments that emphasize the vital role of the court in acknowledging the right to access clean drinking water as an essential aspect of the right to life. Both of these instances were confirmed to have taken place in the year 2000. Throughout its history, the Indian judiciary has constantly shown that the ability to access uncontaminated and secure drinking water is a fundamental human right. These rulings provide as substantiation for this claim. Furthermore, the rulings rendered by the judicial system members have significantly influenced the laws and

procedures currently in effect. Notably, in prominent cases like Rural Litigation and Entitlement Kendra v. State of Uttar Pradesh (1985) and Narmada Bachao Andolan v. Union of India (2000), the Supreme Court of India has made decisions that unequivocally showcase its dedication to upholding the fundamental human entitlement of access to safe drinking water. These pivotal legal rulings, which recognized water as an essential human right, have significantly influenced the current regulatory framework governing water access in India.

According to Article 21 of the United States Constitution, individuals have the entitlement to life, which encompasses the entitlement to access water that is devoid of any potentially detrimental substances. The Supreme Court delivered a ruling that finally strengthened the legislative framework for resolving water-related issues and safeguarding public health nationwide. The court's opinion emphasizes the importance of public health, human dignity, and access to clean water, especially for individuals who have been severely impacted by climate change and development.

In addition, the rulings that were made in instances like these demonstrate the court's commitment to social justice as well as its obligation to protect the rights of persons who are economically and socially disadvantaged. There has been a successful resolution of cases requiring equal protection under the law, and there have been actions done to reduce the imbalance in access to water and other essential resources. The authorities are now compelled to distribute contaminated water to communities and people who have been relocated as a result of environmental degradation in places that have been catastrophically affected by the deterioration of the environment.

Moreover, these cases have established noteworthy legal precedents and highlighted the crucial role of incorporating environmental and human rights factors into the operation of the judicial system. This has been confirmed by the provided

instances. As a result, they have contributed to the formulation of environmental protection laws aimed at enhancing the conservation of the natural environment and improving the quality of life for residents. The legal system plays a crucial role in advancing sustainable development principles by ensuring that building projects align with the rights and requirements of the individuals impacted by them. However, it is essential to bear in mind that there are still challenges to overcome in order to translate these court rulings into tangible measures. The acknowledgment of the right to water has made great progress as a result of these events; yet, it is important to keep this in mind. Close collaboration among all stakeholders, including the judiciary, government institutions, and civil society organizations, is important to enable the efficient implementation of these rulings. To guarantee that everyone has access to clean drinking water, it is crucial to create thorough legal frameworks, allocate sufficient financial resources, and actively involve the local community. Several important legal cases demonstrate the key steps taken to acknowledge and protect the right to access clean drinking water as a fundamental aspect of the right to life. The Indian government bears the accountability for both of these challenges. These verdicts unequivocally illustrate the court system's dedication to attaining the objectives of social justice, environmental sustainability, and the comprehensive protection of human rights. By ensuring widespread availability of water, it has established itself as a leading advocate for fundamental rights and an active agent in India's efforts towards fair and environmentally sustainable development. This represents a noteworthy accomplishment for the legal system (Narmada Bachao Andolan vs Union Of India And Others on 18 October, 2000, n.d.).

3.1.Historical Development of the Right to Water

In recent years, the idea of legally providing humanity the right to water has emerged as a relatively new concept that has evolved throughout time. The origins

of water's significance can be traced back to ancient traditional and indigenous law systems, which recognized the vital role that water plays in the ongoing existence of humans. Furthermore, it is possible to reconstruct the origins of the importance of water. From the start of the modern era, international human rights law has increasingly emphasized that access to water is a fundamental human right. This is due to the generally held belief that water is indispensable for the survival and well-being Rural Litigation and Entitlement Kendra v. State of Uttar Pradesh (1985) and Narmada Bachao Andolan v. Union of India (2000) of humanity. In 1948, the General Assembly of the United Nations officially approved the Universal Declaration of Human Rights, which explicitly recognized the entitlement to uncontaminated water as a fundamental human right. This entitlement encompasses the right to a standard of living that is deemed satisfactory in order to support the maintenance of one's health and overall state of well-being. Several subsequent international human rights treaties, including the Convention on the Rights of the Child and the International Covenant on Economic, Social, and Cultural Rights (ICESCR), recognized the right to water as a crucial element of the right to a satisfactory standard of living. These treaties facilitated this acknowledgment. During the 1990s, both of these treaties were officially approved and adopted. According to the legislation, the right to obtain water is considered to be a fundamental part of the right to adequate living conditions. In other words, the law granted the freedom to acquire water (Planning Journal & Acey, 2016).

3.2.Legal Framework of the Right to Water

Within the field of international human rights, several agreements exist that recognize and protect the entitlement to an adequate amount of water. These agreements are the essential basis of the legal structure that upholds the right to receive water, which is vital to sustain that right. Many countries have agreed to ratify the International Covenant on Economic, Social, and Cultural Rights

(ICESCR), indicating that the right to water is a crucial aspect of the right to a suitable standard of living. According to Article 11 of the International Covenant on Economic, Social, and Cultural Rights (ICESCR), the states that have agreed to the covenant are obligated to guarantee that every person has fair and equitable access to clean water that meets the required standards in terms of both amount and quality for domestic purposes. This implies that there is an absence of any form of discrimination. Consequently, there is an absence of any form of discrimination. Moreover, it is incumbent upon the States Parties to implement measures aimed at preventing and reducing water contamination. This is an extra point of attraction (Fantini, 2020) (International Covenant on Economic, Social and Cultural Rights | OHCHR, n.d.).

In addition to international human rights treaties, legislative systems at the regional and local levels also recognize the right to water as a fundamental human right. This is also true. Both the African Charter on Human and Peoples' Rights and the Inter-American Convention on Human Rights acknowledge that the right to access water is an essential and inherent human right. This is an exemplary illustration because it displays the acknowledgment of this right in both of these documents. Furthermore, the acknowledgment of the entitlement to water has been integrated into the laws, regulations, and fundamental laws of a substantial number of nations (Heyns, 2003).

The Constitution ensures that every person has the entitlement to live in an environment that promotes well health. The Supreme Court of India's verdict in the 1991 landmark case of Subhash Kumar v. State of Bihar had a profound impact on the implementation of environmental law across the country. Subhash Kumar, the petitioner, initiated a public interest lawsuit (PIL) to advocate for the closure of a tannery in Bihar state. The tannery was involved in unsafe and hazardous practices.

Throughout its ruling, the Supreme Court of India stressed that Article 21 of the Constitution of India safeguards the right to life, which includes the right to a secure and conducive environment. This was a crucial factor in the decision. The court recognized that pollution and environmental degradation had a direct influence on the physical and mental health of individuals. Furthermore, the court emphasized that safeguarding and enhancing the environment is the principal duty of the government, with the aim of benefiting the inhabitants, referred to as the population. The court emphasized the need of achieving sustainable growth and ultimately determined that it could not endanger the health and safety of persons or the natural environment. This was the court's verdict. The "polluter pays" principle was introduced, which asserts that the party responsible for producing pollution is also accountable for the costs associated with remediation and restoration of the affected area. This idea was formulated in relation to the principle of "polluter pays." (Subhash Kumar vs State Of Bihar And Ors on 9 January, 1991, n.d.).

The case of Subhash Kumar is usually considered highly significant in Indian environmental law as it established a precedent that had not been set before. Based on the circumstances of this case, it was concluded that the right to a pollution-free environment constituted a fundamental entitlement. This lawsuit set a precedent for further judicial processes and legislation aimed at addressing problems related to pollution prevention and environmental damage. This ruling has highlighted the court's aggressive approach in preserving human rights and the environment. Consequently, this decision has enabled India to implement an economic development plan that is both ecologically conscious and sustainable. The case of Subhash Kumar is largely considered to be highly significant in Indian environmental law as it established a precedent that had not been set before. Based on the circumstances of this case, it was concluded that the right to a pollution-free environment constituted a fundamental entitlement. This lawsuit set a precedent for

further legal actions and laws aimed at addressing problems related to pollution control and environmental damage. As a result, this decision revealed the court's proactive stance in protecting human rights and the environment, thereby paving the way for India to embrace a more sustainable and environmentally friendly approach to economic development (Subhash Kumar vs State Of Bihar And Ors on 9 January, 1991, n.d.).

3.3.Importance of the Right to Water

The preservation and realization of other fundamental human rights, such as the right to life, the right to adequate nourishment, education, and housing, as well as the right to access water, is extremely important. These rights encompass the entitlement to access and utilize water. Access to clean water is crucial for reducing the spread of waterborne diseases and enhancing overall health and well-being. Moreover, it is crucial for the preservation of sufficient sanitation, hygiene, and well-being. This is an additional point of interest. Marginalized and vulnerable populations, including women, children, indigenous tribes, refugees, and persons with disabilities, may suffer disproportionately from the scarcity of water. This is due to the abundance of water as an easily accessible resource. This disparity arises from the varying vulnerability of different populations to the repercussions of water scarcity. Moreover, there is a possibility that this could lead to violations of the human rights of these individuals, exacerbating the existing imbalances (Sanico, 2019).

The harm not only intensifies, but it also becomes increasingly difficult to manage because to the significant correlation between the right to access water, the advancement of sustainable development, and the safeguarding of the environment. Despite its scarcity, water is vital for the operation of ecosystems, as well as for agriculture, industry, and the production of energy. Water plays a crucial role in the

generation of electricity. To effectively achieve the Sustainable Development Goals (SDGs), it is imperative to ensure universal and sustainable access to water inside the United Nations. In order to accomplish Sustainable Development Goal 6, it is crucial that every individual has access to water and sanitation services that are both readily available and environmentally beneficial (Chowdhary et al., 2020).

The right to access water is intricately linked to issues of social equity, and due to the intricate interplay between these factors, a comprehensive investigation is required. Water scarcity and contamination often result in disparities in social, economic, and environmental conditions, disproportionately impacting marginalized groups compared to other communities. By embracing the concept of the "right to water" as a fundamental principle, it is possible to address inequalities, promote fairness, and enable marginalized groups to take part in the decision-making processes concerning the management and regulation of water resources. Every single one of these results is a potentiality (Ezell et al., 2021).

3.4.Scope and Limitations of the Right to Water

The concept of the right to water encompasses various substantial and procedural elements. An individual's exercise of their right to water is contingent upon several factors, such as the presence and amount of water, societal approval, and the quality of accessible water. The state of having a plentiful supply of water resources that are readily accessible for human consumption is known as "availability." In this usage, "availability" denotes the condition of having a substantial quantity of something accessible. In order for water and water infrastructure to be deemed accessible, they must be easily obtainable by all users in an equitable manner and be financially viable. This enables them to be regarded as approachable. Ensuring accessibility is crucial, and it is vital that this criteria is met. When we discuss water being deemed acceptable, we are referring to the state in which it must prove that it meets cultural

standards on its quality, acceptability, and safety. There is a significant correlation between the notion of "acceptability" and the concept of "acceptability," which pertains to the necessity for water to adhere to the water quality requirements set by the World Health Organization (WHO) in order to be considered suitable for consumption. This criterion is utilized to ensure that water fulfills its designated function (Pace, 2019).

A government must meet its responsibilities by enacting laws that provide universal access to water and foster inclusive, transparent, and responsible governance and management of water resources. Governments have a duty to take necessary measures to ensure the right to water, as required by the right to water itself. Furthermore, state governments have the obligation to ensure that every people, regardless of their location, has unrestricted access to water. States are obligated to enforce supplementary measures to prevent and manage water pollution, ensure fair distribution of water resources, and give priority to the requirements of marginalized and disadvantaged communities (Neves-Silva et al., 2019).

Nevertheless, although every individual possesses the entitlement to utilize water, certain members of society may encounter limitations in accessing any accessible water. Although the right to water does not provide unlimited access to an infinite number of water resources, it does offer a consistent framework for resolving water-related challenges. Although the right to water does not provide these advantages, this claim contradicts the actual situation. Instead, it addresses the issue of water-related challenges by devising a methodology to resolve them. These states encounter challenges in efficiently addressing water allocation, water scarcity, and water pollution due to conflicting interests. These obstacles manifest as challenges. Water pollution is a significant issue that raises alarm. Moreover,

although corporations and international organizations are entrusted with the duty of protecting and maintaining the right to water, this right does not impose stringent obligations on these entities (Herrera, 2019).

3.5.Current Challenges and Emerging Issues

While it is indeed a fact that everyone has a legal right to water, there are several obstacles that must be addressed in order to ensure universal access to water that is both economical and uncontaminated. Ensuring cheap access to water for everyone can only be achieved through this method. Numerous persistent issues adversely affect numerous global areas and communities. These issues encompass environmental depletion, unfair water distribution, and inadequate water supply. Multiple factors contribute to the exacerbation of these issues. Several issues contributing to this situation include climate change, population growth, increasing water demands for agriculture, industry, and urbanization. Furthermore, disputes about water resources, the monetization of water utilities, and the lack of suitable infrastructure and administrative protocols are all hindrances that impede the efficient fulfillment of the right to water in its entirety. These impediments hinder the attainment of the right to water (Ozano et al., 2022).

When it comes to exercising the right to water, it is possible for new problems to arise, making conditions more difficult than they would be otherwise. The cross-border ramifications of water concerns, the increasing commodification and commercialization of water, and the influence of new technologies on water management are among the challenges that require attention and resolution. Furthermore, this category encompasses the repercussions of water challenges that extend beyond national boundaries. Due to the complex relationship between the right to water and factors like gender, age, color, ethnicity, and other considerations, it is crucial to implement a comprehensive and inclusive strategy to ensure that

everyone is included in the discussion and no one is left out. Implementing such a technique would guarantee the inclusion of every individual in the conversation without exception (Walker, 2019).

The objective of this study is to examine the current conditions, as well as the difficulties and emerging issues associated with the right to water, in order to understand the existing state of affairs. The purpose of this study is to assess the current status of the right to water, considering its crucial importance in relation to human dignity, well-being, sustainable development, and social justice. More precisely, the assessment will concentrate on the present state of the entitlement to get clean water. The aim of this study is to enhance individuals' understanding of the right to water as an essential human entitlement, and to explore the consequences of this right for activism, practice, and policy on a global scale. In order to attain this purpose, it is crucial to conduct study on the historical context, legal status, and relevance of the right to water. The second phase of the study will primarily involve conducting an inquiry into the historical development of the right to access water.

The diverse range of stakeholders engaged in the governance, administration, and safeguarding of human rights related to water may consider the results of this study to be highly important. This is because the results of this investigation have the potential to be highly advantageous. Stakeholders encompass decision-makers in the government, international organizations, groups representing civil society, and any other relevant parties. Any additional pertinent entities are also regarded as stakeholders. This inquiry may reveal the challenges and shortcomings associated with the implementation of the right to water. There is a possibility that this will happen. In addition, it may encompass suggestions for modifications to both rules and practices that would enable the realization of this right for all individuals and

organizations, especially those who are marginalized and marginalized from the process. This right would apply universally to all individuals and groups.

Based on the principles of fairness, neutrality, and the inherent worth of each individual, every human being has an inherent and inviolable entitlement to water. This assertion is based on the fundamental concepts of fairness and neutrality. These international human rights agreements have recognized and established the right to water as a fundamental human right, thereby gaining acceptance and support for it. When we state that the discussion "encompasses," we mean that both the technique and the subject are covered within the scope of the discourse. The content considers various factors, including the water's acceptability, availability, and quality. Furthermore, it necessitates the creation of a water governance system that is characterized by democracy, accountability, and transparency in its operations (Sanico, 2019).

Although everyone possesses a legal entitlement to water, numerous barriers persist that hinder universal access to water that is both clean and affordable. Water scarcity, pollution, and uneven access to water persist as significant issues, especially in emerging nations and among marginalized populations. The occurrence of climate change, caused by the shifting patterns of rainfall, depletion of water sources, and increasing water stress in various locations, exacerbates these challenges (Berghs et al., n.d.).

In order to fully realize the right to water, it is imperative to surmount other obstacles. These concerns encompass the governance and oversight of water resources. The challenges individuals encounter in accessing water are attributed to insufficient infrastructure, ineffective governance frameworks, and a lack of transparency and responsibility in water management. Concerns have been raised regarding the justice and affordability of water supplies due to the growing

commoditization and privatization of water services. Furthermore, there is a potential for the prioritization of profit over the protection of human rights. These problems have arisen due to the privatization of water utilities. Several challenges related to transboundary water management, including disputes over shared water resources, complicate the implementation of the right to water.(Romano & Akhmouch, 2019).

Emerging concerns are also arising over the impact of new technologies on the governance of water resources, posing a potential challenge to the fundamental right to access water. These rising concerns exemplify new issues. Although technological advancements provide potential to improve water management and access, they also raise concerns over privacy, data ownership, and equitable distribution of benefits. Despite the possibilities brought about by these technical advancements, they also give rise to this scenario. Furthermore, it is crucial to prioritize a higher level of focus on the gendered dimensions of the right to water and to actively implement effective measures in response. Women and girls often experience a disproportionately negative effect due to both inequality and water scarcity. Consequently, this aspect of the entitlement to water necessitates deliberate attention and intervention to mitigate the adverse consequences of these conditions (Di Baldassarre et al., 2019).

To ensure the fulfillment of the right to water, it is crucial to implement a strategy that is both broad and inclusive. Implementing a human rights-based approach to the governance and management of water resources is a strategy that can be used to eventually attain this goal. To attain this objective, it is imperative to ensure that the laws, regulations, and procedures pertaining to water adhere to the concepts and criteria of human rights. This can be achieved by ensuring that all laws, procedures, and practices pertaining to water are in accordance with the principles and values of

human rights. This is an achievable task. Furthermore, it encompasses the advancement of transparency, responsibility, and engagement in the decision-making procedures linked to water resources. When addressing issues such as water scarcity, pollution, and inequality, it is imperative to prioritize the rights and interests of vulnerable and disadvantaged populations. Encompassed within this category are some demographics that are particularly susceptible to harm, comprising the following: At-risk populations, such as women, children, indigenous communities, and refugees (Jiménez et al., 2019).

In addition, enhancing the availability of justice institutions such as courts, tribunals, and other complaint procedures could enable individuals and communities to lodge complaints against those who infringe upon their legal entitlements to water. These institutions offer access to the judicial system. Facilitating access to the legal system can provide valuable aid in this problem. International collaboration and unity can be crucial in enhancing the enforcement of the right to water, especially in nations grappling with significant water scarcity. This is particularly accurate in areas where water is most scarce. This is particularly accurate in areas where there is a substantial water scarcity issue. Developing countries might get two kind of assistance: financial support and technical assistance (Jetschke, 2019).

Access to clean water is essential for upholding human dignity, fostering well-being, and advancing human development. It is considered a fundamental human right. Furthermore, it is vital for the progress of the human species. It is important to note that international law acknowledges the right to access water as a fundamental human right. Although significant efforts have been made to address the issue, numerous challenges still remain in achieving the goal of providing affordable and accessible clean water to all. In order to address these concerns, it is necessary to implement a water governance system that follows a human rights-

based approach that emphasizes openness, accountability, and participation. Furthermore, it is imperative to implement these principles. Furthermore, it is necessary to conduct measures aimed at enhancing international collaboration, ensuring access to justice, and addressing issues related to gender equality. By advocating for the realization of the right to water, we have the capacity to contribute to the establishment of a more equitable, environmentally-friendly, and fair world. This is an achievable task. Once this goal is achieved, it will guarantee the protection and full compliance of every individual's right to access water.

3.6.Examines the current status of the right to water, including global and regional trends, challenges, and emerging issues.

Various regional and global trends, obstacles, and emerging issues impact the realization of this fundamental human right. The contemporary state of the right to water is characterized by a complex landscape, encompassing both local and global patterns, challenges, and emerging issues. This is due to the subject's perpetual evolution. However, although the universal recognition of the right to water exists, numerous challenges have to be overcome, and new issues continue to emerge regularly. Currently, these variables impact the governance and oversight of water resources (Chaitkin et al., 2022).

The global progress in recognizing the right to water suggests that some countries have achieved achievement, but it also suggests that there are ongoing challenges. According to predictions from the United Nations (UN) for the year 2021, over two billion people lack sufficient amounts of clean drinking water, while over four and a half billion people do not have access to it. The provision of affordable, reliable, and safe water to all residents remains a concern, especially in rural and economically disadvantaged regions of many countries. This is particularly accurate in regions that experience economic deprivation. Various variables that contribute

to the exacerbation of social inequality include disparities in access to water based on income, gender, ethnicity, and geography (Guest, 2019)(Chaitkin et al., 2022).

Several factors are responsible for the growing competition for water resources. The aforementioned challenges encompass population increase, urbanization, industrialization, and climate change. Another global pattern is seen here. Several areas are seeing a rise in water stress and scarcity, leading to environmental degradation, conflicts over water distribution, and concerns about food security and livelihoods. These problems are leading to environmental degradation. The challenges are intensifying due to the ramifications of climate change, which are affecting both the availability and the quality of water. This is occurring as a result of alterations in precipitation patterns, the melting of glaciers, and rising sea levels (Guest, 2019)(Chaitkin et al., 2022).

Furthermore, the privatization and commercialization of water resources remain contentious topics. This is an extra point worth noting. Several persons have expressed concerns about the lack of fairness, inclusivity, and the prioritization of financial profit over human rights. However, there are those who argue against this viewpoint, even though some believe that the involvement of the private sector can enhance water management by increasing economic efficiency and investment. The ongoing examination and debate revolve around the challenge of striking a balance between water governance models that prioritize human rights and those that emphasize market orientation. Various factors, including geography, sociopolitical climate, and economic conditions, contribute to the regional variations in the right to water. Although certain areas continue face challenges, progress has been achieved in other regions in terms of water accessibility. In regions such as Europe and North America, the availability of improved water supplies and sanitary amenities is often abundant. Nevertheless, there persist instances of unfairness,

specifically towards individuals who are marginalized, a phenomenon that is particularly prevalent in the United States. However, providing basic water and sanitation services in regions like sub-Saharan Africa, South Asia, and specific parts of Latin America, especially in rural and remote areas, is exceedingly challenging. This is particularly true when it comes to the delivery of water and sanitation services (Ram & Irfan, 2021).

The recognition of the interrelationships between water and other fundamental human rights, such as the right to health, the right to food, and the right to culture, is a recent and prominent focus within the right to water movement. This is one of the most recent subjects that has been raised. An all-encompassing approach to the administration of water resources is absolutely essential, considering the interconnectedness of these entitlements. It is crucial that this plan be prepared. This plan should reflect the prevailing social, economic, cultural, and environmental aspects. Due to the disproportionate impact of water shortages and inequality on women and girls, as well as the necessity of gender-responsive solutions for fair access to water, there is growing attention towards the gendered aspects of the right to water. Nevertheless, this level of attentiveness is insufficient.

Regarding the right to water, I believe that the current situation reflects the patterns, obstacles, and issues happening both domestically and globally. Despite tremendous improvements in water supply in many places of the world, there are still substantial challenges that need to be solved. The challenges encompass a scarcity of accessible water, inequitable resource distribution, the privatization of services, and the repercussions of climate change. The intricacies of the right to water are further emphasized by the emergence of subjects such as the interrelationships between water and other fundamental human rights, as well as gender-related concerns. Effective water governance solutions that encompass

several sectors, involve active participation, and prioritize human rights are crucial for addressing both current and future difficulties, including those that are currently evolving. Furthermore, these policies should prioritize the equitable and sustainable provision of water, while also addressing the specific requirements of marginalized and susceptible populations.

3.7.Analyzes the implications of the right to water for policy, practice, and advocacy, including case studies and examples of good practices

The affirmation of the right to water has a significant impact on activism, praxis, and policy at several levels, ranging from local to global. This effect is observable at every level. The principles and norms that are stated in the right to water can be seen as a framework that can be utilized for decision-making, planning, and implementing water-related policies and practices. To provide universal access to water, this measure is implemented.

Exemplary methods case studies, include the following: In the present reality, the acknowledgment of the entitlement to water has been demonstrated to have yielded favorable outcomes, as substantiated by several performed case studies. For example, when the right to water was included in Uruguay's national constitution, it resulted in improvements such as better water quality, decreased water inequality, and increased water access for rural communities. In Finland, the right to water has been successfully implemented through the implementation of a pricing mechanism that steadily increases over time. The primary duty of this organization is to guarantee universal access to water at an economically feasible rate, while also advocating for water conservation and environmental sustainability. The use of a participatory approach to water management through the Moroccan Water for Life initiative has led to an augmentation in the accessibility of water in rural regions. Additionally, this approach involves the incorporation of local communities in

decision-making processes and providing support for community-based water management solutions (Silva et al., 2020)(Jiménez et al., 2019).

The acknowledgement of the entitlement to water can have a quantifiable influence on the results, as seen by these instances of commendable strategies, which relate to legislation, protocols, and promotional efforts around water availability. This is applicable to every single one of these tasks. There is a potential for governments and other stakeholders to assume greater responsibility as a result of this. Moreover, this might potentially lead to enhanced water accessibility for groups that are susceptible to experiencing discrimination and vulnerability (Jiménez et al., 2019).

The recognition of the right to water has significant implications for activism, practice, and policy when considering its comprehensive scope. The benefits of it include its effectiveness in advocacy, its provision of a normative framework for water legislation, and its guidance for local water management practices. The acknowledgment of the right to water has directly resulted in some advantageous consequences, which have occurred as a direct consequence of the acknowledgment. The benefits of increased accountability, participatory water management, and improved access to water are advantageous for several reasons. The acknowledgment of these practices has led to the observed results as evidenced by case studies of effective strategies. However, there are still challenges that must be addressed, especially in areas with insufficient infrastructure, limited resources, and conflicting interests. These obstacles encompass difficulties related to the execution, supervision, and application of the right to water. These considerations encompass legal issues. The right to water is a fundamental human right. Furthermore, since it continues to gain recognition globally, ongoing endeavors are being undertaken to

bolster and safeguard it. This is an ongoing procedure concerning the continued implementation of the right to water.

3.7.1. Policy Implications

The right to water can serve as a normative framework or guideline for the development of water-related policy at the national, regional, and municipal levels. This framework enables operations at all levels. This commitment necessitates the formulation and implementation of policies that guarantee equitable and unbiased availability of water, give priority to persons who are susceptible and marginalized, and foster sustainability and environmental preservation. Simultaneously implementing these policies is crucial. To guarantee universal access and affordability of water, particularly for persons with limited financial resources, policy interventions such as water pricing, subsidies, and limits might be employed. This would be a significant step towards achieving the goal of ensuring universal access to water. Studies undertaken in countries such as South Africa, Bolivia, and India have discovered that incorporating the right to water into national policies and legal frameworks can result in beneficial improvements in water governance. The results of the case studies validated these conclusions. If this were to happen, it would support the idea that access to water is an inherent right rather than a commodity that can be bought and sold. Furthermore, it is possible that the right to water could impact the administration of water resources. The objective is to engage all pertinent stakeholders, particularly impacted communities, in the decision-making process by implementing inclusive, transparent, and participatory water management techniques. Through the implementation of initiatives such as decentralized governance, participatory water planning, and community-based water management, local communities are given the power to actively engage in the

management of water resources. A participatory water management system was created in the state of Ceará, located in Brazil, as an illustration. This system enabled the participation of local residents in the decision-making process, resulting in improved ability to withstand drought, more access to water, and decreased conflicts.

3.7.2. Advocacy Implications

Civil society organizations, human rights organizations, and underprivileged people can all gain advantages from the recognition of the right to water, since it offers a powerful tool for advocacy that can be utilized by these groups. It can be utilized to ensure that authorities and other parties are held responsible for their actions or omissions related to water. This is a feasible task. Legal proceedings, public awareness initiatives, community organization, and engagement with legislators are all instances of advocacy measures that can be undertaken to support and insist on the enforcement of the right to water. Furthermore, alternative methods of promoting a cause involve leveraging social media platforms. The Latin American Water Justice Movement serves as a compelling example of its effectiveness in pushing for the right to water through its dedicated efforts. In nations like Bolivia, Uruguay, and Argentina, this movement has led to the alteration of legislation, the adoption of participatory methods of water governance, and the broadening of water accessibility.

3.8.Eliminating Discrimination and Inequalities in Access to Water and Sanitation

The fact sheet paper 35 on Right to Water from United Nations focuses on the topics of bias and inequality specifically in relation to water and sanitation. This highlights the worldwide problem of marginalization and exclusion, particularly affecting the impoverished, residents of informal settlements, individuals of various

genders, and other marginalized groups who are excluded from multiple elements of society. To address these issues, the text focuses on integrating international human rights law principles, such as non-discrimination and equality, into the inclusion of those responsible for fulfilling obligations and foreign aid for development. This is done to ensure that these difficulties are resolved effectively.

3.8.1. Human Water and Sanitation Rights

Every individual has the inherent entitlement to access water and sanitation services, ensuring their ability to obtain a sufficient, secure, satisfactory, physically accessible, and affordable water supply for personal and domestic purposes. The package comprises essential provisions such as drinkable water, sanitation amenities, laundry assistance, food arrangement, and personal grooming provisions. The right to sanitation ensures that persons have access to sanitation facilities that are secure, sanitary, safeguarded, and considerate of their dignity.

3.8.2. Discrimination Concept

Discrimination, in accordance with international human rights standards, encompasses any type of distinction, exclusion, or restriction that hinders individuals from fully and equally exercising their human rights. Discrimination can be classified into two distinct forms: deliberate policies that purposefully withhold individuals from accessing services or receiving fair treatment, and seemingly unbiased behaviors that effectively lead to the exclusion of some individuals.

3.8.3. Discrimination in Specific Situations

The fact sheet paper 35 on Right to Water from United Nations outlines some significant

issues:

I. Women and girls in several regions of the world bear significant responsibility for water-related tasks, resulting in inequitable access to water and sanitation services.

II. Multiple characteristics, such as race, ethnicity, religion, national origin, birth, caste, language, and nationality, can contribute to disparities in access to water and sanitation.

III. Individuals who are disabled, aged, or chronically ill face difficulties in obtaining water and sanitary facilities. These folks encounter challenges in acquiring these materials.

IV. Access to basic water and sanitation facilities can be challenging for individuals residing in informal settlements or experiencing poverty, mostly due to variables such as land tenure, location, economic standing, and social status.

3.8.4 State duties and progressive inequality reduction

According to the requirements of the constitution, states are required to gradually decrease disparities in water and sanitation. In order to provide a just and impartial distribution of services, it gives priority to the detection of discrimination and disparities, while also adhering to laws, regulations, goal-setting, and budget allocation. According to the requirements of the constitution, states are required to gradually decrease disparities in water and sanitation. In order to ensure fair and impartial delivery of services, it gives priority to identifying instances of discrimination and inequality, as well as complying with laws, rules, setting goals, and allocating funding. According to the requirements of the constitution, states are required to gradually decrease disparities in water and sanitation. In order to provide a just and impartial distribution of services, it gives priority to the detection of discrimination and disparities, while also adhering to laws, regulations, goal-setting,

and budget allocation. According to the requirements of the constitution, states are required to gradually decrease disparities in water and sanitation. In order to ensure fair and impartial delivery of services, it gives priority to identifying instances of discrimination and inequality, as well as complying with laws, rules, setting goals, and allocating funding.

3.8.5 Progress and Participation Monitoring

In order to ensure that states are actively striving to eliminate prejudice and inequality, it is essential to thoroughly evaluate the efficacy and efficiency of programs and policies. The importance of using participatory methodologies and including affected communities in the decision-making process cannot be overstated in relation to this project.

3.8.6 Conflict resolution and remedy

The primary emphasis is on resolving problems, guaranteeing the legal ability to enforce, and offering solutions for actions that are unequal and prejudiced. This refers to the responsibilities and remedies for violations of water and sanitation rights that occur on a widespread level.

3.8.7 Final thoughts and advice

Finally, the report argues that both governments and non-state actors are indispensable in ensuring the fulfillment of the rights to water and sanitation. Prioritizing the needs of the most disadvantaged and marginalized individuals is crucial to guaranteeing equitable access to rights for all.

3.8.8 Non-Discrimination Implementation Strategies

The proclamation emphasizes the necessity for focused endeavors to address and correct discrimination in the availability of water and sanitation. It requires:

I. Data disaggregation is essential for accurately evaluating bias and inequalities. This entails the gathering and scrutinizing of data in a manner that permits a thorough investigation of particular variables.

II. To ensure equity and impartiality in the provision of water and sanitation services, it is crucial to build policy and regulatory frameworks.

III. In order to foster an inclusive society devoid of discrimination, it is beneficial to educate the general populace about their rights to access water and sanitation, as well as the detrimental effects of prejudice.

IV. Community involvement refers to the active participation of local communities, particularly those who have been negatively impacted by prejudice, in the planning, implementation, and supervision of water and sanitation services.

V. Ensure that marginalized and discriminated people give priority to the distribution of resources.

3.8.9 Problems and Limits

The fact sheet paper 35 on Right to water from United Nations emphasizes certain challenges that must be resolved to eradicate discrimination in the domains of water and sanitation.

I. Both political and economic barriers impede the equitable allocation of resources.

II. People often display discriminatory behavior towards certain groups of individuals as a result of prevalent cultural and societal standards.

III. Insufficient political commitment to enforce regulations that prevent discrimination.

3.8.10 Case Studies and Success Stories

Illustrative instances and cases as present in the chapter and empirical analyses done demonstrate the effective execution of endeavors targeted at alleviating bias in the delivery of water and sanitation services. Examples of such projects include community-led efforts, improvements to laws and legislation, and innovative ways for resource allocation and service delivery. Various courts have settled conflicts related to the promotion and protection of the right to water, specifically in cases involving water resource contamination and the cessation of access to water services. Domestic courts have experienced an increasing number of cases related to the availability of clean drinking water and sanitation. These cases involve the preservation of fundamental rights such as the right to life, health, adequate housing, and a healthy environment.

3.8.11 Future Paths

The roadmap emphasizes the ongoing endeavors in:

I. Advocate for and provide assistance in ensuring the rights to water and sanitation are upheld at all levels of governance.

II. Enhancing global collaborations to share knowledge and distribute resources.

III. Allocating resources towards the development of infrastructure and technologies to ensure fair and equal availability.

IV. Regular evaluation and modification are crucial to maintain tactics that are effective and comprehensive.

The proclamation highlights the importance of collaboration among many stakeholders, including governments, civil society groups, international organizations, and communities, in order to eliminate prejudice and promote

equality in water and sanitation. The declaration emphasizes the vital need of achieving this objective in order to maintain social fairness, human rights, and sustainable development.

3.9 The realization of the right to water.

The right to water is universally acknowledged as an essential and inherent entitlement of every human being. It has significant ramifications for advocacy, practice, and policy. Furthermore, it underscores the importance of a comprehensive approach to water resource management that considers the social, economic, cultural, and environmental dimensions, while also addressing water availability, accessibility, acceptability, and quality. Although the recognition and promotion of the right to water have occurred, challenges persist in effectively implementing, monitoring, and enforcing this right. This is particularly accurate in areas that lack sufficient infrastructure, have limited resources, and face conflicting interests. The right to water is universally acknowledged as an essential and inherent human right. It has significant ramifications for advocacy, practice, and policy. Furthermore, it highlights the importance of a comprehensive approach to water resource management that considers the social, economic, cultural, and environmental dimensions, in addition to addressing water availability, accessibility, acceptability, and quality. Although the recognition and promotion of the right to water have occurred, challenges persist in effectively implementing, monitoring, and enforcing this right. This is particularly accurate in areas that lack sufficient infrastructure, have limited resources, and have conflicting priorities.

The literature on the right to water has emphasized important concepts, conversations, and theoretical frameworks that help us understand the many and varied facets of this right. The analysis has also examined the current status of the right to water, encompassing both regional and international patterns, challenges,

and emerging issues. Furthermore, it has analyzed the consequences of the entitlement to water for advocacy, policy-making, and implementation, offering instances and examples of successful approaches. In order to fully promote the realization of the right to water, additional research and measures are necessary.

3.10 Further Research

I. Further investigation is necessary to comprehend the impact of social, cultural, and environmental factors on the realization of the right to water. Examining issues such as the price, accessibility, and sustainability of water involves understanding how these challenges are influenced by local, national, and international social, economic, and cultural factors.

II. Research could potentially focus on the effectiveness of institutions, legislation, and governance frameworks in promoting the realization of the right to water. This may involve assessing the legal structures, regulations, and methods of enforcement that are implemented to protect the right to water, and analyzing their impact on accountability, fair distribution of water, and conservation of water resources.

III. It is imperative to conduct research that explores the interrelationships between the right to water and other fundamental human rights, including the right to food, shelter, sanitation, and health.

IV. To provide comprehensive and rights-oriented methods for water management, it is necessary to analyze the interconnections and conflicts between these rights and comprehend how they can be integrated into policies and practices.

V. Further research could prioritize those that are impoverished, disenfranchised, and face challenges in accessing clean and safe drinking

water. To do this, it is important to recognize the unique difficulties faced by some groups, including indigenous peoples, women, children, people with disabilities, and refugees. It is crucial to develop methods to address these issues and ensure their access to water is protected.

3.11 Further Policies

I. Policymakers and decision-makers should prioritize the implementation of the right to water. To achieve this, it is necessary to develop and implement legislative frameworks, rules, and policies that align with the values of human rights. To achieve this goal, it is imperative to ensure the protection and appropriate management of water resources, as well as the provision of affordable and easily accessible water services that meet high quality standards.

II. Civil society organizations, advocacy groups, and other stakeholders should persist in advocating for and promoting awareness of the right to water at all levels, including the local, national, and international spheres. To raise awareness about the importance of the right to water and to hold governments and other entities accountable for their responsibilities, it is essential to engage in lobbying initiatives, community mobilization endeavors, and public awareness campaigns.

III. All stakeholders, especially those populations that are disadvantaged and vulnerable, should actively engage in the decision-making processes related to water management. It is necessary for them to participate in the development of water-related policies and initiatives, and their viewpoints, requirements, and worries must be considered in policy-making and implementation.

IV. Encouraging collaboration among governments, civil society organizations, and other stakeholders is crucial to develop equitable and sustainable water management practices. To achieve this goal, it is imperative to promote partnerships, facilitate the sharing of knowledge, and implement capacity-building initiatives. These efforts will help uphold ethical conduct, develop innovation, and ensure social justice in the context of water management.

V. The integration of the right to water into pertinent policy frameworks, such as the Sustainable Development Goals (SDGs), climate change adaptation and mitigation programs, and disaster risk reduction measures, should be prioritized. To ensure the realization of this right for all individuals and groups, especially those who are marginalized or disadvantaged, it is imperative to ensure that water-related interventions are aligned with the principles of the right to water. Additionally, national and international policies should also be in accordance with these principles.

VI. It is imperative to establish procedures that enable the monitoring and evaluation of progress, as well as the repercussions, of policies and actions related to the right to water. Developing metrics to assess the availability, acceptability, and quality of water, as well as the success of policies and activities in supporting the fulfillment of the right to water, is an essential part of this procedure. The inclusion of indicators for building construction, methodologies for data collection, and procedures for reporting are also encompassed.

VII. Initiating capacity building programs is advisable to strengthen the knowledge, skills, and abilities of persons working in water resource

management. The persons encompass public employees, representatives of civil society organizations, and residents of the local community. To enhance the ability of marginalized and vulnerable groups to assert their right to water, it is necessary to offer them training, technical support, and resources. This is done to advocate for a water management system that is founded on the principles of human rights.

VIII. Consequently, the right to water is a fundamental human right that carries substantial consequences for activism, praxis, and policy. Although this right has been recognized and promoted, there are still issues about its execution, supervision, and enforcement. Further research and proactive measures are required to fully achieve universal access to water, especially for persons who are marginalized or poor. By implementing a water management strategy that prioritizes human rights, inclusivity, and collaboration, we may strive to achieve equitable access to water and safeguard this fundamental right for everyone.

This thesis chapter presents the main findings derived from extensive research on the recognition of the right to water as a fundamental human right.

Legal Recognition and Enforcement

The essay explores the historical backdrop and legal frameworks that recognize and safeguard the right to water. This demonstrates that several international treaties, as well as national laws in various nations, recognize water as an inherent human entitlement, emphasizing the crucial function that water serves in safeguarding life and dignity.

Judicial Advocacy and Case Law

This argument focuses on many significant judicial rulings that have influenced the legal landscape concerning the right to water. The courts have played a crucial role in broadening the recognition of water rights within the broader context of the right to life, as demonstrated by notable cases such as Subhash Kumar v. State of Bihar and Narmada Bachao Andolan v. Union of India. Both of these instances were adjudicated in India. Moreover, these examples illustrate the proactive involvement of the judiciary in ensuring the state's responsibility to provide accessible and uncontaminated water.

Challenges in Implementation

The article recognizes the challenges associated with implementing the right to water. The system acknowledges the challenges posed by constraints on resources, insufficient infrastructure, and political obstacles. Understanding the discrepancies between legal frameworks and their actual implementation is crucial for grasping these significant challenges.

Comparative Analysis

The essay offers a viewpoint on India's views and strategies about water governance by drawing comparisons with other countries, like South Africa, which includes explicit provisions for water rights in its constitution. Through adopting a comparative approach, it is possible to pinpoint specific regions in India that could gain advantages from legal and policy restructuring.

Government and Policy Recommendation

The booklet provides comprehensive recommendations for modifying current regulations and implementing government initiatives. The text highlights the importance of implementing robust laws, improving governance systems, and taking

proactive policy actions to ensure fair and long-lasting availability of water for all segments of the society.

Socioeconomic Impacts

This study examines the substantial impact of water availability on many socioeconomic factors, including health, education, and financial stability. The book consistently highlights the crucial role of providing individuals with access to uncontaminated water in enhancing societal well-being and eradicating poverty.

Role of Community and Stakeholder Engagement

The essay highlights the importance of community engagement and supports management approaches that incorporate active participation from the community. This is achieved by promoting the involvement of stakeholders to ensure that water governance is accountable, inclusive, and adaptable to the needs of the most vulnerable individuals.

Future Directions and Research

Through its conclusion, the article emphasizes the relevance of ongoing research that is being carried out in order to address the growing difficulties that are associated with water rights. In addition to this, it offers suggestions for potential future approaches that could be taken in order to better comprehend and handle challenges such as the scarcity of water, the effects of climate change, and the provision of water resources in an equitable manner.

This chapter gives a thorough look at the right to water, showing how it affects people's lives, the environment, and the law. It does this by giving a solid foundation for further research, policymaking, and advocacy work that aims to make water access a basic human right.

CHAPTER 4

COMPARATIVE ANALYSIS OF THE WATER CONSERVATION AND WASTE DISPOSAL POLICY INDIA AND USA

Pollutant contamination is without a question the biggest problem our water sources are facing in the twenty-first century. Because of the huge number of people living there, the lack of resources, and the lack of science knowledge, the problem is especially bad in poor countries. They are doing this even though this is a problem that people all over the world have. If a country like India wants to grow its industry, it needs to deal with the problem of water pollution right away to avoid big problems that affect a lot of people. There is no question about it. The goal of this chapter is to look into the legal steps that India has taken to deal with water pollution and try to figure out how well these steps have worked at making the problem less dangerous. Taking this into account, the goal of this chapter is to look into the present legislative processes in India. To show that the laws meant to stop water pollution, especially the Water Act, are not working as they should, this chapter's main goal is to provide proof that pollution control is still not working. There is also proof in this part that the Water Act is very flawed. This chapter also talks about study that shows how to fix problems with the law that aren't working as well as they do in the United States. The solutions are based on real-life situations.

The Sustainable economic Goals (SDGs) and the Millennium Development Goals (MDGs) both include getting clean water for everyone. This is because it has become one of the most important elements of global environmental and economic issues. After a lot of work, hundreds of millions of people still don't have access to safe, cheap drinking water around the world. Around 75 million people in India don't

have access to clean water, which makes it the Asian country with the biggest percentage of its population that has this problem. India is behind most of its neighbors when it comes to having clean water to drink (Ki-moon & Secretary General, n.d.)(Daci, 2012).

Indian households hold sixteen percent of the world's people, but only five percent of the world's freshwater supplies, according to estimates. Keeping up with India's rising water needs is getting harder and harder (Cronin et al., 2014). Even though there has been a lot of investment and progress in the water field, this is still the case. Without any action, India's water problems will get even worse. Some researchers, Taneja et al. (2024), say that water is not spread out evenly across all of India. There are more than two-thirds of the world's water supplies in just one-third of the land area. The area of the Ganges, Meghna, and Brahmaputra rivers holds 60% of the world's fresh water (Ahmed & Araral 2019).

The Indian constitution says that each state is responsible for developing and managing its own water supplies. People all over the country have this duty. Indian water supplies are managed at the state level instead of centrally because of this. Even though the central government gives money to state governments to help them carry out national-level projects, it is up to the states to develop and manage water resources within the limits of their own administrative systems and physical borders. States have many different groups that are in charge of creating and managing water resources. These groups include regulatory agencies, water ministries, village panchayats, irrigation agencies, and public works offices (Hildering, 2020)(Daci, 2012).

Unacceptable urbanization, deforestation, and the cruel killing of living things show a cruel nature that is seeking profit and pleasure at the expense of others. These actions go against both humanity and conservationism. Most people today think that bathing in the Yamuna or Ganga is bad for your health and not a way to save your soul. This is because these holy rivers are now so dirty and dangerous.

Justice V.R. Krishna Iyer

The water table has had a lot of problems in the last few decades because of things like population growth, the growth of cities and factories, too much use, global warming, changes in the weather, the melting of glaciers in the Arctic and Antarctic, natural disasters (like shifting rain and less snow), people who don't use water properly, and the slow replenishment of natural waters. Economic growth that is happening too quickly, more people wanting energy, and fewer replenishing seas are all big worries (Gerlak & Wilder, 2012). The amount of water taken from different sources in the United States increased a lot from 1950 to 2005. This included water used for irrigation, animals, public (municipal), rural, or private use, and making thermoelectric power. Within the last few decades, there have been more than twice as many areas around the world suffering drought. The amount of rain has changed over the past few years, and in some countries, the area where rainwater collects is shrinking. In the past few years, people have needed more water, so protecting water supplies has gotten more attention. It is expected that water levels will keep going down, which will make using these resources even more important in the years to come. The most important things for people to think about are how to manage water resources, how much water people use, and how to protect

and manage water resources in the long run. (Tully, 2017)(Kurunthachalam, 2013)(Kurunthachalam, 2014). Following these steps can help save water: 1) using existing resources, 2) mechanical auditing, 3) collecting rainwater; 5) increasing de-salination projects (to get more sustainable water from the ocean); 6) reusing water; and 7) strict rules that require people to follow safe and conservative water adaptation policies in order to protect the environment and increase the quality and quantity of sustainable water.

Potable water is wasted in many ways. The most obvious are running the faucet in the kitchen when it's not needed and running the faucet in the bathroom while you're shaving, brushing your teeth, or taking a long shower. Leaky faucets and toilets also waste 20 to 100 gallons of water every day, and flushing the toilet more than you should. Taking care of the yard and lawn at home, washing the car, doing less laundry, and washing the laundry. People in the United States waste about 15% of the water they use. Each person in an average home uses fifty to seventy gallons of water each day. In India, each home uses about 900 liters of water every day, which is about 250 gallons of water every day. There would be five people in the house, and each person would use 60 gallons of water every day. It is possible to save 92% of the water supply, though, by being careful and only using 20 gallons per house per day. It will take more broken plumbing to cut down on leaks in urban, residential, and commercial areas. People think that drinking water losses in Delhi, India, are between 30% and 50% (Afriansyah, 2010).

An absence of water affects more than 650 million people in around 50 countries. Thirty-six of these countries are under a lot of water stress. Some of these countries are in deserts in India, the Middle East, and the Sub-Saharan area. This is one of the reasons why the crises that are coming from Africa and Asia are getting worse. India and China have both had big problems with their energy production and economic

growth because they don't have enough water. Countries that are developing quickly, like India, are facing a severe water problem. This is happening at the same time that their energy output is going down and the quality of their water is going down because of chemical and biological contaminants. Because the tropical rainfall doesn't happen every year in places like India, China, Nepal, and Bangladesh, there is often not enough water for people to use. In some parts of the United States, like the western parts of the dry desert zone, there hasn't been enough water for a long time, especially in the last ten years. There is less water available from sources because streams are drying up, groundwater levels are dropping because of too much pumping, chemicals are getting into the water, and drought conditions are getting worse. Several European Union countries, such as Spain, France, Cyprus, Bulgaria, Romania, Germany, and the Czech Republic, are having trouble getting enough water. There is the least amount of water stress in Croatia, on the other hand. Unfortunately, too much mining has made aquifers in Belgium and France toxic by adding pollutants. Environmental changes and a drop in groundwater levels have both made water stressed, which has been bad for Australia's economy for the last two to five years (S. C. Rai & Saha, 2015)(S.C. Rai & Saha, 2015).

Reliable sources and supplies of drinking water are important for the health and growth of people and the area. It is important to set rules for water control and conservation as soon as possible because of these facts. In light of this, this chapter focused on the best water conservation policies for two large democratic countries in the world: the United States (a developed temperate country) and India (a rapidly growing tropical country) (Di Baldassarre et al., 2019)(M. Kumar & Kumar, 2023).

People who try to save water might eventually want to stop taking it in when they don't need to and send it to places where its physical and chemical properties make it easier to use again. You can also help save water by planning, managing,

enforcing, and coming up with new ideas for water supply systems, as well as by changing the way people use water. It is very important to keep an eye on the water sources and reservoirs of stream flows, surface water supplies, and ground water levels when trying to save water. As a first step, we should look for and avoid causes of water scarcity, overuse, degradation, natural damage (like drought, flood, and rain waste), long-term management that isn't sustainable, and pollution. Reduce each person's water flow by 5 to 15% during drought watch and drought warning situations. During an emergency, it should not be possible to water a golf course, fields, gardens, nurseries, driveways, garage, parking lots, streets, sidewalks, crematoriums, or paved paths. There should also be limits or bans on man-made waterfalls, ponds, swimming pool filling, car washing, and places that use a lot of water, like hotels and restaurants. Some other places where water conservation plans come from are smart meters, water efficiency, interconnected and general water supply and land use planning programs, water use regulation, assured supply law, water utility measures (like managing water pressure, water use audits, water accounting and loss control, public information and education, replacement and promotions, and recycling municipal effluent), and the water market.

In the United States, most people know how important water is to their lives. But they should know all the things they need to do to save water. So, people should start saving water at home by learning how to use less water every day and getting help with it. You can use a number of different water-saving tips. A running water tap can use 20 gallons of water when you shave, 10 gallons when you brush your teeth, 2 gallons when you wash your hands, and more than 5 gallons when you flush the toilet (once). A full bathtub can use up to 36 gallons of water, while a daily shower can use up to 12 gallons. It only takes 5 gallons of water to quickly wet, soap up, and wash off. It only takes 10 to 12 gallons of water to fill up a bath to the minimum amount. Each person used 20.1 gallons of water every day in the toilet.

Clothes washers (15 gallons per person per day) and showers (13.3 gallons per person per day) came in second and third, respectively. Faucets (11.1 gallons per capita/day for a home) and leaks (10 gallons per capita/day for a family). Dishwashers that do the work for you can use up to 16 gallons of water, but cleaning dishes by hand in a sink or dishpan only uses 5. There are also many environmentally friendly ways to water the lawn, grow, wash the car, clean the sidewalks, and organize the garage. Every home would save more water, going from 72.5 liters per person per day to 59.6 liters per person per day. This would save each family more than half of their water. Adding water-saving features to old appliances, buying new water-saving appliances, and using other water-saving methods, devices, or tools (like fixing leaks, recycling liquid waste, collecting rainwater, etc.) are also excellent ways to save water.

If India changes its present system, it can save almost 90% of the water it uses. For 9 minutes, brushing teeth, washing hands, and shaving under a running tap uses 81 liters of water. Using a mug and tumbler, on the other hand, only uses 3 liters. Also, flushing a regular toilet uses 105 liters of water. But using a modified version of the wet down, tap off, soap up, rinse off method and a current dual flush system in the toilet only used 25 liters of water. It may take 720 liters of water to water plants, clean the floor, and wash the car with a hose for 20 minutes. On the other hand, it may only take 51 liters of water to wash the car with a water can, mop, bucket, and two buckets. India, like the US, should teach people how to save water and back changes that will lead to less water use. People and businesses don't know how much water they're using, and water supplies are being misused on a large scale. To fix this, the government should make it very hard for people and businesses to do things like (i) storing surface water, (ii) saving rainwater, (iii) protecting catchment areas, (v) moving water between basins, (vi) using drip sprinklers for irrigation, (vii) managing crop growing patterns by choosing the right crops, making

sure they get enough nutrients, and understanding the role of anti-transpiration; (viii) lowering evaporation from different bodies of water; (x) recycling water and residential water conservation; (xi) lowering water loss; and (xii) reusing wastewater and artificially adding water to groundwater.

More and more people are collecting rainwater for use in their gardens and homes. The Indian government should encourage this by subsidizing the purchase of rainwater collection tools like catching ducts, filtration units, pumps, and roofs that store rainwater and have the right plumbing. Agricultural places in tropical countries should start collecting rainwater. Rainwater that has been saved and filtered can be used to water plants and grass at home, to take baths (after being filtered and germ-free), to flush toilets, and even in small-scale farming. To grow short-term, high-yielding plants, digging lakes, ponds, rivers, and canals to collect rainwater and adding more water reservoirs to rural areas would be helpful.

To get people in cities to use less water, rules like limiting the amount of water certain users can use and making sure certain technologies are used are often used. There has been a big shift in pollution control rules toward market-based policies over the last few decades. Recycling or reusing reclaimed water (wastewater treatment effluent) in golf courses, parks, graves, road medians, paper mills, carpet designers, flushing toilets, removing dust, building construction, mixing cement, and creating lakes. In addition to fire safety, water that has been used before can also be used to water gardens, farms, fountains, and other decorative features. Industries mostly use water to clean, heat, and cool things. For example, coatings, chemical colors, and natural or man-made pigments are all mixed with industrial water. Utilizing industrially treated water in alternative areas with less stringent water quality regulations, such as for cooling purposes in power plants and oil refineries, or for industrial processes, is an additional method to reduce waste and expenses.

The most water-intensive method employed in industrial settings is known as once-through cooling. This process involves directing water towards a heat source to reduce its temperature, after which it is promptly discharged. A re-circulating cooling system can significantly reduce water use by reusing the same water for many cooling operations. Evaporative cooling is a method that can be used to conserve water. Two other methods include ozonation and air heat exchange. Managing and conserving water is crucial at a global scale. Disseminating the message to individuals on the utmost significance of conserving water is crucial for safeguarding the planet and ensuring people's well-being.

Comparing India's and the US's policies on saving water and getting rid of trash shows that each country has its own unique way of doing things that are shaped by its government, resources, and people's needs. The United States' federal government lets each state make its own laws that are specific to its own economic and environmental conditions. We'll talk about specific laws from a few US states and compare them to Indian laws. California and New York will get the most attention because they are so aggressive about managing water and saving it.

4.1 US State Laws on Water Conservation and Disposal

I. California

California Water Efficiency Laws—Laws like the Water Conservation of 2020 have made it very important for Californians to save water. Additionally, the 2014 Sustainable Groundwater Management Act (SGMA) requires water agencies and governments to stop overdraft and return groundwater basins to balanced amounts of pumping and recharging.

Rules for Getting Rid of Waste: The California Integrated Waste Management Act says that trash has to be cut down, recovered, and thrown away safely. Every city and county in the state has to divert 50% of their trash from landfills by law.

II New York

Regulation of Water Withdrawal: The Water Withdrawal Permit Program in New York controls water withdrawal. People who take out or can take out more than 100,000 gallons of water per day must get a permit. This is part of the state's ongoing work to properly handle its water resources.

Waste Management: The Solid garbage Management Act controls New York's program for managing solid waste, which encourages recycling, reducing garbage, and the safe disposal of dangerous materials.

4.2 Comparison with Indian States

India's efforts to save water and get rid of trash are often slowed down by weak enforcement of rules and variations in how they are carried out in different states. But some states, like Gujarat and Tamil Nadu, have made big steps forward:

I. Tamil Nadu

Rainwater Harvesting - Tamil Nadu was the first Indian state to require all buildings to catch rainwater so that groundwater wouldn't run out. The work has gained a lot of support and has helped restore water supplies.

Solid Waste Management - The Tamil Nadu Pollution Control Board applies solid waste management standards that say trash must be separated, recycled, and thrown away safely. However, these standards are hard to put into practice because of limited infrastructure.

II. Gujarat

Water Conservation - The Sujalam Sufalam Jal Abhiyan is a large-scale effort to save water. It includes making check dams, deepening bodies of water, and cleaning and desilting riverbanks. Industrial Waste Management: Gujarat is a leader in

disposing of industrial waste. Its policies encourage the building of waste treatment plants and the reuse of industrial waste.

III. Comparative Analysis

I. Policy Strictness and Enforcement: Both California and New York have strong regulatory frameworks and strong enforcement systems. This is in contrast to Indian states, where regulation isn't always consistent.

II. Cutting Edge Technologies: In the United States, state governments often use cutting edge technologies to handle water and trash. Indian states focus more on community-driven and traditional methods because they don't have as much money or technology.

III. Availability of Resources: The US usually has better infrastructure for putting conservation methods into practice and keeping an eye on them. India, on the other hand, has problems like limited budgets and infrastructure that stop widespread and effective adoption.

When you look at these two situations side by side, it's clear that the US has a more decentralized and well-funded plan that lets each state do its own thing, while India has trouble enforcing policies and allocating resources. India's community-driven programs in places like Tamil Nadu and Gujarat, on the other hand, teach us a lot about how to get local people to work together on environmental projects. This study helps us understand how different types of government and the availability of resources can affect how well water conservation and waste management methods work. In the end, this chapter looked at the many problems caused by water pollution and how important it is to save water, especially in India, comparing these issues to the United States' world views and actions. Both the laws that are already in place

and the ideas for how to fix them cover all the possible risks to water supplies. We've summed up the results into a few key points here:

4.2.1.1 Legal and Institutional Framework:

I. India's water laws, led by the Water (Pollution Prevention and Control) Act of 1974, make it very easy to clean up polluted water. Nevertheless, the chapter talks about problems with both enforcement and actual application that make it less useful.

II. Looking at how things are done in the US gives us hope for a more centralized method that could work with state-level efforts to create a unified campaign against water pollution.

4.2.1.2 Resource Allocation:

India's problem with water scarcity is made worse by the fact that water supplies are not spread out evenly. This is made worse by the country's fast industrial and population growth. The example from the US shows that proactive management, like spreading out water sources and properly allocating money, can help solve similar problems.

4.2.1.3 Public Awareness and Participation:

I. This chapter talks about how important it is for people in India and the US to learn about and get involved in water saving efforts.

II. Campaigns to raise awareness can change people's habits, which can help cut down on water waste at home and in businesses.

4.2.1.4 Technological and Policy Innovation:

People can use a lot less water if they use smart practices like recycling and reusing water, buy appliances that use less water, and get better at treating waste.

4.2.1.5 Cross-Country Learning and Adaptation:

I. The comparative analysis provides a compelling justification for a tailored approach that takes into account the specific geographical and socioeconomic circumstances of each country, while also allowing for the incorporation of best practices from all around the world.

II. Lessons learned from the United States regarding market-based policy and the adoption of technology can be of assistance to India in addressing its water resources challenges.

4.2.1.6 Emergency Planning and Conservation

I. For the sake of safeguarding their water resources, both nations may choose to implement stringent emergency conservation measures in the event that water becomes scarce.

II. India, with its various climate zones and difficulties, might potentially benefit from robust planning and conservation strategies that are guided by global ideas while staying responsive to the requirements of the local community.

4.2.1.7 Government and Stakeholder Collaboration:

One of the most essential things to take away from this is the significance of collaboration among many stakeholders, including government agencies, non-governmental organizations (NGOs), entities from the corporate sector, and local people, in order to achieve sustainable water management.

Increasing coordination and knowledge exchange with foreign partners and local organizations have the potential to improve India's decentralized water governance system.

In conclusion, the comparative analysis offers compelling evidence that, despite the fact that India faces significant challenges in terms of ensuring water conservation and managing water pollution, there are viable solutions available. In order to accomplish efficient water management, it is necessary to combine legislative reform, technological innovation, public participation, and strategic planning. By gaining knowledge from the experiences of other countries throughout the world, particularly those of industrialized nations like the United States, India is able to implement a diversified strategy to safeguard its water resources for the benefit of both the immediate and future generations. The ultimate objective is to design a method of water consumption that is sustainable and beneficial to both the environment and the growth of the economy.

Laws and regulations pertaining to water that are peculiar to each state are a reflection of the distinct environmental, economic, and social situations faced by each state. The western states often adhere to the principle of prior appropriation, in contrast to the eastern states, which frequently follow riparian rights. There is a large amount of variation in water quality standards, groundwater management, resource planning, and drought management, which highlights the significance of having a grasp of the local contexts in water legislation and regulation for water.

Each of the five regional Water Management Districts (WMDs) in Florida is responsible for the management of water resources within their respective boundaries. This is the case for the state of Florida. Flood control, water supply, and water quality protection are all aspects of the complete water management strategies that these districts put into action.

For instance, the Washington State Department of Ecology is in charge of providing oversight for the management of water resources. The state makes use of watershed-based planning and has adopted instream flow standards in order to

guarantee that there is sufficient water in rivers and streams to support fish, wildlife, and recreational activities.

A good example of this is the state of Colorado, which adheres to the prior appropriation doctrine quite strictly. It is the date of the initial appropriation that determines the distribution of water rights. Water rights holders who are older get priority over those who are younger, particularly during times of scarcity.

CHAPTER 5

LAW REGULATING AVAILABILITY AND USE OF WATER IN THE NCT DELHI: A PERSPECTIVE ON IMPLEMENTATION

India is currently going through a severe drought that is affecting almost the whole country. This is because of the growing need for water to feed the country's more than a billion people and for farming, industry, and other activities related to farming. But India hasn't done many studies on the problem of not having enough water. According to information from the Central Water Commission, the water level in 91 big bodies of water has dropped to disturbingly low levels. Aside from that, the point of this chapter is to look at Delhi's water transfer system. In Delhi, which is the National Capital Territory, there are nine main water treatment plants (WTP) right now. These WTPs are in charge of making sure that Delhi's 16.8 million people can get water. We created a simple way to figure out how much fresh water people who live in each WTP's command area need by using the Geographical Information System (GIS) and data from the 2011 Census of Delhi. We also took into account the Delhi Jal Board's (DJB) water supply norm, which is sixty gallons per capita per day (GPCD). We get an idea of how much water the people who live in each WTP need by multiplying the population size of each WTP by sixty GPCD, which is what the 2011 Census tells us. Based on the results and what we know now about the main signs of a water shortage, this chapter gives an outline of possible solutions that could work.

There isn't a lot of geographical study in India that looks into the problem of not having enough water. A small number of studies have suggested that collecting rainwater and reusing wastewater could be two ways to solve problems with water shortages. (Suresh 2001). However, there isn't enough knowledge about how Delhi's

water delivery system works and what problems it has right now. The main city of India is Delhi, which is also the world's third-largest city area, after Tokyo and Mumbai. We use a Geographical Information System (GIS) that is based on a simple water demand estimate that we made to look into the city's water supply and growing demand. At the same time, we map out feasible and eco-friendly ways to find water shortages. This is because Delhi still has a serious water problem because its population is growing so quickly.

India comes in at number 122 out of 123 countries in the safe water index study. Pollution and overuse are polluting water sources more and more, which is making water sources poisonous. Groundwater is the main source of drinking water for most people in India who live in rural places. High amounts of fluoride, iron, salt, and arsenic make groundwater unsafe to drink in about a third of India's 600 districts. The level of harm that drinking too little water does to your health is very bad. Every year, water-borne diseases affect about 37.5 million people in India. A lot of kids have trouble growing and learning every year because they are in water that isn't clean enough. As a result of bad water quality, inadequate sanitation, and poor hygiene habits, diarrhea is the main cause of children's poor health and high death rates. India also has a large population (66 million people) that could be at risk of too much fluoride exposure, and another 10 million people who drink water that contains too much arsenic. Infectious diseases that spread through water cost the economy a lot; every year they cost about 600 million US dollars. On top of that, these infections cause 73 million days of lost work hours. Families are under a lot of stress because of their high medical bills. About 66% of hospital beds are full of people who have waterborne illnesses, which makes the problems in the healthcare system even worse. Extremely poor people are the ones who have to deal with the worst effects of economic, health, and social problems. Based on the results of the India National Family Health Survey, 40% of people who live in great poverty do

not have access to improved sources of clean water. When it comes to poor and rural places, it is not financially possible to build expensive infrastructure for traditional water distribution systems. The wide spread of towns makes it hard to keep an eye on the quality of groundwater. It's even harder to deal with these problems because many villages are out of reach for central officials to patrol regularly. Besides that, there are things in the world to think about. It is shocking that every day 26.5 billion liters of wastewater that has not been treated are dumped into bodies of water. This does not meet the environmental protection standards that have been set for these aquatic areas.

5.1. Issues of Geographical Location and Methodology for water supply in Delhi

Delhi is geographically situated in a latitude of 28.61 degrees North and a longitude of 77.23 degrees East, making it a unique location. Uttar Pradesh is situated to the east of Haryana and is bordered by it on three sides: the north, south, and west. The National Capital Territory (NCT) of Delhi spans an area of 1483 km2 (573 sq. miles) and is home to a population of 16.8 million individuals, accounting for 97.5% of the total population, as per the Census of India in 2011. The urban population stands at 16.4 million, and the rural population amounts to 0.4 million. The Delhi Development Authority (DDA) forecast that the population would reach 19.9 million in 2016 and is expected to reach 23 million by 2025. Since the 1990s, NCT has experienced rapid development, leading to a decrease in its agricultural land and an expansion in its urban area. This has resulted in the construction of a "conurbation." In 1991, the NCT had an agricultural land area of 797.66 km2 and an urban land area of 685.34 km2. In the fiscal year of 2014-2015, the rural area of the National Capital Territory (NCT) decreased to 369.35 km2, while the urban area increased to 1113.65 km2. This suggests that the NCT is a region with a

continuously expanding urban population, which puts strain on its water supply and other essential facilities.

Delhi is situated in the Alpide band, a highly dangerous seismic zone prone to earthquakes with magnitudes between 8 and 9 on the Richter scale. The Alpide band is also known as the Alpine-Himalayan orogenic belt. Within the central and southern regions of Delhi, there exist several small rocky terrains that extend from the north-northeast to the south-southwest. In addition, Delhi is characterized by its flat topography, situated at an approximate altitude of 210 meters above sea level. NCT experiences a humid subtropical climate, characterized by average temperatures exceeding 36 degrees Celsius (97 degrees Fahrenheit) between April and July, and falling below 18 degrees Celsius (64 degrees Fahrenheit) from December to February. The NCT experiences an average annual rainfall of 28.1 inches (714 mm), mostly influenced by the monsoon season that takes place in July and August.

Delhi, the National Capital Territory (NCT), now has nine principal Water Treatment Plants (WTP) that provide water to the city's population of 16.8 million individuals. The water supply in DJB is set at a regular rate of sixty gallons per capita per day (GPCD). According to the Population Census of 2011, the expected total water usage in Delhi is projected to be 1020 MGD as a result of this. This figure considers the needs of the community, commercial, and industrial sectors, as well as the requirements for fire protection, mobile population, and specific applications in institutions such as restaurants, hotels, and embassies. To calculate the water demand in Delhi, National Capital Territory, we have devised a simple way to evaluate if there is a shortage or excess of water (refer to Table 5.1). Utilizing Geographic Information System (GIS) and data sourced from the Census of India (2011), we calculated the population of each command region of the primary Water

Treatment Plants (WTPs). Based on these discoveries and our current knowledge of the main signs of water scarcity, we develop practical solutions.

Table 5.0 Calculated water deficiency/surplus among the population in the water treatment facility control region.

Name of WTP	Water demand (in Gallons) = Populations 60 GPCD	Water demand (in MGD)	WTP installed capacity (in MGD)	Deficit/Surplus (in MGD)	Population (Census of India, 2011)	Deficit/Surplus
Bawana	25874935	26	20	6	431249	Deficit
Bhagirathi	134274356	134	100	34	2237906	Deficit
Chandrawal	77767406	78	90	−12	1296123	Surplus
Dwarka	32053659	32	50	−18	534228	Surplus
Haiderpur	213714846	214	200	14	3561914	Deficit
Nangloi	132681091	133	40	93	2211351	Deficit
Okhla	20271672	20	20	0	337861	Balanced
Sonia Vihar	255595395	256	140	116	4259923	Deficit
Wazirabad	107242985	107	120	−13	1787383	Surplus

Although water demand increases throughout the summer months, DJB is committed to consistently producing 835 MGD per day. If there is a situation where

the demand for water exceeds the available supply, the corporation will distribute water tankers as a measure to address the shortage. DJB's output in July 2014 reached a staggering 843 million gallons, according to the available evidence. However, preliminary findings indicate that water treatment plants (WTPs) such as Dwarka and Nangloi are not receiving enough raw water to meet their established capacity. Other individuals have stated that the distribution of water has been inconsistent due to a shortage of raw water. However, based on the 60 gallons per capita per day (GPCD) criteria, the projected water requirement for a population of 26 million in 2021 would be around 1,560 million gallons per day (MGD), taking into account a 15% inclusion of Non-Revenue Water (NRW). This exceeds the DDA's prediction by three million. Non-revenue water (NRW) is the amount of water that is produced and distributed but cannot be charged to customers owing to leakage, overflow, or use by individuals who are not invoiced for it. Efficient management is needed to address water shortages as a result of this.

5.2. Role of Delhi Jal Board (DJB)

The National Capital Territory of Delhi, commonly referred to as NCT Delhi, is among the rapidly rising urban areas in India. The city's population is expected to grow by 4 million, reaching a total of around 18 million by 2030. The current water supply in the city is around 4,300 million liters per day (MLD). However, it is expected that the demand for water in the city would increase to 5,663 MLD by 2021. This indicates a significant disparity between the availability and need, and it is expected that the situation will worsen in the future. The water quality in Delhi is a major concern due to extensive contamination from sewage originating from residential and industrial sources, as well as agricultural runoff.

In order to tackle these challenges, the Delhi government has implemented several laws and regulations that restrict the accessibility and usage of water. The

Delhi Jal Board (DJB) is the primary entity entrusted with the task of supplying and distributing water in the city. It was officially constituted for this purpose under the Delhi Water Board Act of 1998. The Water (Prevention and Control of Pollution) Act of 1974 and the Environment (Protection) Act of 1986 are legislations that regulate the release of waste substances from industrial and residential sources into various water bodies.

The Delhi Jal Board (DJB) is the main governing body in charge of water supply and distribution, as well as the management of current water resources, in the National Capital Territory of Delhi, India. The initiative was launched in 1998 with the aim of guaranteeing that the inhabitants of Delhi have access to water that is both secure and sanitary. DJB has implemented several policies and guidelines to regulate water production and disposal inside the city. The subsequent collections of legislation and prerequisites are of utmost significance:

I. Delhi Water Board Act: The Delhi Water Board Act was enacted in 1998 to establish the Delhi Jal Board and confer upon it the requisite authority and responsibilities pertaining to water management and distribution.

II. Water Tariff rule: The Delhi Jal Board is tasked with formulating a tariff policy that establishes the rates consumers are obligated to pay for water supply. The regulation sets specific tariff rates for several categories of consumers, such as residential, commercial, and industrial users, among others.

III. Furthermore, the Delhi Jal Board has implemented regulations for obtaining water connections for residential, commercial, and industrial consumers. The recommendations provide a comprehensive overview of the necessary documentation, the process for establishing the connection, and the corresponding charges.

IV. Water Supply guidelines: The Delhi Jal Board has implemented water supply regulations that define the minimum amount of water that should be provided to each individual in the city on a daily basis. The rules also specify the requisite quality of water that must be supplied to users.

V. Water Conservation Measures: The Delhi Jal Board has implemented numerous water saving initiatives in the city. Strategies such as rainwater harvesting, wastewater recycling, and the promotion of water-saving technologies are implemented.

VI. For the city of Delhi, the Delhi Jal Board is in charge of making important laws and rules about how to manage and distribute water supplies.

VII. The Delhi Jal Board has worked with the World Bank to create a plan for changing the distribution system. This is because there won't be any major water supply expansions in the next ten years and there is a lot of bulk water available compared to other Indian and foreign cities. This approach is all about trying out and eventually implementing continuous supply for water delivery instead of the current method of intermittent supply, which is known to be the main reason why the distribution system doesn't work well.

VIII. In 2004, the Delhi Jal Board came up with a plan for change that included the following steps for the first phase:

IX. People thought that a price increase in December 2004 would cover about 80% of the DJB's costs for running and maintaining the business. The price rise comes from a change in the volumetric fee for the four blocks: 0–10 m3/month, 10–20 m3/month, 20–30 m3/month, and more than 30 m3/month. For the remaining blocks, the new prices are much higher than

the old ones. Now, the cost of using more than 30 m^3 per month is 10 Rs./m^3, while it used to be 3 Rs./m^3.

X. Over the course of five years, outsourcing water supply and sewerage services in two DJB operational zones, which is about 12% of the connections (see map 3), with the main goal of gradually switching from an intermittent supply system to a continuous supply system. Making the two areas technically separate from the rest of the system, installing meters, and fixing up the whole supply system would help reach this goal of lowering technical losses from 40% to 20%.

XI. Repairs to some main sewer and water lines will happen outside of the two pilot zones.

5.3.Issues of availability of water related to Delhi

There are a lot of important reasons why the amount of water in Delhi, which is the city of India, is a problem.

I. Increment in population: The number of people living in Delhi keeps going up, making it one of the places in the world that is growing the fastest at the moment. Since there is more water available now than there was before, the number of people who need water has grown faster. This is putting a lot of stress on the water supply. Rai (2011); Balha, Vishwakarma, et al. (2010).

II. Deficiency of groundwater: The underground water supply is running out because most of Delhi's water comes from underground sources. In contrast, the city's supplies have been depleted because too much groundwater is being taken out, which often goes beyond what is

considered safe. Because of this, the water table has dropped a lot, making it harder to get to groundwater. In 2009 and 2019, Yadav, Lata et al. and Ghosh, Kansal et al.

III. Dependence on neighbouring states: A lot of Delhi's water comes from states like Haryana and Uttar Pradesh, which are close by and have river systems. There is a chance, though, that some of these sources don't provide enough water because of disagreements about how to distribute it, problems with the supply, or political worries. (Agarwal, Prajapati et al. 2015, Sharma, Sharma et al. 2016).

IV. Inefficient water management: Different ways of managing water are partly to blame for Delhi's water shortage. Because of leaks in the water supply system, illegal water hook-ups, and homes and companies that don't use water efficiently, the amount of water that is available goes down and overuse happens. (Gupta 2006, Chatterjee, Gupta et al. 2009).

V. Water pollution: There is a lot of trash in the Yamuna River, which is a big part of Delhi's water supply. The river is very dirty because of this trash and waste from factories. Due to the high level of pollution in the river, it is not safe to drink from it directly. It will need to be cleaned up a lot before it can be used. It is even harder to get clean water when there is pollution in the water (Zafar and Alappat 2004, Ahamad, Raju et al. 2019) .

5.4.Possible options for better water availability in Delhi

Delhi has a lot of people, but not enough water for everyone. As a result, getting them more water will require a number of different approaches. Have a look at these possible ways to solve the problem:

I. Water Conservation and Demand Management: People who use less water are less likely to waste it, which is one way to cut down on environmental damage. Sharing knowledge and encouraging people to use less water in their homes, businesses, and farms, as well as fixing leaks in water supply systems, can help protect a lot of water resources. (Kurunthachalam 2014) (Sharma 2009).

II. Rainwater Harvesting: Disseminating information on rainwater collection methods can contribute to replenishing groundwater and augmenting the water supply. Installing rainwater collection systems in residential, commercial, and public structures allows for the collection and storage of rainfall for future utilization. (Drangert and Sharatchandra 2017, Gado and El-Agha 2020).

III. Wastewater Treatment and Reuse: Implementing contemporary wastewater treatment infrastructure can facilitate the recycling and repurposing of purified wastewater for non-drinking purposes such as agriculture, commercial activities, and toilet flushing. This can reduce the demand for rainwater and enhance the ability of water sources to meet the need. (Abedin and Rakib 2013) (Shi, Wang et al. 2018).

IV. Interlinking of Rivers: Exploring the feasibility of interconnecting adjacent rivers can facilitate the transfer of water from regions abundant in water resources to those experiencing water scarcity, such as Delhi. However, this decision requires meticulous strategizing, thorough analysis of the surroundings, and consideration of long-term viability. (Kishore 2013, Sharma, Kumar et al. 2020).

V. Desalination: Despite Delhi's inland location, the option of desalination could still be considered if advancements in technology and cost-effective

methods for transporting desalinated water from coastal areas become accessible. The current high energy consumption and cost of desalination necessitate a thorough examination of its practicality. (Schiffler 2004, Davies, Hossain et al. 2009).

VI. Management of Groundwater: In order to ensure the long-term availability of water, it is crucial to manage groundwater resources appropriately. Ensuring equilibrium between groundwater extraction and replenishment can be achieved through the implementation of monitoring and regulating practices for groundwater mining, promoting genuine recharge techniques, and enforcing stricter regulations on groundwater utilization. (Sahin, Siems et al. 2017) (Acharya, Sharma et al. 2018).

VII. Upgrades to the Water Distribution Network: Enhancing the effectiveness of the water distribution network, reducing losses caused by leaks and unauthorized connections, and implementing intelligent measuring systems can augment the quantity of accessible water and ensure equitable distribution. (Loureiro, Alegre et al. 2014, Dimaano 2015).

VIII. Collaboration with nearby States: Collaborating with neighboring states to ensure sufficient water supply from shared rivers or lakes might mitigate water issues in Delhi. In order to effectively manage water resources, it is imperative for states to engage in agreements, engage in negotiations, and collaborate with one another. (Allred, Campolucci et al. 2003).

IX. Awareness and Participation of the Public: Creating public awareness about the significance of water conservation, encouraging responsible water usage, and engaging the community in water management

initiatives can contribute to increasing the water availability in Delhi. (Sharma and Nayak 2013, Ameyaw and Chan 2015).

X. Water "ATMs" are vending machines that are administered by cloud technology and fueled by solar energy. They work continuously, without requiring cash, and provide clean drinking water.

XI. Autonomous water systems with integrated purifying components, catering to a specific region, provide supplementary advantages and embody a cost-efficient strategy.

XII. At the local level, it is feasible to enforce measures regarding operation and maintenance to ensure the acquisition of essential expertise and financial resources for operations such as operation and maintenance, replacement, and expansion. Implementing a water safety strategy at the local level has the capacity to avoid contamination at its origin, while also providing cost-effective and more stringent purification technology.

XIII. It is crucial to bear in mind that implementing any of these options will require a comprehensive and sustained strategy that includes the government, legislators, water management authorities, and active participation from the public. Implementing this approach is the sole means of ensuring a consistent water supply for Delhi.

5.5.Role of public vis-à-vis the role of government and regulator

The Indian government has set goals to guarantee that households in rural areas have access to a minimum of 40 liters of piped water per person per day, either directly to their dwellings or within a 100-meter radius, for at least 50% of the rural population. The Constitution of India has given great priority to the provision of potable water. Article 47 assigns the various states with the duty of guaranteeing

access to safe drinking water and improving public health standards. It is worth noting that the water industry in each state is fragmented, with different bodies responsible for controlling irrigation, household, and industrial water delivery. The distribution of goods and services to local customers, especially those living in cities, is further distinguished by fragmentation. In India, it is typical for municipal authorities to create comprehensive and centralized piped water systems. These systems purify raw water from a specific source by using sand filters, chlorination, and then pumping it to raised tanks. Subsequently, the purified water is conveyed by pipelines to private abodes. The issue being discussed is marked by an emphasis on the availability of resources, substantial financial investment, insufficient support infrastructure at both the state and community levels, as well as a lack of financing and skilled personnel to continuously operate and maintain the systems. Consequently, there is an irregular supply of water and a below-average grade of water quality. The most often used method for disinfecting water is the use of bleaching powder or a hypochlorite solution. Often, the quantity of substance added to the water is not controlled, which can lead to insufficient disinfection if too little is added, or the water being carcinogenic and poisonous if too much is added. In addition, this technique specifically removes only biological contaminants, but does not remove fluoride, iron, and arsenic. The National Rural Drinking Water Program was launched in April 2009 with the aim of providing financial aid in the form of grants for the establishment of rural water supply systems, with a specific focus on areas affected by poor water quality. The fundamental goal of the program is to achieve decentralization, which involves transferring the responsibility for designing, executing, operating, and maintaining the program to the recipients. This strategy is considered to be more efficient and effective. To accomplish this goal, there is a significant focus on encouraging private sector participation in the planning and management of water systems.

The World Bank is offering support to the government's national groundwater program, called the Atal Bhujal Yojana, in order to improve groundwater management. An extensive groundwater management program, headed by the community, has been successfully implemented in 8,220-gram panchayats spanning seven states in India. The program aims to improve the understanding of water availability and usage patterns among villages, as they bear the responsibility for groundwater conservation together with many other persons and communities. This knowledge enables individuals to efficiently regulate their water consumption by formulating suitable water usage strategies. The Bank assisted the state government of Punjab, an area mostly focused on agriculture, in undertaking a groundbreaking project targeted at preserving groundwater. The reason for this intervention was the substantial decrease in the water table resulting from the extensive utilization of tubewell irrigation in the area. The "Paani Bachao, Paisa Kamao" initiative intends to offer incentives to farmers in order to encourage them to decrease their consumption of groundwater resources. Around 300 farmers enrolled in the scheme received financial incentives to encourage the preservation of power for irrigation. This strategy resulted in water reductions ranging from 6 to 25 percent, while also guaranteeing that crop yields were not impacted.

The Delhi Water Board Act, enacted in 1998, is the primary legislation that regulates the accessibility and utilization of water in the National Capital Territory of Delhi. The Delhi Jal Board (DJB) was established as the governing body accountable for the administration, allocation, and preservation of water resources in the National Capital Territory of Delhi in accordance with this legislation. The DJB is responsible for the allocation of potable water, the purification of sewage, and the comprehensive administration of the area's water assets.

A View from Within the Implementation:

I. Water Supply: The DJB is accountable for ensuring that the residents of Delhi have continuous access to an adequate and dependable water supply for drinking purposes. Nevertheless, the city is currently facing challenges related to water scarcity as a result of causes including heightened urbanization, population growth, and excessive extraction of groundwater. To meet the growing demand for water, ongoing efforts have been made to implement systems for water supply. The procedures involve the establishment of supplementary water treatment facilities and pipes.

II. Regulation of Groundwater: Groundwater is a crucial component of Delhi's water supply, but it requires regulation. It is imperative to establish regulations that govern the utilization and availability of groundwater in order to prevent excessive extraction. The act contains rules pertaining to the regulation of groundwater usage. However, the enforcement of these laws can be challenging due to the abundance of privately owned borewells.

III. Wastewater Management: Proper treatment of wastewater is vital to prevent water pollution and ensure a sustainable water supply. The DJB has been diligently enhancing the infrastructure for wastewater treatment and implementing measures to promote responsible management and treatment of wastewater by individuals and companies..

IV. Measures to Conserve Water : The legislation also incorporates requirements for enhancing water efficiency and implementing conservation measures. However, there is an ongoing requirement to educate the general public and corporate communities regarding the

importance of water conservation and to promote the adoption of water-saving techniques.

V. The Institutionalization of Law and Its Enforcement : While the Delhi Water Board Act provides the legal basis for water regulation, it is crucial that these regulations and standards are rigorously implemented to ensure the proper implementation of the plan. Issues such as unauthorized hookups, water theft, and illegal extraction of groundwater have been consistently reported, necessitating continuous monitoring and enforcement measures.

VI. The development of adequate infrastructure: Effective implementation of water regulations relies heavily on having adequate infrastructure in place. Investing in water treatment facilities, pipelines, sewage treatment plants, and distribution networks is crucial to ensure the reliability of the water supply and proper management of wastewater.

VII. Participation of the Public : Ensuring public participation in water management decisions and raising knowledge about the importance of responsible water usage are crucial elements for successful implementation. Engaging the general people is a means to promote greater adoption of sustainable practices and reduce water wastage.

VIII. Cooperation Between Different Government organizations and Departments : Efficient water management often necessitates cooperation across several governmental departments and entities. In order to achieve comprehensive water management, it is imperative that the DJB, urban planning authority, environmental agencies, and other stakeholders coordinate effectively.

IX. The involvement of the public, government, and regulators is pivotal in the management of water resources in Delhi. Every entity has a specific function in guaranteeing the accessibility, excellence, and fair allocation of water. Below is a summary of their responsibilities:

5.5.1. Public

The general public, comprising of residents, neighborhood groups, and civil society organizations, play a crucial role in water management (Kacker and Joshi 2012). They have the ability to make contributions by:

I. Engaging in water conservation efforts and implementing sustainable water usage practices at both the individual and community levels.

II. Informing the relevant authorities about water-related problems such as leaks, pollution, or excessive use.

III. Engaging in public awareness campaigns and educational initiatives to advocate for water conservation and the proper utilization of water resources.

IV. Promoting policies and practices that prioritize fair and equal access to water and safeguard water resources.

5.5.2. Government

It is the duty of the government, at different levels, to guarantee the supply of uncontaminated and sufficient water to the inhabitants of Delhi. (Dutta and Tiwari 2005). The government's roles and responsibilities include:

I. Creating and enforcing laws and regulations pertaining to the management of water resources, encompassing aspects such as water supply, distribution, quality requirements, and pricing.

II. Constructing water infrastructure, including dams, reservoirs, treatment facilities, and distribution networks, to fulfill the water requirements of the city.

III. Supervising and implementing water-related rules, such as pollution control measures, to guarantee the safety and excellence of water provided to the general public.

IV. Ensuring sufficient allocation of resources and funding for initiatives related to water management, infrastructure development, and maintenance.

V. Conducting extensive water resource planning, which involves investigating alternative water sources like rainwater collection or groundwater recharge, in order to guarantee water security for the city in the long term.

5.5.3. Regulators

Regulatory authorities have the responsibility of supervising and ensuring adherence to water-related laws, rules, and standards. The Delhi Jal Board (DJB) is the main governing body in Delhi that oversees the provision of water and management of wastewater. (Parween, Ramanathan et al. 2017). The regulator's roles include:

I. Establishing and implementing regulations regarding the quality, availability, and cost of water.

II. Issuing licenses, permits, and authorizations for water-related operations, such as the extraction of groundwater or the establishment of water treatment facilities.

III. Performing inspections, audits, and monitoring activities to verify adherence to regulations and implementing appropriate enforcement measures against individuals or entities found in violation.

IV. Mediating conflicts and dealing with complaints over issues pertaining to the provision, standard, or cost of water.

V. Engaging in partnerships with various stakeholders, such as government agencies, the public, and non-governmental organizations, to create and execute efficient water management strategies.

VI. The interconnectedness of tasks and responsibilities among entities is crucial for sustainable water management in Delhi. Effective collaboration and coordination among the public, government, and regulators are critical in this regard.

5.6. Survey for Water in Delhi NCR with Consumers, Industry, Regulatory bodies

Industry

The survey is conducted on waste water per day in 50 Industries in Delhi NCR. The average of the industry category of water waste was identified.

Table 5.1. Waste Water Generation in Various Industries

Industry	Quantity of Waste Water Generated (Litres)
Power	45
Manufacturing (Noida)	35
Auto (Gurugram)	30
Manufacturing, Oil, and Gas (Delhi)	180

Manufacturing (Noida)	160
Manufacturing (Gurugram)	140

The table 5.1, labelled "Waste Water Generation in Various companies," presents valuable information regarding the estimated daily volume of wastewater produced by different companies in important sites within the NCR region. This data provides insight into the ecological impact of various sectors and serves as a basis for specific waste management strategies.

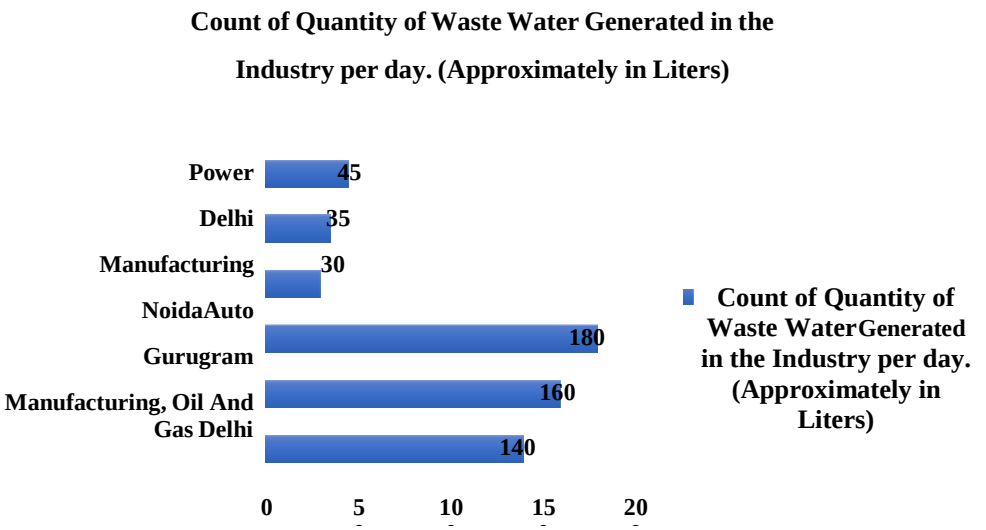

Fig 5.1. Count of Quantity of Waste Water Generated in the Industry per day. (approximately in Litres)

The graph 5.1, which is a horizontal bar chart, shows the daily average amount of waste water produced by several industries in Gurugram, Noida, and Delhi.

I. Power Industry in Delhi:

Produces a conservative 45 liters of effluent daily. The relatively low volume indicates effective water utilization or smaller-scale activities in comparison to other industries.

II. Manufacturing Industry in Noida (Small Scale):

Generates a daily volume of 35 liters of effluent. Although this region is known for its manufacturing activities, the lower figure suggests that there may be smaller-scale operations or more efficient water management measures in place at particular businesses.

III. Automotive Industry in Gurugram:

Produces a daily volume of 30 liters of effluent. The industry's emphasis on water conservation may be attributed to strict environmental restrictions or the implementation of novel water recycling methods.

IV. Manufacturing, Oil, and Gas Industry in Delhi:

Impressively, it generates a substantial 180 liters of effluent daily. The significant amount of activity in this sector emphasizes the magnitude and strength of activities, emphasizing the necessity for reliable wastewater treatment and recycling systems.

V. Manufacturing Industry in Noida (Large Scale):

Generates a daily volume of 160 liters of effluent. Signifies substantial industrial operations, requiring efficient waste management solutions to minimize environmental consequences.

VI. Manufacturing Industry in Gurugram:

Produces 140 liters of effluent daily. Like Noida, this table demonstrates significant industrial activities, highlighting the significance of implementing sustainable water usage policies.

Table 5.2. Waste Water Disposal governing authority for industry

	Government body for Waste water Disposal			
Industry	**Central Pollution Control Board**	**State Pollution Control Board**	**National Green Tribunal**	**Local Governing Body**
Industrial Gurgaon	**0**	**6**	**0**	**7**
Manufacturing Noida	0	6	0	2
Production, Gas & Oil Delhi	5	5	0	0
Gurugram Automotive Industry	0	6	0	0
Noida Manufacturing	0	0	0	7
Power Delhi	4	2	0	0

This table shows the details : The industries need to take approval and permission from respective Pollution Control Board/ local authority for disposal of waste water.

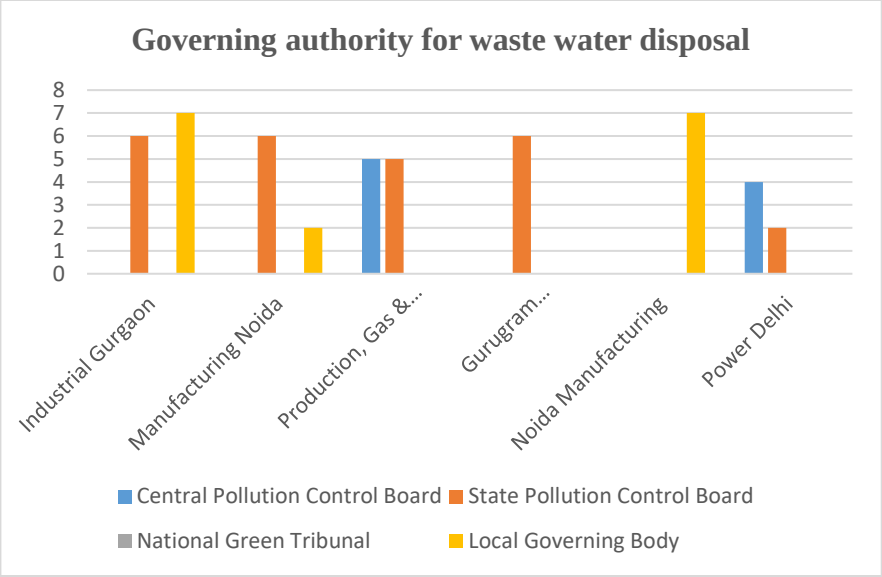

Fig 5.2. Waste Water Disposal governing authority for industry

This graph 5.2 depicts that the category of Industrial Gurgaon Industry has taken approvals for waste water disposal equally by State Pollution Control Board and Local governing body. Whereas when we see the category of Automotive Gurgaon Industry, the approval is from State Pollution Control Board only. The bigger Industry category ie manufacturing Noida has more approvals from State Pollution Control Board and lesser from local governing body. Whereas the small industry under category of Noida manufacturing have all approvals from local governing body. Coming to Delhi we will see that maximum approvals whether in power or production, oil & gas industry category, approvals are from Central Pollution control Board and State Pollution Control Board with no involvement of local governing bodies.

Table 5.3. Knowledge of industry on water disposal laws and method

Industry	Limitations on Water Usage and Disposal by Govt	Knowledge on Waste Water Disposal Laws	Disposal of Waste water Generated
Industrial Gurgaon	Yes	Yes	Waste water treatment
Manufacturing Noida	Yes	Yes	Waste water treatment
Production, Gas & Oil Delhi	Yes	Yes	Waste water treatment
Gurugram Automotive Industry	Yes	Yes	Waste water treatment
Noida Manufacturing	Yes	Yes	Waste water treatment
Power Delhi	Yes	Yes	Waste water treatment

This table shows the survey conducted on knowing if the industry is aware of the limitations on water usage and disposal by respective governing authority . knowledge of industry on waste water disposal laws and the method by which they dispose waste water.

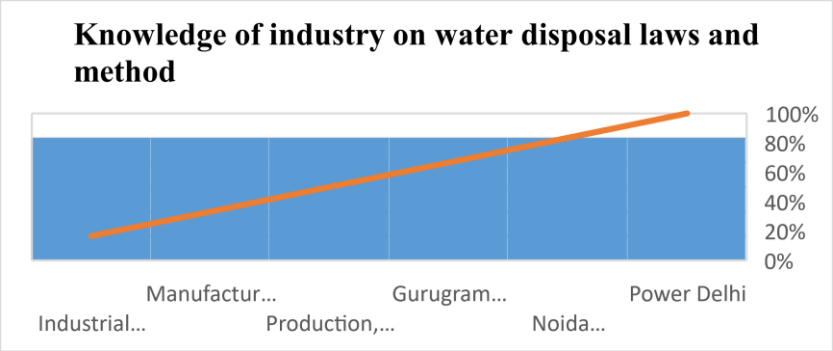

Fig 5.3. Knowledge of industry on water disposal laws and method

This graph clearly shows that each category of industry whether in Delhi, Gurgaon or Noida confirmed they all are aware of limitations as imposed by governing body on water usage and waste water disposal. They all confirmed having knowledge on waste water disposal laws. All of them confirmed of using waste water treatment. This shows that the industry has awareness on importance of water usage and waste water disposal but how far the same is actually being implemented is not clear.

Table 5.4. Feedback on governing body on complaints

Industry	**Average Feedback on Govt while dealing on Waste water Disposal (Scale 1 to 5)**	**Complaints made to Govt on Waste water disposal issues (per year)**
Industrial Gurgaon	3	4
Manufacturing Noida	4	4
Production, Gas & Oil Delhi	4	4
Gurugram Automotive Industry	5	4
Noida Manufacturing	3	5
Power Delhi	5	3

This table shows the no. of complaints made to respective governing body on waste water disposal issues and the feedback on the resolution .

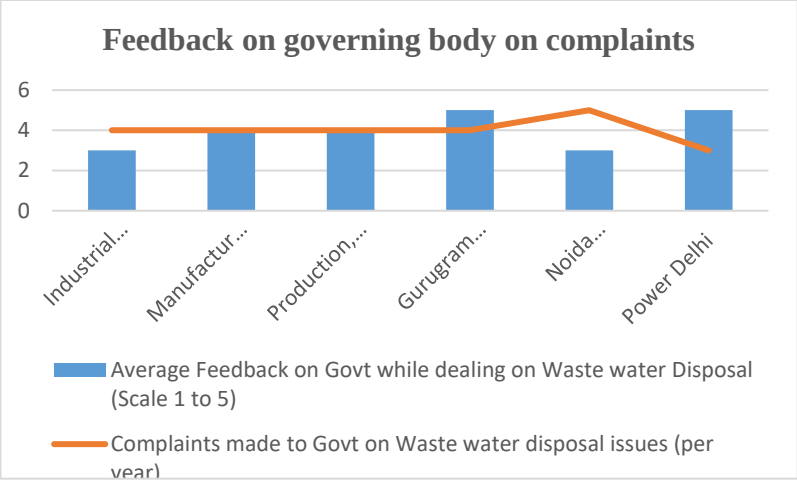

Fig 5.4. Feedback on governing body on complaints

The graph 5.4 above shows that the average feedback on resolution from governing body on waste water disposal has been satisfactory by industry. The number of complaints that the industry made was on an average 3 or 4 per year. This shows that governing body are active on waste water disposal when it comes to industry.

Insights:

Environmental Impact Awareness: The data demonstrates in table 5.1. a clear and direct relationship between industrial operations and the production of wastewater. Industries that have higher levels of production must implement sophisticated treatment technologies in order to minimize their impact on the environment.

Resource Allocation for Waste Management: Areas such as Delhi and Gurugram, which have larger amounts of wastewater, should give priority to allocating resources for the development and upkeep of effective wastewater treatment facilities.

Encouraging Sustainable Practices: Industries that have reduced levels of wastewater production serve as exemplars, demonstrating the advantages of implementing sustainable water usage and management methods. This has the potential to motivate other industries to adopt comparable tactics.

Policy Implications: Policymakers can utilize this data to formulate industry-specific laws that promote water conservation and discourage the development of excessive effluent, so cultivating a more sustainable industrial ecology.

An in-depth comprehension of the subtle distinctions in wastewater production across various businesses not only identifies areas that need enhancement, but also demonstrates effective methods that can be expanded and duplicated, so propelling the NCR region towards a more environmentally friendly and sustainable future.

The vertical axis indicates the various industries and cities, while the horizontal axis shows the approximate amount of waste water produced (in litres). A horizontal bar is used to symbolise each industry in each city, with the length of the bar representing the amount of waste water produced daily. There is no proper mechanism or policy with them on disposal of waste water except very few of them. No concrete details were obtained on the same, which shows that it is lagging on effective disposal of waste.

This horizontal bar chart makes it simple to compare the amount of waste water produced by various industries in Gurugram, Noida, and Delhi, giving information about how each one's environmental effects differ. It promotes initiatives to develop more effective waste water management

methods in various industrial sectors and aids in identifying possible problem areas.

Consumers

Table 5.5. Survey analysis for water consumption, Bill, Waste disposal, water scarcity

Area	Quantity of Water Used at Home per day (approximately in Litres)	Cost of Water as per Bill (approx per month) INR	How do you Dispose Waste Water at Home ?	Frequency of Water Scarcity you face
Delhi	23	696	Cleaning Floor	Once a month
Delhi	24	1344	Watering Plants	No Scarcity of water
Delhi	27	724	Sinks/ Drains	Once a month
Delhi	20	1114	Sinks/ Drains	Once a month
Delhi	21	1292	Sinks/ Drains	No Scarcity of water
Delhi	30	586	Sinks/ Drains	No Scarcity of water
Delhi	28	963	Watering Plants	No Scarcity of water
Delhi	25	1305	Watering Plants	Mostly scarcity is there

Delhi	28	771	Watering Plants	No Scarcity of water
Delhi	28	996	Watering Plants	More than 2 times a month
Delhi	22	1171	Sinks/ Drains	More than 2 times a month
Delhi	29	934	Sinks/ Drains	No Scarcity of water
Delhi	29	997	Sinks/ Drains	No Scarcity of water
Delhi	29	898	Watering Plants	More than 2 times a month
Delhi	29	910	Cleaning Floor	More than 2 times a month
Faridabad	27	538	Sinks/ Drains	More than 2 times a month
Faridabad	26	618	Sinks/ Drains	No Scarcity of water
Faridabad	27	1281	Watering Plants	Once a month
Faridabad	21	980	Sinks/ Drains	Once a month
Faridabad	22	1497	Watering Plants	Once a month
Faridabad	27	1364	Sinks/ Drains	No Scarcity of water
Faridabad	29	846	Cleaning Floor	Once a month

Faridabad	23	1312	Cleaning Floor	More than 2 times a month
Ghaziabad	20	1122	Watering Plants	More than 2 times a month
Ghaziabad	23	1348	Cleaning Floor	More than 2 times a month
Ghaziabad	26	1789	Cleaning Floor	More than 2 times a month
Ghaziabad	27	1809	Sinks/ Drains	Once a month
Gurugram	25	1366	Sinks/ Drains	Once a month
Gurugram	23	1272	Sinks/ Drains	Once a month
Gurugram	28	884	Watering Plants	Once a month
Gurugram	22	548	Sinks/ Drains	No Scarcity of water
Gurugram	21	1385	Watering Plants	No Scarcity of water
Gurugram	20	855	Watering Plants	Once a month
Gurugram	28	1145	Sinks/ Drains	Once a month
Gurugram	24	973	Sinks/ Drains	Once a month
Gurugram	21	780	Sinks/ Drains	More than 2 times a month
Gurugram	20	588	Watering Plants	Mostly scarcity is there

Gurugram	22	1457	Sinks/ Drains	Once a month
Gurugram	27	867	Watering Plants	Once a month
NOIDA	21	861	Sinks/ Drains	No Scarcity of water
NOIDA	25	633	Sinks/ Drains	Mostly scarcity is there
NOIDA	24	1182	Sinks/ Drains	No Scarcity of water
NOIDA	22	796	Watering Plants	Once a month
NOIDA	21	800	Sinks/ Drains	Twice a month
NOIDA	27	866	Watering Plants	No Scarcity of water
NOIDA	21	780	Sinks/ Drains	No Scarcity of water
NOIDA	23	1101	Sinks/ Drains	More than 2 times a month
NOIDA	20	760	Sinks/ Drains	Once a month
NOIDA	18	660	Cleaning Floor	Once a month
NOIDA	20	810	Cleaning Floor	Once a month
GREATER NOIDA	20	950	Sinks/ Drains	Once a month
GREATER NOIDA	10	750	Cleaning Floor	Twice a month

GREATER NOIDA	15	850	Cleaning Floor	Twice a month
GREATER NOIDA	18	900	Sinks/ Drains	No Scarcity of water
GREATER NOIDA	18	900	Sinks/ Drains	No Scarcity of water
GREATER NOIDA	16	875	Sinks/ Drains	Once a month
GREATER NOIDA	12	770	Sinks/ Drains	Twice a month
GREATER NOIDA	13	800	Cleaning Floor	Twice a month
GREATER NOIDA	15	900	Cleaning Floor	Twice a month
GREATER NOIDA	20	950	Sinks/ Drains	Twice a month
Faridabad	23	1350	Sinks/ Drains	More than 2 times a month
Faridabad	10	690	Cleaning Floor	More than 2 times a month
Faridabad	20	1310	Sinks/ Drains	More than 2 times a month
Faridabad	25	1550	Sinks/ Drains	Once a month
Faridabad	25	1600	Sinks/ Drains	Once a month
Faridabad	30	1930	Sinks/ Drains	Twice a month
Faridabad	24	1475	Sinks/ Drains	More than 2 times a month

Ghaziabad	25	1780	Cleaning Floor	More than 2 times a month
Ghaziabad	20	1440	Sinks/ Drains	Twice a month
Ghaziabad	30	2103	Cleaning Floor	Once a month
Ghaziabad	12	867	Cleaning Floor	More than 2 times a month
Ghaziabad	25	1800	Sinks/ Drains	Twice a month
Ghaziabad	23	1720	Cleaning Floor	Once a month
Ghaziabad	28	1910	Sinks/ Drains	No Scarcity of water
Ghaziabad	30	2109	Sinks/ Drains	No Scarcity of water
Ghaziabad	24	1800	Cleaning Floor	Once a month
Ghaziabad	25	1920	Cleaning Floor	No Scarcity of water
Ghaziabad	25	1910	Sinks/ Drains	Once a month
Gurugram	30	1103	Watering Plants	Twice a month
Gurugram	28	1223	Watering Plants	No Scarcity of water
Gurugram	23	1510	Sinks/ Drains	Twice a month
NOIDA	20	830	Watering Plants	Twice a month

NOIDA	21	870	Cleaning Floor	Once a month
NOIDA	24	1103	Watering Plants	Once a month
NOIDA	30	1304	Watering Plants	Twice a month
Delhi	30	1104	Watering Plants	No Scarcity of water
Delhi	35	1310	Sinks/ Drains	Twice a month
Delhi	25	565	Sinks/ Drains	Once a month
Delhi	20	460	Watering Plants	No Scarcity of water
Delhi	30	1200	Sinks/ Drains	Once a month
Delhi	22	410	Watering Plants	More than 2 times a month
Delhi	24	600	Sinks/ Drains	Once a month
Delhi	28	900	Watering Plants	Twice a month
Delhi	30	1310	Sinks/ Drains	Once a month
Delhi	20	520	Watering Plants	No Scarcity of water
Jhajjar	15	340	Sinks/ Drains	More than 2 times a month
Jhajjar	18	430	Sinks/ Drains	Once a month
Jhajjar	20	523	Sinks/ Drains	Twice a month

Jhajjar	23	640	Cleaning Floor	More than 2 times a month
Jhajjar	28	860	Sinks/ Drains	Twice a month
Jhajjar	20	510	Cleaning Floor	Twice a month
Jhajjar	12	310	Cleaning Floor	Once a month
Jhajjar	10	300	Cleaning Floor	Twice a month
Jhajjar	24	700	Sinks/ Drains	No Scarcity of water
Jhajjar	23	680	Sinks/ Drains	No Scarcity of water

The table provides a detailed analysis of water-related data for various places, with an emphasis on four major metrics: daily water usage at home (in liters), monthly water bill costs (in INR), wastewater disposal techniques, and the frequency of water scarcity experienced by residents.

I. In Delhi, daily water use ranges from 20 to 35 litres, with monthly prices ranging from 410 to 1344 INR. Cleaning floors and watering plants are common means of wastewater disposal, with water scarcity ranging from "no scarcity" to "more than 2 times a month."

II. Water usage in Faridabad is between 10 and 30 liters per day, with monthly prices ranging from 538 to 1930 INR. Residents report water scarcity ranging from "no scarcity" to "more than 2 times a month." Wastewater is largely disposed of through sinks/drains or used to water plants.

III. Ghaziabad uses 20 to 30 liters of water per day, which costs between 867 and 2109 INR. Here, too, wastewater is primarily managed through sinks/drains or used for floor cleaning, and water shortage ranges from "once a month" to "no scarcity."

IV. In Gurugram, water consumption averages from 20 to 30 liters per day, with bills ranging from 548 to 1510 INR. Residents primarily dispose of wastewater through sinks/drains or utilize it to water plants, with scarcity reported ranging from "once a month" to "mostly scarcity is there."

V. According to NOIDA data, people use 18 to 30 liters of water per day, which costs between 630 and 1304 INR per month. Wastewater disposal is identical to other locations, and water scarcity ranges from "no scarcity" to "twice a month."

VI. Greater NOIDA has the lowest daily water consumption, ranging from 10 to 20 liters, with monthly bills ranging from 750 to 950 INR. Sinks/drains and floor cleaning are two methods of wastewater disposal, and water scarcity ranges from "no scarcity" to "twice a month."

VII. In Jhajjar, daily water consumption ranges between 10 and 28 liters, with monthly prices ranging from 300 to 860 INR. Wastewater is also disposed of through sinks and drains or used to clean floors, and people confront water scarcity "once a month" to "more than twice a month.".

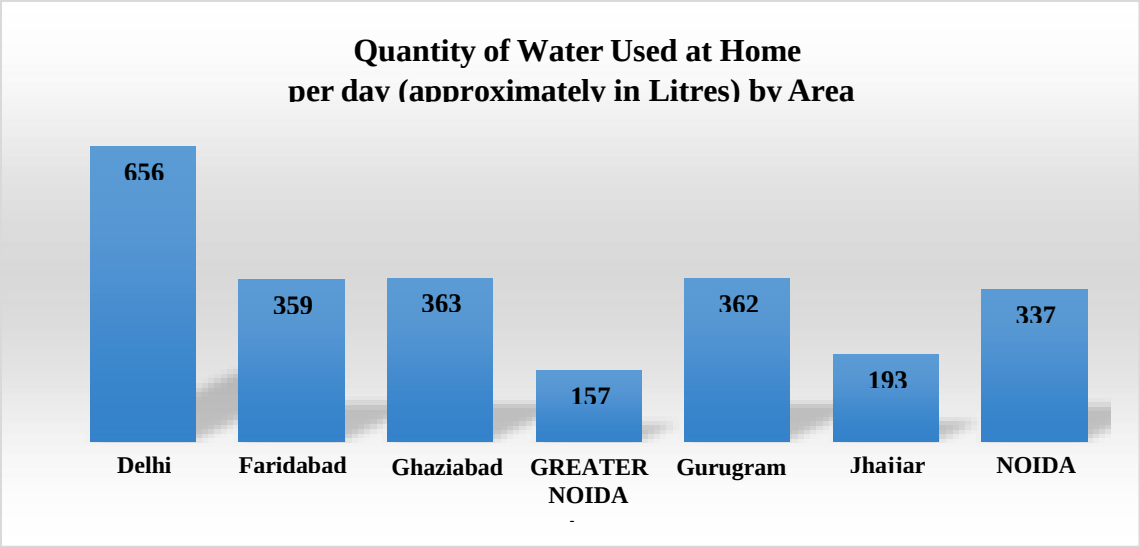

Fig 5.5.a Count of Quantity of water used in Delhi and nearby areas. (Approximately in Litres)

Figure 5.5a shows a bar chart that compares average daily household water use in liters across different geographies. The chart's title, "Sum of Quantity of Water Used at Home per Day (approximately in Litres) by Area," suggests that the data represents household water usage.

The figure shows the following data points for daily water usage:

I. Delhi has the highest water consumption at 656 liters.

II. Faridabad and Ghaziabad use equal amounts of water, with 359 and 363 liters, respectively.

III. Greater Noida Area has the lowest usage of the mentioned places, at 157 liters.

IV. Gurugram and NOIDA have moderate water use, with 193 and 337 liters, respectively.

V. The chart also contains a notation indicating that the statistics refer to the "Count of Quantity of Waste Water Consumed in Delhi and Nearby Areas." However, this note appears to be in disagreement with the chart's title, which could indicate an error. If the graphic is intended to represent waste water, the title should be updated to reflect that. If the graphic truly depicts 'used' water, the notation may need to be changed or removed to prevent confusion.

The visual depiction in the form of blue bars enables easy comparison of the various areas, with the length of each bar corresponding to the volume of water used. The bar chart in Figure 5.5a depicts the variation in home water consumption in various areas near Delhi. The y-axis shows the volume of water in liters, and the x-axis shows the areas of Delhi, Faridabad, Ghaziabad, Greater Noida Area, Gurugram, Jhajjar, and NOIDA. A notable difference exists, with Delhi at the peak of consumption and the Greater Noida Area at the bottom. This graphic comparison highlights the diversity of water usage habits in nearby places. It is critical to address the following note, which appears to contradict the chart's title and requires verification and correction to assure the accuracy of the data depiction in the context of the thesis.

The bar chart in Figure 5.5b is named "Sum of Cost of Water as per Bill (approx per month) INR by Area," and it shows the average monthly cost of water in Indian Rupees (INR) for various places. The data are as follows:

I. Delhi has the highest monthly water bill, totaling 23,080 INR.

II. Ghaziabad follows at a huge cost of 25,427 INR.

III. Faridabad's average bill is 18,341 INR.

IV. Gurugram and NOIDA have lower costs than the rest, with 15,956 and 13,356 INR, respectively.

V. Greater NOIDA has the lowest water cost, at 8,645 INR.

VI. Jhajjar is likewise priced lower, at 5,293 INR.

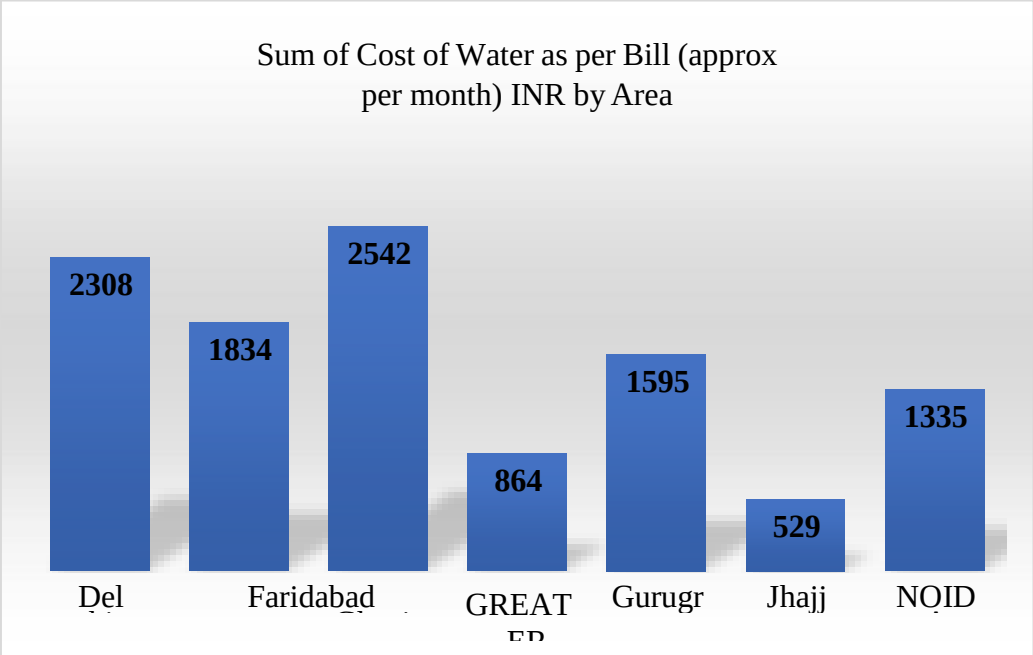

Fig 5.5.b Charges of Quantity of Water in Delhi and nearby areas. (Approximately in Litres)

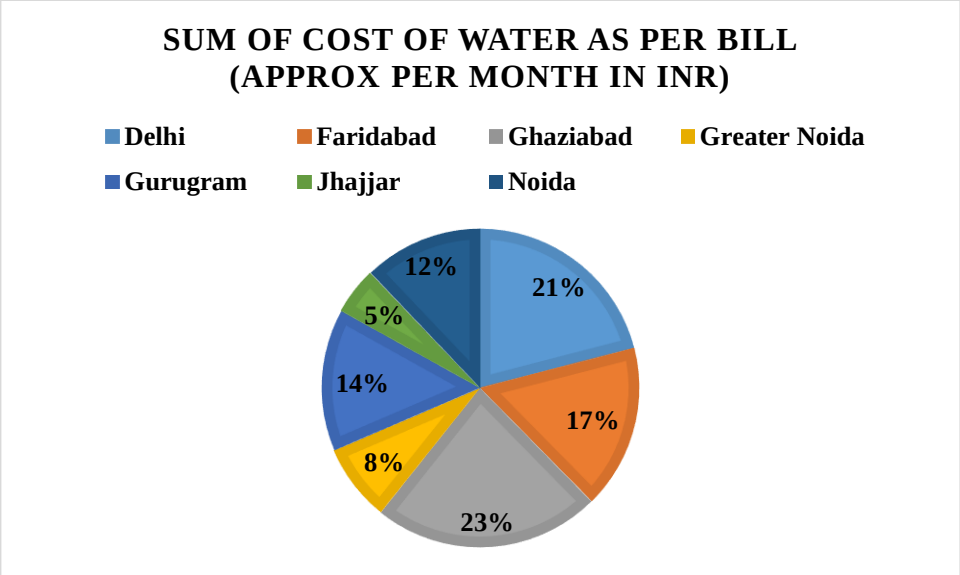

Fig 5.5.c Monthly Water Bill Distribution by Region (in INR)

The pie chart fig 5.5c. titled "Monthly Water Bill Distribution by Region (in INR)" illustrates the proportional distribution of water bill costs across various regions surrounding Delhi. Each segment of the pie chart represents a different region and shows its percentage contribution to the total monthly water bill. The regions and their corresponding percentages are as follows:

I. Delhi: Represented by the blue segment, Delhi accounts for 21% of the total monthly water bill.

II. Faridabad: Represented by the orange segment, Faridabad accounts for 17% of the total monthly water bill.

III. Ghaziabad: Represented by the gray segment, Ghaziabad accounts for 23% of the total monthly water bill.

IV. Greater Noida: Represented by the yellow segment, Greater Noida accounts for 8% of the total monthly water bill.

V. Gurugram: Represented by the green segment, Gurugram accounts for 14% of the total monthly water bill.

VI. Jhajjar: Represented by the light blue segment, Jhajjar accounts for 5% of the total monthly water bill.

VII. Noida: Represented by the dark blue segment, Noida accounts for 12% of the total monthly water bill.

The figure effectively highlights the varying costs of water bills in different regions, providing a clear visual comparison. This data is crucial for understanding regional differences in water billing and can help in analyzing water consumption patterns and cost management strategies in these areas.

Similar to the previous picture, there is a statement below stating, "Figure 5.2. Quantities of waste water charges in Delhi and surrounding locations. (Approximately in liters)" The statement in this caption is in direct opposition to the information shown in the picture. The figure specifically pertains to the cost of water, not the quantity of wastewater. This discrepancy suggests a possible issue with the labeling that needs to be addressed in order to match the data presented in the chart. Figure 5.5b illustrates the financial aspect of water usage, displaying the average monthly water expenses for several regions in and around Delhi. The chart presents a comparison of the cost in Indian Rupees (INR) on the vertical axis (y-axis) against a range of regions on the horizontal axis (x-axis). The billing disparities are substantial, with Ghaziabad experiencing the highest average cost and Greater NOIDA having the lowest. This data may indicate discrepancies in the economic aspects of water pricing or usage patterns across different locations. Nevertheless, there is a notable inconsistency in the subsequent statement regarding the 'Charges of Quantity of Waste Water,' since it does not align with the reported expenses on water bills. We could also observe that consumers were not aware on any regulatory

framework of law whether on usage or disposal as it was all answered no by most of them. The feedback on water quality was equalized by them to water supply only. For them water supply was the only issue and they were not using the water for drinking purpose since they all had drinking water purifiers at home. They only complaint to their respective bodies for water supply but the feedback was poor by all of them. This has not been shown in graphs as no concrete significant numbers was obtained.

Regulatory Bodies

Table 5.6. Complaints for Water Issues in NCR Region.

No.of Complaints	Delhi (Delhi Jal Board)	Noida (Noida authority water department)	Gurgaon (Jal Board, Gurgaon)
No. of Complaints on Water Supply (average per week)	487	480	450
No. of Complaints on water quality (average per week)	456	489	420
No. of Complaints on water drainage (average per week)	320	480	430

The table 5.6, named "Complaints for Water Issues in NCR Region," presents the average weekly number of complaints regarding water supply, water quality and water drainage problems in three prominent cities of the National Capital Region (NCR) of India: Delhi, Noida, and Gurugram.

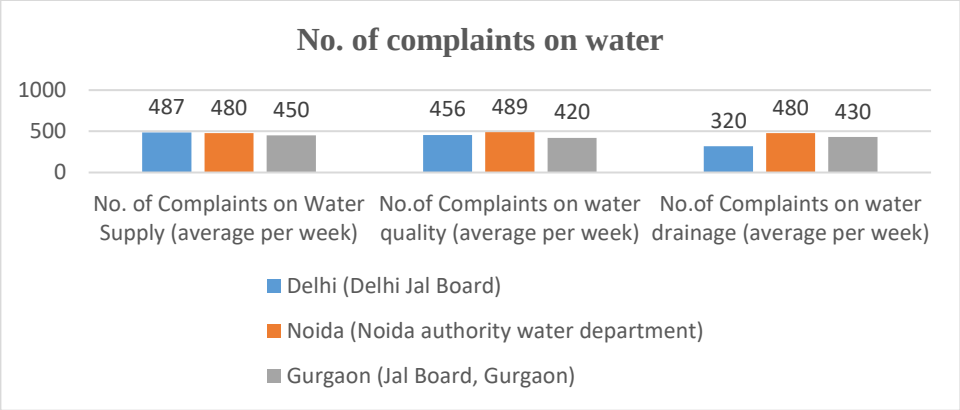

Fig 5.6.a Complaints for water issues in NCR region

The graph 5.6a is a vertical bar chart depicting the weekly mean of complaints regarding water drainage and water quality in Delhi, Noida, and Gurugram.

I. Delhi: On average, the city of Delhi received 456 complaints per week regarding the quality of its water and 487 complaints on water supply.

II. Noida: Conversely, Noida had a little higher mean, with an average of 489 water quality grievances and 480 on water supply per week.

III. Gurugram has the lowest overall number of complaints, with an average of 420 complaints per week regarding water quality and 450 on water supply.

IV. Delhi: On average, the city of Delhi received 320 complaints each week regarding water drainage difficulties.

V. Noida: Noida had an average of 480 complaints per week regarding water drainage, which was the highest among all areas.

VI. In Gurugram, there was an average of 430 complaints per week regarding inadequate water drainage.

VII. The horizontal axis displays the three cities, while the vertical axis represents the number of complaints. Each city is represented by a vertical bar, where the length of the bar corresponds to the average number of complaints received in that city.

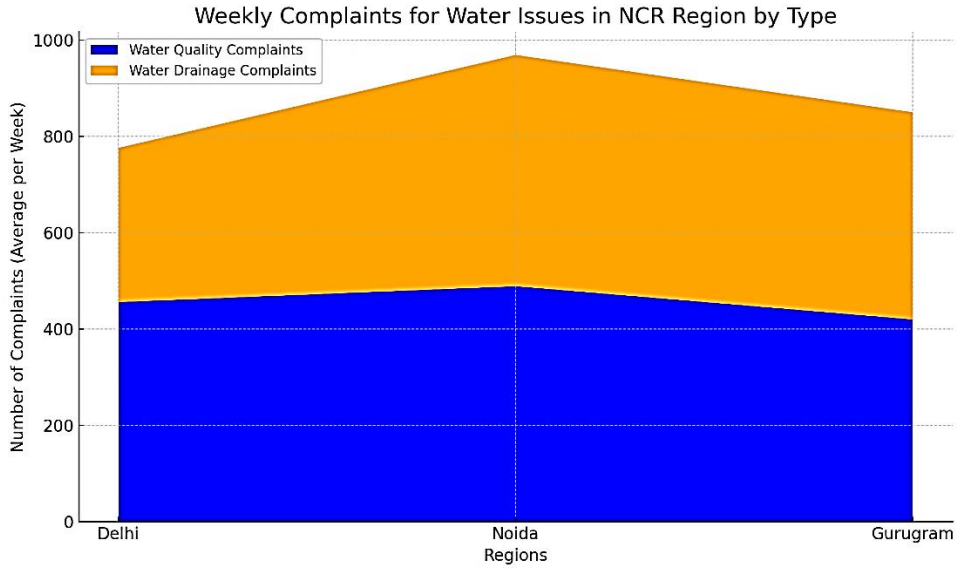

Fig 5.6.b Weekly Complaints for Water Issues in NCR Region by Type

The stacked area chart, named "Weekly Complaints for Water Issues in NCR Region by Type," visually displays the mean weekly complaint count for water quality and water drainage problems in three regions: Delhi, Noida, and Gurugram. The figure enables a cumulative comparison, displaying the overall number of complaints and the breakdown between the two categories of difficulties.

I. Delhi:

1) Water quality complaints in Delhi were reported at an average rate of 456 each week, as indicated by the blue area.

2) Water drainage complaints in Delhi were concentrated in the orange area, with an average of 320 complaints per week.

II. Noida:

1) Water quality complaints in Noida were reported at an average rate of 489 per week, as indicated by the blue region.

2) Noida, represented by the orange area, experienced an average of 480 water drainage complaints every week.

III. Gurugram:

1) Gurugram got an average of 420 water quality complaints every week, as indicated by the blue area.

2) Gurugram, indicated by the orange area, experienced an average of 430 water drainage complaints every week.

This graphic provides a clear representation of the number of complaints regarding water difficulties throughout the NCR region. It shows both the separate and combined contributions of each complaint type in different regions. Employing distinct colors for each complaint category improves legibility and facilitates differentiation across data categories. This graph provides a clear representation of the number of complaints regarding water difficulties throughout the NCR region. It shows both the separate and combined contributions of each complaint type in different regions. Employing distinct colors for each complaint category improves legibility and facilitates differentiation across data categories.

Table 5.7. Grievance handling days.

Agency	**Grievance Redressal Days**
Delhi (Delhi Jal Board)	7
Noida (Noida authority water department)	2

Gurgaon (Jal Board, Gurgaon)	Not specified

This table as above shows the grievance handling days by respective water authority on supply, quality or sanitation.

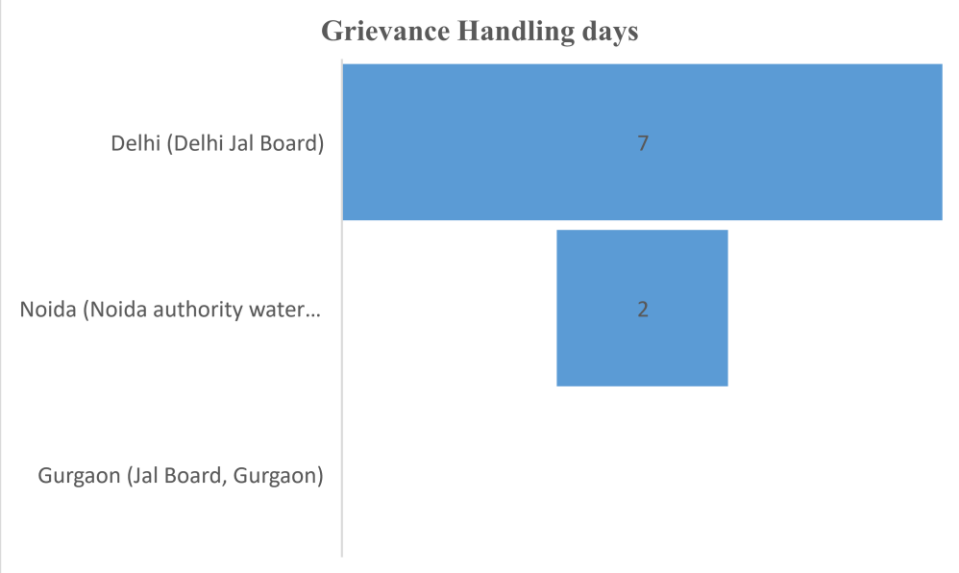

Fig 5.7. Grievance handling days.

This figure shows that Noida is more prompt in handling water related issues of consumers, whereas Gurgaon has not specified the time limit. We see even if these issues are being addressed , the issues are still creeping whether on water supply, quality or sanitation.

Table 5.8. Water Sanitation and monitoring by government agency

Agency	No. of times Water sanitation is done (monthly)	Water Cleaning/ Sanitation done Method	Monitoring water disposal at homes/ industry
Delhi (Delhi Jal Board)	2	Chemical Addition, Waste water Treatment plants	Awareness campaigns, inspections
Noida (Noida authority water department)	1	Chemical Addition, Waste water Treatment plants	Awareness campaigns, inspections
Gurgaon (Jal Board, Gurgaon)	1	Chemical Addition, Waste water Treatment plants, osmosis	Awareness campaigns, inspections

Table clearly shows the number of times particular city meets the water cleaning and sanitation method.

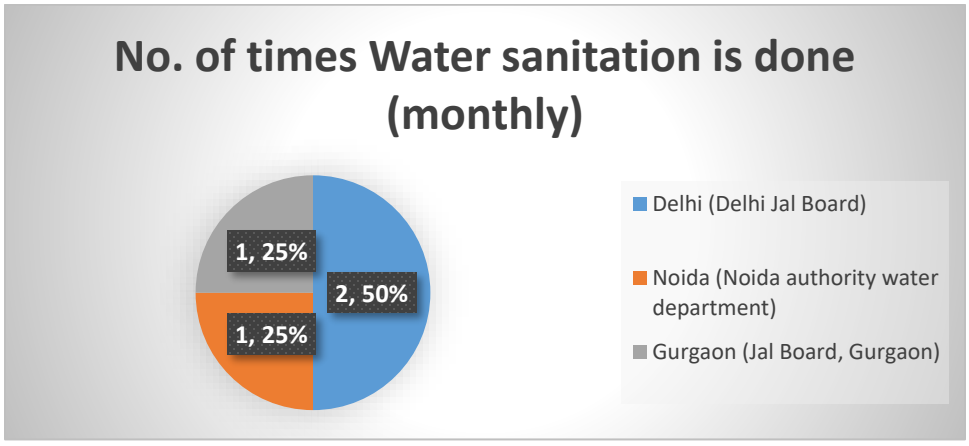

Figure 5.8. Water Sanitation and monitoring by government agency

The graph 5.8 shows that Delhi is more active on cleaning water process than Noida and Gurgaon. If we see the method of water sanitation, we observe all agency are using more or same process . The focus should now be on solar purification or any new method with a mandate on law for the multiple times to ebe done to ensure water quality and the standard.

The government agency also does a monitoring on waste water disposal by homes/ industry via awareness campaigns and inspections. But the details on inspection are not known. No fines are being imposed, not known the implementation of regulations on same. In industry it may be but not at homes.

CHAPTER 6

INSTITUTIONAL EFFORTS IN REGULATING WASTE DISPOSAL AND RESOURCE CONSERVATION: COMPARING EXECUTIVE, LEGISLATIVE AND JUDICIAL ACTION IN INDIA

Efficient waste management and the preservation of resources are crucial concerns for achieving sustainable development. The expanding worldwide population and escalating levels of consumption have led to a rapid increase in waste generation and depletion of resources. Consequently, governments and regulatory agencies have acknowledged the necessity of regulating waste disposal and advancing resource conservation through institutional means. efforts(Ezeah et al., 2013).

The objective of this chapter is to evaluate institutional efforts in waste disposal and resource conservation. The chapter analyzes the role of governments and other regulatory bodies in regulating waste disposal and promoting resource conservation. It also evaluates different institutional approaches to waste disposal and resource conservation, identifies challenges and limitations, and provides recommendations for improving institutional approaches.

The chapter is structured as follows: first, we discuss the role of institutions in waste disposal. Second, we discuss the role of institutions in resource conservation. Third, we provide case studies of institutional efforts in waste disposal and resource conservation from different countries or regions. Finally, we summarize the key points discussed in the chapter, highlight the importance of institutional efforts in waste disposal and resource conservation for sustainable development, and provide recommendations for improving institutional approaches to waste disposal and

resource conservation. Efficient waste management and the preservation of resources are significant environmental issues that require attention from many levels of government. Efforts by institutions to regulate the disposal of waste and save resources often involve a partnership between central or federal government agencies and state or regional governments. Let us compare and differentiate the roles and responsibilities of these two tiers of government in addressing these issues.

6.1. Central/Federal Government:

I. Policy Framework: Central governments often set the comprehensive policy framework and regulations in waste management and resource conservation. They have the authority to establish nationwide environmental objectives and standards that all states are required to adhere to.

II. Regulatory Agencies: Generally, central governments typically establish agencies or departments that are responsible for the oversight and management of environmental protection and regulation. Nationally, these agencies have the authority to develop and implement policies related to waste disposal, pollution control, and resource conservation.

III. Research and Innovation: Central governments have the ability to support research and innovation programs that focus on waste reduction, recycling, and sustainable resource management. They have the ability to promote and support the progress of cutting-edge technology and methods.

IV. International accords: National policies and laws can be influenced by central governments' representation of the country in international environmental treaties and conventions.

*6.2.***State/Regional Government:**

I. Implementation: The state or regional administrations play a vital role in implementing and guaranteeing adherence to the rules and regulations set by the federal or central governments. They modify and adapt these regulations to suit their particular local circumstances and needs.

II. Monitoring and Enforcement: It is the responsibility of states to ensure compliance with waste management and resource conservation policies within their jurisdiction. In order to oversee and ensure compliance with these regulations, it is possible for them to establish their own dedicated environmental protection agencies or departments.

III. Regional Variations: Due to the unique environmental challenges and objectives of each state, additional regulations or incentives may be implemented to address local issues. Coastal states may implement specific regulations to protect marine habitats.

IV. Public Outreach: State governments often undertake public outreach and education campaigns to promote awareness of waste reduction and resource conservation. Additionally, they could offer incentives or subsidies to promote the implementation of sustainable practices.

V. Funding and Grants: States have the authority to allocate funding for waste management and conservation initiatives independently, in addition to receiving grants and financial assistance from the federal government to support local projects.

Both central/federal and state/regional governments have complementary roles in regulating trash disposal and resource conservation. Although the central or federal government sets the general structure and national guidelines, it is the

responsibility of state governments to carry out and adjust these policies to address specific local concerns. Efficient collaboration and coordination among several tiers of government are necessary to achieve substantial advancements in environmental preservation and resource conservation. The responsibilities of the central (federal) government and state governments in water disposal and conservation vary based on a country's governance structure, policies, and legal frameworks. The following outlines the typical roles that these two levels of government play in regulating water disposal and conservation.

6.3.Central (Federal) Government Roles

I. Policy Development: The federal government often assumes responsibility for establishing national water policies and guidelines. These policies set the general course and objectives for water management, encompassing both disposal and conservation.

II. Legislation: Central governments enact and oversee water-related laws, including regulations pertaining to water quality requirements, wastewater treatment, and conservation efforts. They have the ability to establish a legal framework to govern the issuance of licenses and the regulation of water disposal.

III. Regulatory Oversight: Central government bodies, such as the Environmental Protection Agency or similar organizations, often have the authority to regulate and enforce standards for water quality and controls on discharges. The task involves monitoring water contamination levels and ensuring compliance with federal regulations.

IV. Interstate Water Management: In nations characterized by numerous states or regions, the central government may provide assistance for the facilitation of interstate collaboration and synchronization in the

administration of interstate water resources, such as rivers that traverse multiple states..

V. Research and Development: The federal government has the authority to finance research programs and technology development initiatives focused on water conservation and pollution management. They possess the capacity to stimulate innovation in approaches to water management.

VI. International Agreements: Central governments possess the jurisdiction to engage in discussions and establish international accords about transboundary water resources, guaranteeing that the nation's concerns for water preservation are represented globally.

6.4.State Governments' Roles:

I. Implementation: State administrations are tasked with implementing the water policies and laws of the central government within their own regions. They adapt national policies to address specific water issues and circumstances at the local level.

II. Water Resource Management: Every state has its own water resource management authority that supervises the allocation and utilization of water resources within its jurisdiction. They have the authority to provide water usage licenses, which may include permission for discharging water.

III. Wastewater Treatment: State governments often regulate and oversee wastewater treatment facilities to guarantee compliance with water quality regulations. In addition, they may be responsible for developing and implementing regulations regarding the disposal of industrial and municipal wastewater.

IV. Local Water Conservation Initiatives: States have the ability to create and execute water conservation programs and initiatives at a local level that are tailored to their specific requirements. Possible examples of such measures include incentives for water conservation efforts, water reuse systems, and the collection of rainwater.

V. Emergency Response: During instances of water-related disasters such as floods, droughts, or outbreaks of waterborne diseases, states often take on the role of primary responders. They supervise operations connected to the response and recovery of water-related disasters.

VI. Public Outreach and Education: State governments have a crucial responsibility in educating the public regarding water conservation and appropriate water disposal. They could implement educational campaigns and advocate for water conservation practices within the local community.

VII. It is imperative to bear in mind that the distinct roles and obligations of the federal and state governments in water disposal and conservation vary significantly among countries. Regional or local administrations can exert substantial influence over water management in certain countries, especially under federal systems with decentralized governance structures. Ensuring sustainable and responsible water resource management necessitates efficient coordination and cooperation between the federal and state governments.

VIII. In summary, this chapter emphasizes the crucial importance of institutional initiatives in overseeing waste management and advancing the preservation of resources. This highlights the necessity for a holistic and unified strategy towards waste management and preservation of

resources, considering the economic, social, and environmental dimensions of sustainable development.

6.5.Institutional Efforts in Waste Disposal

Waste management is a significant global environmental issue in the present era. Government entities and other regulatory authorities have a crucial function in overseeing trash disposal, guaranteeing the safe and effective management of garbage. Institutional endeavors in waste disposal generally encompass the implementation of policies, regulations, and procedures that oversee the gathering, transportation, treatment, and disposal of waste (Mani & Singh, 2016).

Various institutional strategies for garbage management have been employed, such as landfilling, incineration, and recycling. Landfills are the predominant method of trash disposal, accounting for around 90% of global waste disposal. Nevertheless, landfills exert substantial environmental consequences, such as the poisoning of groundwater, the emission of air pollutants, and the release of greenhouse gases. Incineration, however, is a highly efficient method of garbage disposal. Nevertheless, it does have environmental consequences, such as air pollution and the emission of hazardous chemicals(Marchettini et al., 2007). Recycling is a method of trash disposal that involves extracting valuable components from waste for reuse. Recycling has the potential to greatly decrease the quantity of garbage that is disposed of in landfills and incinerators, but it necessitates substantial expenditures in infrastructure and technology (Pathak et al., 2017).

Notwithstanding the efforts made by institutions in garbage disposal, there still exist substantial challenges and constraints. The factors contributing to the problem are insufficient infrastructure and funding, limited public awareness and participation, and opposition from the waste management sector. Furthermore,

politicians in Delhi tend to prioritize economic development over environmental concerns, typically perceiving garbage management as a low priority (Bhuvaneshwari et al., 2019) .

6.6.Institutional Efforts in Resource Conservation:

Preserving resources is essential for achieving sustainable development. Institutional endeavors in resource conservation generally encompass the implementation of laws, regulations, and incentives that encourage resource efficiency, minimize waste and pollution, and foster the utilization of renewable resources. Resource conservation encompasses several strategies such as enhancing energy efficiency, promoting water conservation, implementing sustainable agriculture practices, and reducing waste (Wanjiru & Xia, 2018).

Energy efficiency is a highly important aspect of conserving resources. Institutional endeavors in energy efficiency encompass the implementation of laws and regulations that advocate for the adoption of energy-efficient technologies, such as LED lighting and energy-efficient appliances. Water conservation is a crucial aspect of resource conservation, especially considering the growing shortage of water resources in many regions of the world. Institutional endeavors in water conservation generally entail the implementation of rules and regulations aimed at fostering the effective utilization of water, including the adoption of water-saving technology and practices (Srinivasa Rao et al., 2016).

Sustainable agriculture encompasses the implementation of policies and regulations that encourage sustainable farming techniques, including organic farming and agroforestry, as a means of conserving resources. Waste reduction is essential for resource conservation because it decreases the need for raw materials and encourages the optimal utilization of resources (Southgate & Whitaker, 1992).

Despite the efforts made by institutions to preserve resources, significant obstacles and limitations still exist. The issues include a lack of political will, inadequate financial backing and resources, and limited public awareness and involvement. Moreover, commercial and political incentives often impede resource conservation initiatives by giving priority to quick financial gains rather than long-term sustainability (Skoulikidis, 2009).

Institutional endeavors in resource conservation encompass the implementation of laws, regulations, and incentives aimed at fostering resource efficiency, diminishing waste and pollution, and encouraging the utilization of renewable resources. Resource conservation encompasses various strategies, such as enhancing energy efficiency, promoting water conservation, implementing sustainable agriculture practices, and reducing waste. Case studies from various countries and areas can be used to demonstrate the efficacy of institutional initiatives in resource conservation. Although there has been progress in conserving resources, there are still substantial obstacles and constraints, such as a lack of political determination, insufficient money, and limited public awareness and involvement (Kakwani & Kalbar, 2020).

Policymakers should put long-term sustainability ahead of short-term economic gains if they want to effectively deal with the problems and limits of institutional attempts to protect resources. Creating rules and laws that support sustainable practices and discourage non-sustainable ones is one way to do this. Another way is to provide money and other resources to help create and use sustainable tools and ways of doing things (Zanzanaini et al., 2017).

Institutional efforts can have a big effect on resource conservation in areas like saving energy and water, and farming in a way that doesn't harm the environment. For instance, buildings and products that use less energy can lower the need for

energy and greenhouse gas emissions. Also, sustainable farming methods can improve soil health and biodiversity while cutting down on the use of harmful chemicals and fertilizers (Lettinga et al., 2001).

Reducing waste is another important thing that institutions do to help protect resources. Cut down on the trash that people make, reuse, and recycle. This will lower the need for raw materials and encourage people to use resources more efficiently. Policies and rules that encourage people and businesses to cut down on waste and support recycling can help make this happen (Bogner et al., 2008).

Overall, attempts by institutions to protect resources are very important for promoting sustainable development and making sure that resources will be available for a long time. Even though there are still problems and limits, things can move forward by creating rules, laws, and rewards that value sustainability and promote environmentally friendly actions (Hart & Calhoun, 2010).

One big problem with institutional attempts to protect resources is that politicians don't want to put long-term sustainability ahead of short-term economic gains. Many politicians might not want to make changes that could hurt their country's economy in the short term, even if those changes would be good for the country in the long term. So, it's important to make people more aware of the advantages of protecting resources and the possible dangers of doing things that aren't sustainable so that institutions can get the support they need (Srinivasa Rao et al., 2016).

Another obstacle that arises is the insufficiency of financial assistance and resources to facilitate the advancement and execution of sustainable technologies and practices. This can be especially difficult in underdeveloped nations, where there may be a scarcity of resources and the expense of sustainable technologies may be prohibitive. To tackle this difficulty, international organizations and rich countries should allocate funds and offer technical help to aid the establishment and

execution of sustainable practices in developing nations. Furthermore, the development of strategies for resource conservation at an institutional level should be carefully planned to include the active participation of stakeholders, including local communities, enterprises, and civil society organizations. These stakeholders play a vital role in advocating for resource conservation and assuring the effectiveness and sustainability of institutional efforts. (Markantonis et al., 2019).

Ultimately, the implementation of institutional initiatives aimed at conserving resources is crucial for advancing sustainable development and guaranteeing the enduring accessibility of resources. Despite the presence of obstacles and restrictions, advancements can be achieved by implementing rules, regulations, and incentives that prioritize sustainability and promote sustainable behaviors. Additionally, engaging stakeholders and allocating sufficient financing and resources can also contribute to success. Through collaboration, we can advocate for the responsible utilization of resources and guarantee a more enduring future for everyone. Implementing effective institutional initiatives for resource conservation can yield multiple advantages for both the environment and society at large. Energy-efficient buildings and appliances have the ability to not only decrease greenhouse gas emissions and preserve resources, but also decrease energy expenses for consumers. Likewise, the implementation of sustainable agricultural methods can enhance soil quality and biodiversity, while also offering consumers healthier food choices. Efforts to reduce waste can have substantial advantages, such as diminishing the quantity of garbage that is deposited in landfills and contaminates the environment, preserving natural resources, and decreasing the need for raw materials. Recycling and composting initiatives have the potential to generate employment and economic prospects within the waste management and recycling sectors. In addition, the implementation of institutional initiatives to conserve resources can make a significant contribution towards attaining global sustainability

objectives, such as the United Nations' Sustainable Development Goals (SDGs). SDG 12 specifically targets responsible consumption and production, highlighting the importance of promoting sustainable behaviors and minimizing waste and pollution.

To attain these advantages and surmount the obstacles confronting institutional endeavors in resource preservation, it is imperative for policymakers to give precedence to sustainability and engage stakeholders in formulating and executing sustainable policies and practices. Individuals should actively make deliberate decisions in their daily lives, such as decreasing their energy usage and waste production, to endorse institutional initiatives and help achieve a more sustainable future for everyone. Institutional endeavors in resource conservation are crucial for advancing sustainability and guaranteeing the enduring accessibility of resources. Through collaborative efforts to emphasize sustainability and advocate for sustainable behaviors, we may establish a future that is both environmentally sustainable and fair for future generations.

Cases related with Regulating Waste Disposal and Resource Conservation

M.C. Mehta v. Union of India (1988) (M.C.Mehta v/s Union of India, n.d.)

The court case of M.C. Mehta v. Union of India addressed the issue of pollution in the Ganges River, which holds great religious and cultural importance in India. The case was prompted by concerns regarding the escalating pollution levels in the Ganges River, which posed significant threats to both public health and the environment. The Supreme Court acknowledged the situation and implemented measures to prevent any additional contamination of the river.

The court's order stipulated the closure of firms that release untreated effluents into the Ganges, as well as the enforcement of stringent pollution control measures by the competent authorities. The court observed that the right to a clean and healthy

environment is an essential element of the right to life, as stated in Article 21 of the Indian Constitution. This lawsuit represented a significant advancement in comprehending the need of safeguarding the country's water supplies and the entitlement of folks to experience uncontaminated, pure water.

Mehta v. Kamal Nath (1997) (M.C. Mehta vs Kamal Nath & Ors on 13 December, 1996, n.d.)

In the case of Mehta v. Kamal Nath, the Supreme Court dealt with the issue of illegal extraction of groundwater and its impact on the environment and water resources. The issue arose due to concerns about illegal and excessive extraction of groundwater, which led to a decline in groundwater levels and had severe impacts on water availability.

The court expressed strong disapproval of unauthorized groundwater extraction and emphasized the need for the state to exercise control and regulation over such activities in order to ensure sustainable water management. The court determined that the excessive and indiscriminate utilization of groundwater violated the fundamental right to life as stated in Article 21 of the Constitution. Additionally, the court recognized that access to water is essential for survival.

The court's verdict mandates that the state must implement appropriate measures to halt unauthorized extraction of groundwater and promote responsible water usage. This case underscored the necessity for effective groundwater management plans and highlighted the judiciary's responsibility in protecting water resources and ensuring citizens' entitlement to reliable access to water.

These additional cases serve as additional proof of the Supreme Court's commitment to addressing India's issues regarding access to clean water and sanitation. The court has always prioritized the preservation of citizens' constitutional rights and the promotion of responsible water management practices

to ensure water security and environmental protection through its interventions and verdicts.

Avinder Singh v. State of Punjab (2013) (Avinder Singh Etc vs State Of Punjab & Anr. Etc on 19 September, 1978, n.d.)

The case of Avinder Singh v. State of Punjab was a significant legal matter that dealt with the issue of water contamination caused by industrial activity in Punjab. The case originated from concerns regarding the discharge of untreated industrial effluents into rivers and other water bodies, resulting in significant environmental degradation and posing health hazards to local people.

In its verdict, the Supreme Court vehemently denounced water pollution and mandated the immediate shutdown of any company discovered to be discharging untreated effluents into water bodies. The court emphasized that enterprises must use efficient pollution control methods to safeguard the environment and the health of the general people. In order to avoid water pollution and ensure the protection of a pristine and salubrious ecosystem, the court emphasized the necessity of rigorously enforcing environmental laws.

Narmada Water Dispute (2000) (Narmada Bachao Andolan vs Union Of India And Others on 18 October, 2000, n.d.)

An interstate water dispute arose among the states of Gujarat, Madhya Pradesh, Maharashtra, and Rajasthan regarding the allocation of the Narmada River's water resources. The dispute arose due to the construction of the Sardar Sarovar Dam and its potential impact on water availability for multiple states.

The Supreme Court's intervention in the Narmada Water Dispute was crucial in resolving the complex issue of water allocation among the states. To address the concerns of each state and promote the sustainable utilization of the river's waters,

the court issued directives about the equitable allocation of water. The verdict emphasized the need of cooperative federalism and the riparian rights principle in addressing water disputes between different states. The Narmada Water Dispute case set important standards for resolving conflicts regarding the utilization of shared water resources among states. It emphasized the significance of achieving a harmonious equilibrium between the requirements of social and economic progress, environmental conservation, and the fair allocation of water resources.

The Supreme Court's role in addressing India's water and sanitation issues is exemplified by the aforementioned instances. The court has played a crucial role in safeguarding the right to clean water and a healthy environment through its legal decisions. These landmark judgments have emphasized the state's responsibility to protect water resources, regulate pollution, and ensure equitable access to water for all residents. The Supreme Court's proactive interventions remain crucial in shaping policies and practices for a sustainable and water-secure future, given India's ongoing challenges with water scarcity, pollution, and water management.

Indian Council for Enviro-Legal Action v. Union of India (1996)

(INDIAN ENVIRO LEGAL COUNCIL V. UNION OF INDIA AND OTHERS |LawFoyer, n.d.)

The court case, Indian Council for Enviro-Legal Action v. Union of India, addressed the issue of pollution in the Ganges River and the measures implemented to remediate it and reinstate its ecological equilibrium. The deteriorating state of the Ganges river can be attributed to industrial discharge, untreated sewage, and religious ceremonies that involve sacrificing to the river. These factors have led to the emergence of the current situation.

The Supreme Court emphasized the Ganges River's importance as a symbol of India's cultural and spiritual heritage in its verdict. The court has issued an injunction

to the government and its officials to commence the immediate process of cleansing and rejuvenating the river. The verdict resulted in the establishment of the Ganga Action Plan (GAP), which seeks to address pollution and implement various initiatives to improve water quality.

The disagreement showcased the court's dedication to safeguarding the environment and its recognition of the entitlement to a river that is devoid of contamination. The text underscored the utmost importance of collaboration among the government, individuals, and other relevant parties to safeguard and rehabilitate the ecological equilibrium of the River Ganges.

State of Tamil Nadu v. State of Kerala (2018) (The State Of Kerala vs The State Of Tamil Nadu on 9 April, 2018, n.d.)

The legal dispute between Tamil Nadu and Kerala regarding the Mullaperiyar Dam is referred to as the State of Tamil Nadu v. State of Kerala. The controversy stemmed from various issues, including apprehensions regarding the dam's structural soundness, water allocation, and safety measures.

The Supreme Court's involvement in this case was to resolve the acrimonious water dispute between the two states. The court meticulously analyzed the technical specifications of the dam, taking into account the interests of both states. The document provided guidelines and directions for the management and secure operation of the dam, while ensuring equitable distribution of water between Kerala and Tamil Nadu. The court's verdict in this case demonstrated its function in resolving complex disputes over water resources between several states and promoting collaborative governance in water management. It emphasized the importance of inter-state communication and collaboration to address water allocation issues and protect the rights of residents in both states.

The Supreme Court of India's engagement in issues related to water and sanitation underscores its commitment to conserving the environment, overseeing water resources, and safeguarding citizens' rights. These groundbreaking rulings have had a significant impact on water policies and practices throughout the country, creating essential regulations for fair water allocation between states, pollution control, and sustainable water administration. The court's proactive engagement remains crucial in upholding the tenets of environmental justice and ensuring a future that is both water-secure and ecologically sustainable, given India's ongoing challenges related to water scarcity and environmental degradation.

Chameli Singh v. State of Uttar Pradesh (1996) (Chameli Singh And Others Etc. vs State Of U.P. And Another on 15 December, 1995, n.d.)

The court case Chameli Singh v. State of Uttar Pradesh dealt with the matter of manual scavenging, a brutal practice involving the cleaning of human waste from dry latrines. This practice had a disproportionate impact on poor groups. The lawsuit exposed the perilous and degrading working conditions that manual scavengers face, which infringe upon their fundamental human rights and dignity.

The Supreme Court, in its verdict, condemned the practice of manual scavenging and emphasized that it contravenes Article 21 of the Indian Constitution, which guarantees the fundamental right to a life devoid of humiliation. The court mandated the state administration to promptly cease the practice of manual scavenging and provide rehabilitation for those engaged in it. The case played a crucial role in highlighting the plight of manual scavengers and catalyzing legal and policy measures to eradicate this practice. The Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, enacted in 1993 following a court ruling, aimed to prohibit manual scavenging and provide affected individuals with alternative economic opportunities.

Research Foundation for Science, Technology, and Ecology v. Union of India (1999) (Research Foundation, Sci. , Tech. & Eco. VS Union of India - Supreme Today AI, n.d.)

The case of Research Foundation for Science, Technology, and Ecology v. Union of India involved a discussion on genetically modified organisms (GMOs) and their potential impact on the environment and public health. The case brought attention to the concerns surrounding the introduction of genetically modified seeds into agriculture without adequate scientific evaluation and regulatory oversight.

The Supreme Court recognized the need for careful measures regarding the introduction of GMOs and their impact on the environment and public health in its verdict. Prior to granting authorization for the commercial distribution of genetically modified crops, the court emphasized the importance of rigorous scientific research and soliciting opinion from the general public. The verdict had a substantial impact on the nation's policy framework concerning genetically modified organisms and showcased the court's commitment to protecting the environment and the overall well-being.

Vellore Citizen Welfare Forum v. Union of India 1996 (K. Singh et al., 1995)

In 1996, the Supreme Court of India presided over a consequential environmental case known as Vellore Citizen Welfare Forum v. Union of India. The lawsuit revolved around the detrimental impact of industrial activities and improper garbage disposal on the Palar River and groundwater in the city of Vellore, Tamil Nadu. In its verdict, the Supreme Court recognized the significant environmental harm caused by industrial pollution and the severe repercussions for both the ecosystem and public health. The court approved the concept of sustainable development and emphasized the importance of protecting the environment and water resources for present and future generations.

The court established the principle of "polluter pays" as one of the main rules in this ruling. According to this concept, corporations bear the responsibility for any environmental damage caused by their activities and methods of waste disposal. It compels businesses to bear the costs of pollution management and cleanup processes, motivating them to transition to cleaner, more ecologically sustainable production methods.

Since that time, the principle of "polluter pays" established by the court has become a fundamental aspect of Indian environmental law. It promotes the concept of minimizing the ecological impact of enterprises and also advocates for environmental justice, which involves holding responsible parties accountable for restoring the ecosystem to its original state before any damage occurred.

The ruling in the case of Vellore Citizen Welfare Forum v. Union of India also set important precedents for imposing tight restrictions on industrial pollution and safeguarding water resources. In order to safeguard the water quality of the Palar River and the groundwater in Vellore, the court has mandated the closure of some firms that are causing pollution, as well as the enforcement of measures to control pollution.

This landmark decision has exerted a substantial impact on subsequent legal rulings and policy formulation in relation to environmental conservation, pollution mitigation, and the promotion of sustainable growth. This case remains significant in India's ongoing efforts to strike a harmonious equilibrium between economic progress and the conservation of the environment, thereby reinforcing the judiciary's role as a guardian of ecological sustainability and environmental fairness.

In conclusion: The aforementioned Supreme Court cases exemplify the judiciary's proactive involvement in addressing water and sanitation-related matters, advancing environmental conservation, and advocating for public health in India.

The Supreme Court has affirmed the fundamental rights of inhabitants, including the right to access clean water, a healthy environment, and a life characterized by dignity, through its significant legal decisions. These instances have influenced laws and policies, while also raising public awareness about significant issues related to water and sanitation, manual scavenging, and genetically modified organisms. The proactive interventions of the Supreme Court remain essential in shaping policies, promoting sustainable practices, and safeguarding the rights and welfare of the Indian population amidst the country's changing challenges in these domains.

Oleum Gas Leak Case (Oleum Gas Leak Case (M.C Mehta vs. Union of India)- Important in 2022.)

The Shriram Foods and Fertilizers gas leak event, also referred to as the Oleum Gas Leak Case, was a significant environmental disaster that occurred in Delhi in 1986. An incident of gas leakage occurred at the Shriram Foods and Fertilizers complex, leading to the release of oleum gas, a very dangerous chemical, into the atmosphere. This event caused significant pollution in the environment and posed a serious threat to human health.

Environmental advocate M.C. Mehta lodged a Public Interest Litigation (PIL) in the Supreme Court of India in response to this unfortunate event, seeking redress and responsibility for the victims and the ecological damage caused by the gas leak. The PIL heightened awareness of the issue and sought remedies to prevent future instances of similar nature. The 1987 verdict by the Supreme Court in this case had profound consequences and set crucial standards for Indian environmental law. The court determined that the industry bears full responsibility for any harm caused to the environment or the general public, regardless of whether it had demonstrated due diligence or implemented reasonable precautions.

This landmark ruling established the principle of "strict liability" in environmental law, which holds that corporations engaged in inherently hazardous activities have full responsibility for any harm they may inflict, without the need to prove negligence or fault. The verdict significantly shifted the responsibility of proving guilt from the victims to the polluting industries, making them accountable for their actions and emphasizing the urgent necessity of safeguarding the environment.

India's legal system was fortified and stringent environmental regulations were established in response to the Oleum Gas Leak Case, with the aim of preventing industrial disasters and protecting the environment. Furthermore, it underscored the role of the court in safeguarding the rights of individuals to a secure and salubrious environment, as well as ensuring that those who pollute are held responsible for their actions.

Due to this landmark verdict, Indian businesses are now required to enforce stringent safety protocols and preventive procedures to prevent accidents and minimize environmental pollution. The case serves as proof of the judiciary's proactive stance in maintaining environmental justice and protecting the health of both individuals and the environment.

Bellandur Lake Pollution Case (SC Restores Bengaluru's Bellandur, Varthur Lakes' Pollution Case to NGT | Deccan Herald, n.d.)

The Bellandur Lake Pollution Case in Karnataka has gained significant attention due to the severe pollution affecting Bangalore's Bellandur Lake, making it a critical environmental issue. The lake has been contaminated with untreated sewage and industrial effluents, resulting in the deterioration of the ecosystem and posing health hazards to the surrounding population.

In 2017, the National Green Tribunal (NGT) acknowledged the issue of rising pollution crisis in response to a Public Interest Litigation (PIL) filed by Namma Bengaluru Foundation. The PIL demanded immediate measures to halt the deteriorating condition of the lake and the alarming levels of pollution.

The NGT's intervention in the Bellandur Lake Pollution Case led to the issuance of numerous crucial decisions and directions aimed at effectively resolving the pollution situation. The tribunal's decision to shut down environmentally harmful firms in close proximity to the lake was a significant and impactful measure. This initiative aimed to halt the ongoing release of untreated industrial effluents into the lake by addressing the fundamental causes of contamination.

Another significant measure taken was the National Green Tribunal's instruction to construct sewage treatment facilities (STPs) to manage the influx of wastewater into the lake. In an effort to tackle the problem of untreated sewage discharge, which is a major cause of the lake's contamination, the tribunal mandated the installation and proper functioning of Sewage Treatment Plants (STPs).

The NGT additionally directed the state government to implement comprehensive measures to rejuvenate and rehabilitate the ecological well-being of Bellandur Lake. This entailed removing solid trash and encroachments from the vicinity of the lake, implementing effective waste disposal protocols, and safeguarding the lake's catchment area.

The aggressive stance of the NGT in addressing environmental concerns and protecting the preservation of natural resources is exemplified by the Bellandur Lake Pollution Case. The tribunal's decisions and directives in this case have greatly heightened public consciousness regarding water contamination and promoted the implementation of effective measures to protect urban water sources. This case highlights the importance of citizen participation and the role of civil society

organizations in taking legal proceedings to protect the environment. The Bellandur Lake Pollution Case has prompted efforts to restore the lake's ecological equilibrium and prevent additional environmental deterioration, setting an example for similar interventions in other regions confronting similar issues due to the intervention of the National Green Tribunal (NGT) and the Public Interest Litigation (PIL) filed by Namma Bengaluru Foundation.

6.7.Comparing Executive, Legislative and Judicial Action in India

India is a federal republic that has a clear division of powers among its executive, legislative, and judicial departments of government. The Constitution of India defines the specific tasks and powers of each branch. Regarding the regulation of waste disposal and conservation of resources, each branch of the institution has a specific responsibility. The executive branch, which includes the Prime Minister and Cabinet, is responsible for implementing policies and regulations related to waste disposal and resource conservation. This include the formulation and execution of policies at the national level, together with the enforcement of current regulations.(Morales-García et al., 2023).

The legislative branch, comprising the Lok Sabha (lower house) and Rajya Sabha (upper house), is tasked with enacting legislation pertaining to garbage disposal and resource conservation. This encompasses the formulation and enactment of laws pertaining to the management of waste, control of pollution, and preservation of resources.(Environment Laws In India - Waste Management - India, n.d.).

The judicial branch, comprising the Supreme Court and subordinate courts, is tasked with the interpretation and enforcement of legislation pertaining to waste disposal and resource conservation. This encompasses adjudicating issues pertaining to breaches of environmental legislation and ensuring that those responsible are held liable for their conduct. In India, every section has undertaken

endeavors to tackle concerns of trash disposal and the preservation of resources. The executive branch has enacted a range of laws and efforts to advance sustainable practices and minimize waste, including the implementation of the Swachh Bharat Abhiyan (Clean India Campaign). This campaign is focused on enhancing sanitation and waste management throughout the nation.(Role of Indian Judiciary in Protection of the Environment - IPleaders, n.d.).

The legislative branch has enacted various laws pertaining to waste disposal and resource conservation. These include the Solid Waste Management Rules, which offer directives for the handling of municipal solid waste, and the National Green Tribunal Act, which established a specialized court to adjudicate cases involving environmental infractions.

The judicial branch has contributed to the regulation of waste disposal and resource conservation by interpreting and enforcing environmental regulations. As an illustration, the Supreme Court has mandated the shutdown of unlawful and environmentally harmful companies, and has also imposed penalties on individuals found responsible for breaching environmental regulations.

However, there are still obstacles and restrictions that need to be addressed in order to effectively regulate garbage disposal and encourage resource conservation in India. These factors encompass insufficient money and resources for waste management and resource conservation activities, together with a deficiency in public knowledge and engagement in these endeavors.

To summarize, although every department of government has taken steps to tackle waste disposal and resource conservation, further action is required to advance sustainability and guarantee the enduring accessibility of resources. Through collaboration and a focus on sustainability, India has the potential to forge a future that is both environmentally sound and fair for all. Aside from the endeavors

undertaken by the government, it is imperative for individuals and communities to assume accountability for waste management and the preservation of resources. This can encompass basic measures such as minimizing, repurposing, and disposing of waste in an environmentally friendly manner, as well as endorsing local endeavors and associations that advocate for sustainable methods.

One example of such initiatives is the Green Schools Program, which aims to promote environmental education and sustainability in schools across India. The program provides resources and training for students and teachers to develop and implement sustainable practices, such as waste segregation, composting, and energy conservation.

Another example is the work of non-governmental organizations (NGOs) such as Chintan Environmental Research and Action Group, which works to promote sustainable waste management practices and reduce waste in urban areas. Through initiatives such as waste pickers' cooperatives and recycling centers, Chintan helps to create jobs and economic opportunities in waste management while also promoting environmental sustainability. Ultimately, promoting sustainable waste disposal and resource conservation requires a multifaceted approach that involves the government, individuals, and communities working together. By prioritizing sustainability and taking concrete actions, India can move towards a more sustainable future and ensure the long-term availability of resources for future generations.

In recent years, there have been increasing concerns about the impact of waste disposal and resource depletion on the environment and human health. This has led to a growing recognition of the importance of sustainable practices, and the need for greater efforts to regulate waste disposal and promote resource conservation.

In India, this has been reflected in the government's recent initiatives such as the Swachh Bharat Abhiyan and the Smart Cities Mission, which aim to promote sustainable waste management and reduce waste in urban areas. These initiatives have been accompanied by a growing public awareness and engagement in waste management and resource conservation.

However, challenges and limitations remain in regulating waste disposal and promoting resource conservation, particularly in rural and underprivileged areas. These areas often lack basic infrastructure and resources needed for effective waste management and resource conservation. In addition, there is a need for greater investment in research and innovation to develop new technologies and practices that can help to address these challenges.

Despite these challenges, there are also reasons for optimism. India has a long history of innovation and resilience, and there are many individuals and organizations working towards promoting sustainability and reducing waste. By building on these efforts and working towards a common goal, India can move towards a more sustainable future and ensure the long-term availability of resources for future generations. Moreover, promoting sustainable waste disposal and resource conservation can also have significant economic benefits. Sustainable practices can create jobs and economic opportunities, particularly in the waste management and recycling sectors. This can help to address issues such as poverty and unemployment while also promoting environmental sustainability.

In addition, sustainable practices can also lead to cost savings for businesses and households. For example, reducing waste and promoting energy conservation can lead to lower utility bills and operating costs. This can help to increase the financial sustainability of businesses and households while also reducing their environmental footprint.

In conclusion, promoting sustainable waste disposal and resource conservation is essential for ensuring the long-term availability of resources and protecting the environment and human health. While significant challenges remain, there are also many opportunities for progress, particularly through collaboration between the government, individuals, and organizations. By working together and prioritizing sustainability, India can create a more sustainable and equitable future for all.

6.8.Legal Framework Related to Water Conservation and Waste Management in India

Aside from the endeavors and actions undertaken by individuals and groups, the legal structure also plays a pivotal role in governing garbage disposal and advancing resource conservation in India. Multiple rules and regulations exist to regulate the accessibility and standard of water, as well as the management of waste and the prevention of water contamination.

This section will present a concise summary of the applicable legal framework and the entities tasked with its execution. In addition, we will analyze empirical data to give the researcher's perspective on matters concerning water supply, quality, waste disposal, and water contamination. In addition, we will assess and contrast the functions of the executive, legislature, and judiciary in advancing sustainable practices and safeguarding the environment.

The legal regulations concerning water and waste management in India are mainly dictated by the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981. These acts establish the Central Pollution Control Board (CPCB) and the State Pollution Control Boards (SPCBs) as the entities responsible for enforcing the laws.

The Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) have the responsibility of monitoring the quality of water and air, granting

permits for companies and activities that produce pollution, and enforcing measures against those who violate regulations. Furthermore, the National Green Tribunal (NGT) is a specialized judicial body that specifically handles cases related to environmental conflicts and infractions. Although India has established a legal framework and administrative processes, there are still obstacles to effectively controlling waste disposal and fostering resource conservation. For instance, the implementation of environmental rules and regulations may be ineffective, and there is a dearth of collaboration among various agencies and stakeholders.

In addition, there are other difficulties associated with the accessibility and standard of water, especially in rural and disadvantaged regions. A significant portion of the population residing in these regions lacks access to potable water, and the existing water sources are frequently contaminated, resulting in adverse health effects and environmental deterioration.

Ultimately, although India has established a legislative framework and institutional procedures to govern garbage disposal and encourage resource conservation, there are still unresolved difficulties that require attention. Through the assessment and juxtaposition of the functions of the executive, legislature, and judiciary, and taking into account factual evidence, we can pinpoint domains that require enhancements and strive towards a future that is more enduring and fair.

Regarding the executive's responsibilities, the government has implemented multiple initiatives and policies with the objective of fostering sustainable waste management and preserving resources. An instance of this is the Swachh Bharat Abhiyan (Clean India Mission) that was initiated in 2014. Its objective is to enhance waste management methods and advocate for cleanliness and sanitation throughout the nation. In a same vein, the National Green Tribunal has been vigorously enforcing environmental regulations by penalizing offenders and ordering the

closure of companies that contribute to pollution. The judiciary has also had a substantial impact on advancing environmental sustainability through influential rulings, such as the 1996 Vellore Citizen's Welfare Forum v. Union of India case. This case established the principle of the "polluter pays" and mandated that industries bear the financial responsibility for the environmental harm they inflict. The legislature has played a crucial role in promoting sustainable waste management and the conservation of resources. The Indian parliament passed both the Water (Prevention and Control of Pollution) Act and the Air (Prevention and Control of Pollution) Act, and further amendments have been introduced to strengthen the legal framework. Nevertheless, despite the efforts achieved thus far, there are still challenges to be addressed in terms of regulating garbage disposal and promoting resource conservation in India. To address these challenges, a comprehensive and coordinated strategy is necessary, involving the active involvement of all pertinent stakeholders, such as the government, civil society, and the business sector.

The long-term protection of the environment and the improvement of human health and well-being depend on the crucial need for sustainable waste management and resource conservation. By evaluating and comparing the roles of the administration, legislature, and judiciary, we may identify areas that require improvements and work towards a future that is fair and equitable for both the environment and society.

Chapter 7

CONCLUSION AND RECOMMENDATIONS

In conclusion, the issues and shortcomings associated with trash disposal and water resource preservation in the Delhi National Capital Region (NCR) are numerous and urgently require comprehensive attention and effective execution of laws and regulations. Rapid urbanization and population increase have put enormous strain on current waste management and water supply infrastructure, resulting in serious environmental and health repercussions.

7.1. Key concerns identified include:

I. Deficit in knowledge and Education: There is a significant lack of knowledge and education among the general people regarding waste management and the need of protecting water resources. There is an urgent need for widespread public awareness campaigns and educational programs to encourage safe garbage disposal and water-saving measures. These measures should target not only residents, but also enterprises, industries, and other key contributors to trash generation and water usage.

II. Strengthening Enforcement Procedures: Current entities in charge of monitoring and regulating waste disposal and water resource management must be given adequate resources and authority. This would ensure strict adherence to rules and increase cooperation among various government bodies and agencies involved in waste management and water conservation.

III. Investment in Advanced Technology and Infrastructure: There is an urgent need for investment in contemporary waste management technology and infrastructure. Waste-to-energy plants, recycling

facilities, and decentralized waste management systems should all be considered in the Delhi NCR. Rainwater collection, wastewater treatment, and severe water use rules are also crucial for maintaining natural water supplies.

IV. Collaborative Approaches: Collaboration between the commercial sector and civil society organizations is critical in addressing waste disposal and water resource preservation challenges. Public-private collaborations are critical in building sustainable waste management systems and adopting effective water conservation strategies.

V. Policymakers and authorities in Delhi NCR must realize the gravity of these concerns and prioritize the implementation of appropriate remedies. Conservation of natural water resources and proper waste disposal strategies are critical not only for environmental health but also for citizens' overall well-being.

VI. Significant progress toward effective waste management and water resource preservation in Delhi NCR can be made by strengthening the legal framework, increasing awareness and education, improving enforcement mechanisms, investing in sustainable infrastructure, and encouraging collaboration among various stakeholders.

VII. Furthermore, long-term planning and preventive steps are required. Integrated waste management strategies should include the full waste lifetime, from generation to disposal, while encouraging trash reduction and recycling. A holistic approach to maintaining natural water resources is required, such as groundwater recharging, pollution prevention for water bodies, and water efficiency promotion.

VIII. It is critical to learn from other regions' experiences with sustainable waste management and water resource conservation. Adopting worldwide best practices and technological advancements can greatly help Delhi NCR.

IX. Regular monitoring and evaluation of implemented interventions, involving environmental experts, is required for evidence-based decision-making.

X. Finally, addressing trash disposal and water resource preservation challenges in Delhi NCR is a difficult but necessary task. It necessitates a comprehensive approach comprising strong political will, active public participation, and coordination among government, corporate sector, and civil society organizations. Together, these measures can assure a sustainable and environmentally friendly future for Delhi NCR and its residents.

XI. The full examination of trash disposal and water resource protection in the Delhi NCR highlights the interconnectedness of numerous challenges and laws. For example, groundwater depletion is intertwined with bigger issues such as irrigation regulations and urban development. Addressing this requires a comprehensive approach that incorporates several policy areas.

7.2. Additional considerations include:

I. Irrigation Policy ramifications: The depletion of groundwater in Delhi NCR has obvious ramifications for irrigation policies. Over-reliance on groundwater for agriculture in neighboring regions exacerbates scarcity, demanding a review of irrigation practices and regulations to promote water-efficient approaches.

II. Urban Planning and Development: Water resource management concerns are inextricably linked to urban planning and development strategies. It is vital to incorporate water conservation techniques into urban planning, such as legislating rainwater harvesting in new construction and redevelopment zones.

III. Policies and collaboration across sectors: Water resource management and trash disposal require coordination across sectors and policy areas to be effective. This includes harmonizing policies relating to urban growth, environmental protection, agricultural, and industrial development with the aims of sustainable water usage and waste management.

IV. Technical Integration and Innovation: Embracing technical advancements for water conservation, such as smart water meters and improved irrigation systems, can aid in better controlling water demand and supply. Similarly, breakthrough waste processing technology can alter waste management techniques.

V. Community Engagement and Behavioral Change: Long-term solutions to these difficulties rely on behavioral changes at the community level. Encourage communities to adopt water-saving techniques, minimize trash creation, and participate in recycling activities.

VI. Policy Enforcement and Regulatory Frameworks: It is critical to strengthen the enforcement of existing regulations and maybe build new frameworks to address rising difficulties in water and waste management. This includes strict controls against unlawful groundwater extraction and trash disposal.

VII. Learning from Global Best Practices: It is beneficial to look at successful examples from other cities and nations that have successfully managed similar difficulties. Adapting and executing these best practices in the context of Delhi NCR can pave the road to long-term resource management.

VIII. Building Sustainability and Resilience: The emphasis should be on developing a sustainable and resilient Delhi NCR that can withstand environmental challenges and assure the long-term sustainability of resources. This includes taking into account future climatic impacts and population expansion in planning and policymaking.

Finally, in recognition of the linked nature of environmental concerns, a holistic strategy to managing water resources, waste, air quality, and green areas is essential. This broad perspective guarantees that improvements in one area do not exacerbate issues in another. To summarize, solving the complex concerns of waste disposal and water resource protection in the Delhi NCR necessitates a multifaceted, integrated approach that transcends typical policy silos. It takes a collective effort by policymakers, enforcers, the community, and many stakeholders to create a sustainable and thriving urban environment.

7.3. Water Uses and Limitations in India for Consumers, Government Agencies, and Industry

In India, water is a key resource that sustains life and supports a variety of socioeconomic activity. Its applications and restrictions varied across sectors, with important ramifications for consumers, government agencies, and industries. Let us investigate these points:

7.3.1. Consumers:

Uses:

I. Domestic Use: Water is crucial for families because it is used for drinking, cooking, bathing, and sanitation.

II. Irrigation: A substantial part of water is used to support agricultural activities and food production.

III. Water is used in a variety of industries, including textiles, food processing, and manufacturing.

IV. Water bodies are used as recreational locations for swimming, boating, and other leisure activities.

V. Water is essential for maintaining the biological balance of rivers, lakes, and wetlands, as well as sustaining biodiversity and natural habitats.

Limitations:

I. Water Shortage: Water scarcity exists in some places of India, resulting in a lack of appropriate water supply for a variety of needs, including drinking and irrigation.

II. Groundwater Depletion: Excessive withdrawal of groundwater for agricultural and industrial reasons has resulted in groundwater depletion, raising worries about long-term sustainability.

III. Water pollution is caused by untreated sewage, industrial effluents, and agricultural runoff, which contaminates water bodies and poses health problems.

IV. Inequitable Access: Water is frequently inequitably distributed, with vulnerable people encountering difficulties in obtaining clean and safe water.

V. Climate Change: As a result of climate change, changing weather patterns and extreme weather events can worsen water availability and quality challenges.

7.3.2. Government Agencies:

Uses:

I. Water Supply Management: Government agencies have a critical role in ensuring that clean and safe drinking water is available in both urban and rural regions.

II. Irrigation: Government activities are critical for implementing irrigation projects and supporting agricultural water use that is sustainable.

III. Environmental Protection: Agencies seek to conserve and safeguard bodies of water, wetlands, and ecosystems.

IV. Policy Development: To efficiently manage water resources, government agencies create water policies, laws, and standards.

Limitations:

I. Infrastructure Issues: Inadequate infrastructure and resources may impede the provision of adequate water supply and sanitation services.

II. Regulatory Compliance: Enforcing water pollution management methods and ensuring compliance with environmental standards can be difficult.

III. Water Disputes Between States: Resolving interstate water disputes necessitates coordination and collaboration between several state governments.

7.3.3. Industries:

Uses:

I. Manufacturing: Water is used in a variety of operations in the manufacturing industry, including cooling, cleaning, and as a raw material.

II. Agriculture: Water is used in the food processing and beverage industries to wash and treat agricultural produce.

III. Water is used to cool thermal power plants, which generate energy.

IV. Waste Treatment: Water is required by industries for the treatment and management of wastewater before to release.

Limitations:

I. Impact on the Environment: Industries can contribute to water pollution by releasing untreated effluents, affecting water quality and ecosystems.

II. Water Scarcity: Industrial activities in water-stressed areas may experience difficulties procuring appropriate water supplies.

III. Water-intensive sectors may face increased costs and sustainability challenges as a result of increasing water scarcity and pollution control measures.

Water is a finite and crucial resource in India, with several uses and constraints for consumers, government agencies, and enterprises. Addressing constraints and establishing sustainable water management techniques are crucial to satisfying the

water needs of all stakeholders while protecting this priceless resource for future generations. Collaboration among diverse stakeholders, effective water governance, and the use of water-saving technology are critical steps toward achieving water security and sustainability in India.

Throughout this study, we have examined the existing legal framework governing waste disposal and water resource preservation in Delhi NCR. We have also explored the state of implementation of these laws and regulations, identifying key challenges and gaps in their enforcement. It is evident that while there are comprehensive laws and policies in place, their implementation has been inadequate, resulting in the continued degradation of the environment.

7.4.Interpretation of Data

The table 5.1, labeled "Waste Water Generation in Various companies," presents valuable information regarding the estimated daily volume of wastewater produced by different companies in important sites within the NCR region. This data provides insight into the ecological impact of various sectors and serves as a basis for specific waste management strategies. Policymakers can utilize this data to formulate industry-specific laws that promote water conservation and discourage the development of excessive effluent, so cultivating a more sustainable industrial ecology.

The table 5.2 shows water details for consumers. This graphic comparison highlights the diversity of water usage habits in nearby places. It is critical to address the following note, which appears to contradict the chart's title and requires verification and correction to assure the accuracy of the data depiction in the context of the thesis.

The table 5.3, named "Complaints for Water Issues in NCR Region," presents the average weekly number of complaints regarding water quality and water drainage problems in three prominent cities of the National Capital Region (NCR) of India: Delhi, Noida, and Gurugram.

This graph provides a clear representation of the number of complaints regarding water difficulties throughout the NCR region. It shows both the separate and combined contributions of each complaint type in different regions. Employing distinct colors for each complaint category improves legibility and facilitates differentiation across data categories

7.5.Conclusions

Finally, by strengthening the legal framework, increasing awareness and education, improving enforcement mechanisms, investing in sustainable infrastructure, and encouraging collaboration among various stakeholders, Delhi NCR can make significant strides toward effective waste management and natural water resource preservation. To establish a sustainable and environmentally friendly future for Delhi NCR and its citizens, all sectors of society must work together.

Furthermore, the need of long-term planning and proactive steps to solve garbage disposal and water resource preservation concerns in Delhi NCR cannot be overstated. Ad hoc measures and short-term repairs will not be enough to minimise

the environmental consequences of unregulated waste creation and water mismanagement.

Integrated waste management plans must be established, taking into account the full waste lifetime, from generation to disposal. This involves promoting waste reduction and recycling, as well as researching innovative waste treatment and disposal methods. The concept of a circular economy, in which trash is considered

as a valuable resource that may be reused and repurposed rather than being wasted as landfill, should be emphasised.

Furthermore, the conservation of natural water resources necessitates a multifaceted approach. Measures such as groundwater recharge, pollution protection for water bodies, and promoting efficient water usage through conservation measures should be incorporated into urban planning and development procedures. Rainwater collection should be encouraged and made mandatory for both residential and commercial buildings, and strict rules should be put in place to prevent illicit groundwater extraction and contamination.

It is critical to learn from other regions' and countries' experiences with sustainable waste management and water resource preservation techniques. To guarantee that the most effective and efficient solutions are adopted in Delhi NCR, international best practises, technical breakthroughs, and research findings should be incorporated into the policymaking process.

Regular monitoring and assessment of implemented procedures is required to assess their efficacy and find areas for improvement. Environmental experts, scientists, and researchers must be involved in order to conduct studies, gather data, and provide evidence-based recommendations to assist decision-making processes.

Finally, successful waste disposal and natural water resource preservation in Delhi NCR necessitate a comprehensive and integrated approach involving strong political will, active citizen participation, and collaboration between government agencies, private sector entities, and civil society organisations. It is a shared duty that necessitates a collaborative effort from all stakeholders in order to effect significant change and ensure the region's long-term viability.

To summarise, tackling trash disposal and water resource preservation concerns in the Delhi NCR is a difficult but necessary endeavour. By emphasising sustainable behaviours, enacting and enforcing stringent laws and regulations, increasing awareness and education, investing in infrastructure, and encouraging collaboration, the Delhi NCR may pave the way for a cleaner and healthier environment. The time for action is now, and by working together, we can assure a better future for future generations.

The conclusion of the thesis on water consumption and wastewater management in the Delhi National Capital Region (NCR) must be consistent with Delhi's present water laws and regulations. Given the complexities of water resource management and the constraints of waste disposal, a comprehensive strategy is required. To Protect water as a valuable resource, it’s important to follow legislative obligations, prioritize sustainable practices, and collaborate with all parties. In light of Delhi's water law, the data presented emphasizes the importance of integrated water resource management systems that are both legally compliant and environmentally responsible. The disparity in water usage and cost across the NCR emphasizes the importance of a differentiated approach to water pricing and delivery, customized to each region's particular demographic and geographic conditions. Furthermore, while widespread wastewater disposal options indicate a repurposing trend, they must be controlled to ensure they fulfill the standards outlined in Delhi's water rules, enabling increased water recycling and reuse.

The study's regular reports of water scarcity highlight the need for a strong regulatory framework that not only promotes the significance of water conservation but also enforces water-saving measures throughout the system. This includes requiring rainwater collecting systems, installing water-saving devices in houses of water conservation measures. The water law should lead the implementation of these

measures, ensuring that they are not just suggested but also enforced as part of a bigger strategy to address water scarcity and minimize the financial burden of water consumption.

Delhi's water regulations should also stimulate the creation of green infrastructure for wastewater treatment, as well as the employment of environmentally friendly disposal technologies. In accordance with these guidelines, this study proposes for increased wastewater recycling for non-potable purposes, which would reduce demand on existing freshwater resources and encourage sustainable water use practices.

In conclusion, the thesis emphasizes the importance of legislative action, community participation, and infrastructure development in addressing the dual concerns of garbage disposal and water resource conservation in the Delhi NCR. The water legislation serves as a vital framework for these efforts, pushing for regulations that promote efficient water usage, encourage waste reduction, and develop a culture of sustainability. By combining legal regulations with community activities and technical breakthroughs, Delhi can create a water-wise urban center that is ready to satisfy the needs of its rising population while also protecting its water supplies for future generations. To guarantee the viability of this valuable resource, a coordinated and collaborative effort is necessary, guided by the fairness, sustainability, and resilience principles inherent in Delhi's water laws.

This conclusion ties together the findings and the legal context, emphasizing the need of a regulatory framework that enforces water conservation, efficient use, and sustainable management practices.

7.6.Recommendations

- Additionally, the information in the table emphasises how crucial water conservation and sustainable water management methods are in solving

the growing problems of water scarcity and rising water costs. Frequent water shortage areas, especially those that experience it more than twice a month, require prompt attention and focused water-saving initiatives. The financial burden of high water bills can be lessened by putting into place water-saving measures including rainwater collection, water-efficient fixtures, and awareness campaigns.

- The various waste water disposal techniques also necessitate a greater focus on environmentally beneficial methods. Reducing water waste and preserving this priceless resource can be accomplished by promoting the reuse and recycling of waste water for non-potable uses like watering plants and cleaning floors. Additionally, fostering water-efficient habits at the home level and spreading knowledge about the responsible use of water can have a substantial positive impact on the region's overall water consumption patterns.
- In order to implement comprehensive water management policies, legislators, local governments, and communities must work together. Water scarcity is still a serious issue around the world. Utilizing the information in this table, specific water conservation plans that take into consideration the particulars of each place can be created. A more sustainable and water-secure future may be possible through empowering people and households to actively participate in water conservation activities. We can protect this vital natural resource for both the present and the future via group effort and responsible water use.
- To summaries, the issue of trash disposal and natural water resource preservation in the Delhi NCR is a complex and diverse subject that requires immediate attention and efficient execution of laws and

regulations. Rapid urbanisation and population increase in the region have put tremendous strain on the region's existing waste management infrastructure and water supplies, resulting in serious environmental and health repercussions.

- One of the key issues noted in the overall research is a lack of awareness and education among the general people about waste management and the need of preserving water resources. There is a need for widespread public awareness campaigns and educational programmes to promote appropriate garbage disposal and water saving techniques. Such measures should not just target residents, but also enterprises, industries, and other stakeholders who contribute significantly to trash generation and water usage.
- Another critical issue that must be addressed is the strengthening of enforcement procedures. Existing institutions in charge of monitoring and regulating waste disposal and water resource management must be sufficiently enabled, both in terms of resources and authority, to ensure strict adherence to the rules. The emphasis should be on improving coordination and cooperation among various governmental entities and agencies involved in waste management and water protection activities.
- Furthermore, there is an urgent need for investment in cutting-edge waste management technology and infrastructure. To efficiently handle the region's increasing volume of waste, Delhi NCR should investigate new alternatives such as waste-to-energy plants, recycling facilities, and decentralised waste management systems. Furthermore, initiatives such as rainwater harvesting, wastewater treatment, and rigorous water use rules can help to preserve natural water supplies.

- The cooperation of the commercial sector and civil society organisations is critical in tackling trash disposal and water resource preservation concerns. Public-private collaborations can help to build sustainable waste management systems and put in place effective water conservation methods. Collaboration among various stakeholders, including government agencies, non-governmental organisations (NGOs), community groups, and academic institutions, is critical to developing a comprehensive and integrated approach to addressing these environmental concerns.
- There is a need to revise and update existing water and waste management laws to reflect current challenges and technological advancements and ensure that these laws are stringent enough to deter violations and adaptable to evolving needs. Also there is need to enhance the capacity of regulatory bodies to enforce water and waste management laws effectively. This includes increased funding, training, and authority for inspections and penalties. Government should need to enact a comprehensive water management law that integrates all aspects of water use, conservation, and management. This law should cover surface water, groundwater, rainwater harvesting, and wastewater management.
- There is also a need to revise existing waste management laws to ensure uniformity and coherence. Incorporate modern principles of waste management, such as the circular economy, which emphasizes reuse, recycling, and recovery. Government may increase fines and penalties for violations of water conservation and waste management laws to ensure they act as effective deterrents. Include provisions for criminal liability in cases of severe violations. Government also needs to mandate regular

inspections by relevant authorities to ensure compliance with water and waste management regulations. Establish a robust monitoring system to track violations and enforce penalties swiftly. Empowering regulatory bodies like the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) would help in enforcing law. Government should create specialized authorities dedicated to water and waste management at both the state and local levels. These bodies should have clear mandates and sufficient powers to coordinate and implement policies. Developing platforms for citizens to report violations of water and waste management laws will also help. Establish a whistleblower protection framework to encourage reporting without fear of retaliation.

- Enacting laws that support the establishment of waste-to-energy plants, including streamlined approval processes and financial incentives would also support alongwith developing legal standards and guidelines for recycling and reuse of wastewater. If strict regulations on groundwater extraction are introduced, especially in over-exploited areas, it will help.
- It is critical that policymakers and authorities in the Delhi NCR acknowledge the gravity of the situation and prioritise the implementation of appropriate solutions to the problems. The conservation of natural water resources and effective waste disposal techniques are not only important for the environment, but also for the residents' overall well-being and quality of life. he legal framework for water conservation and waste management in Delhi NCR requires comprehensive reforms to address current challenges effectively. By strengthening legislation, enhancing enforcement mechanisms, building institutional capacity, and promoting public participation, the region can move towards sustainable

and equitable water and waste management. Implementing these legal recommendations will help protect natural resources, improve public health, and ensure a better quality of life for the residents of Delhi NCR.

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Annexures

Questionnaire

We are doing a survey on the availability, sources, general quality, permissions and limitations on water uses in Delhi NCR. In this regard, you are requested to fill up few questions as in Form below to support us in collecting the data :

* Indicates required question

1. Name of Person

2. Name of Industry

3. Industry *

Check all that apply.

- [ ] Manufacturing
- [ ] Agriculture
- [ ] Textiles
- [ ] Poultry
- [ ] Beverage
- [ ] Other: _____

4. Location of Industry *

Mark only one oval.

- ◯ Delhi
- ◯ Gurugram
- ◯ Faridabad
- ◯ NOIDA

5. Email Id

_____

6. Mobile No.

_____

7. Number of Employees working in the specified location of Industry *

Mark only one oval.

- ◯ Less than 50
- ◯ Between 51 to 100
- ◯ Between 150-250
- ◯ Between 251-500
- ◯ More than 500
- ◯ Other: _____

8. Quantity of Waste Water Generated in the Industry per day. (approximately in Litres) *

Mark only one oval.

- ◯ Upto 5 gallons
- ◯ Between 6 to 20 gallons
- ◯ between 21 to 30 gallons
- ◯ More than 31 gallons
- ◯ Other: _____

9. From which Government agency the permission is taken for waste water disposal *

Mark only one oval.

- ◯ CPCP (Central Pollution Control Board)
- ◯ State Pollution Control Board
- ◯ National Green Tribunal (NGT)
- ◯ Local Governing Body

10. Are there any Limitations on Water Usage and Disposal specified by Government *

Mark only one oval.

- ◯ YES
- ◯ NO

11. Your Knowledge on Waste Water Disposal Laws

Mark only one oval.

- ◯ No Knowledge
- ◯ Very Less Knowledge
- ◯ Complete Knowledge

12. How do you Dispose Waste Water Generated ? *

Mark only one oval.

- ◯ Sinks/ Drains
- ◯ Use any waste water treatment plant
- ◯ Lakes/ Rivers
- ◯ Any Other

13. Feedback on Government dealing with Waste Water Disposal

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Highly responsible

14. Have you ever complaint to Government body on Waste Water Disposal Issue

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

15. What Response was received on the complaint made if 'YES' above

16. Any Remarks on Water Usage and Disposal for Improvement

Questionnaire-Government Agencies

We are doing a survey on the availability, sources, general quality, permissions and limitations on water uses in Delhi NCR. In this regard, you are requested to fill up few questions as in Form below to support us in collecting the data :

* Indicates required question

1. Name of Government Agency/ Authority

_____

2. Location of Government Agency/ Authority *

Mark only one oval.

- ◯ Delhi
- ◯ Gurugram
- ◯ Faridabad
- ◯ NOIDA

3. Email Id

_____

4. Departments under the agency *

Mark only one oval.

- ◯ Water Supply
- ◯ Waste Water Sanitation
- ◯ Water Cleaning
- ◯ Water Drainage & Sewage
- ◯ Others
- ◯ Other: _____

5. No. of complaints received on Water Supply (average per week) *

Mark only one oval.

- ◯ 100
- ◯ 101-500
- ◯ 501-1000
- ◯ More than 1001
- ◯ Other: _____

6. No. of complaints received on Water Quality (average per week) *

Mark only one oval.

- ◯ 100
- ◯ 101-500
- ◯ 501-1000
- ◯ More than 1001
- ◯ Other: _____

7. No. of complaints received on Water Drainage (average per week) *

Mark only one oval.

- ◯ 100
- ◯ 101-500
- ◯ 501-1000
- ◯ More than 1001
- ◯ Other: _____

8. Grievance Redressal Days *

Mark only one oval.

- ◯ 7 working days
- ◯ 30 days
- ◯ 60 days
- ◯ Not fixed

9. No. of Times Water Sanitation is done by the agency *

Check all that apply.

- ☐ Once in a month
- ☐ Once in six months
- ☐ Once in a year
- ☐ Only on emergency / complaint crisis
- ☐ Other: _____

10. How the Water Cleaning/ Sanitation is done

Mark only one oval.

- ◯ Iodine Addition
- ◯ Chlorine Addition
- ◯ Osmosis
- ◯ Distillation
- ◯ Solar Purification
- ◯ Clay Vessel Filteration
- ◯ Others-Pl specify
- ◯ Other: _____

11. How the agency monitors proper water disposal at Homes/ Industry ? *

Mark only one oval.

- ◯ Timely Inspections
- ◯ Spreading Awareness
- ◯ Imposing Fines
- ◯ Government Policies Imposition
- ◯ Others
- ◯ Other: _____

12. Any Remarks on Water Usage and Disposal for Improvement

_____

_____

_____

_____

_____

Questionnaire -General Public

We are doing a survey on the availability, sources, general quality, permissions and limitations on water uses in Delhi NCR. In this regard, you are requested to fill up few questions as in Form below to support us in collecting the data :

* Indicates required question

1. Name of Person

2. Area *

Mark only one oval.

- ◯ Delhi
- ◯ Gurugram
- ◯ Faridabad
- ◯ NOIDA
- ◯ Ghaziabad
- ◯ Others

3. Email Id

4. Mobile No.

5. Number of Persons at Home *

Mark only one oval.

- ◯ 1
- ◯ 2
- ◯ 3 to 5
- ◯ 6 to 10
- ◯ Other: _____

6. Quantity of Water Used at Home per day (approximately in Litres) *

Mark only one oval.

- ◯ Upto 20 l
- ◯ 20 to 30 l
- ◯ Above 30 l

7. Cost of Water as per Bill (approx per month) INR *

Mark only one oval.

- ◯ Less than 500
- ◯ Between 500 to 1500
- ◯ Between 1500 to 3000
- ◯ More than 3000

8. Frequency of Water Scarcity you face *

Mark only one oval.

- ◯ Once a month
- ◯ More than 2 times a month
- ◯ Mostly scarcity is there
- ◯ No Scarcity of water

9. Your Knowledge on Water Usage Laws

Mark only one oval.

- ◯ No Knowledge
- ◯ Very Less Knowledge
- ◯ Complete Knowledge

10. Your Knowledge on Waste Water Disposal Laws

Mark only one oval.

- ◯ No Knowledge
- ◯ Very Less Knowledge
- ◯ Complete Knowledge

11. How do you Dispose Waste Water at Home ? *

Mark only one oval.

- ◯ Sinks/ Drains
- ◯ Watering Plants
- ◯ Cleaning Floor
- ◯ Any Other

12. Feedback on Quality of Water you receive at home

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Very Good

13. Feedback on Government dealing with Water Crisis

Mark only one oval.

	1	2	3	4	5	
Very	◯	◯	◯	◯	◯	Highly responsible

14. Have you ever complaint to Government body on Water Scarcity Issue

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

15. What Response was received on the complaint made if 'YES' above

16. Any Remarks on Water Usage and Disposal for Improvement

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