

# Groundwater Management in India: Problems and Perspectives

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## ABSTRACT

Groundwater, which occurs beneath the surface of the land, filling the pore spaces of rocks called aquifers, plays a great role in the human lives as it constitutes the major portion of the world's drinking water. Groundwater is heavily relied upon for other domestic purposes, agriculture and industrial uses also. Indiscriminate and unplanned over-extraction and use of groundwater has led to groundwater depletion and pollution and the groundwater reserve all over is under an intense pressure. This paper highlights the evolution and recognition of right to water in India and in the international framework. It traces the evolution of statutes in relation to the control of groundwater resources, starting from the Colonial era, traversing through the latest legislative attempts initiated for the conservation of groundwater in India. In order to address the issues related to the use of groundwater and to comprehensively identify strategies for management of the same in the best way, there is a need for coordinated efforts by the stakeholders including the government, industries, and agriculturists and so on. Immediate and stringent actions are required to ensure sustainable utilisation of this resource so that it can be preserved for the generations to come. The paper concludes by giving suggestions and recommendation for the enhancement of the legal regime for the effective preservation and maximum utilisation of the groundwater resources.

**Keywords:** Groundwater; Exploitation; Pollution; Groundwater management

## INTRODUCTION

Earth is also referred to as “water planet” and “blue planet” as more than seventy-one percentage of the earth's surface is covered with water. The presence of water on earth makes earth the home for all living organisms. History reveals that all major world civilizations flourished around the water sources [1]. Even though almost two-third of the surface of the earth is covered by water, only one percentage of it is water usable for the human beings. Ninety-seven percentage of the earth's water is saltwater, which contains various mineral components which makes it non usable for human consumption. 2% of the water is ‘locked up’ in ice caps and glaciers, leaving only 1% available as portable fresh water [2].

Water is indispensable for the sustenance of life on earth. All living bodies including plants and animals require water for survival. Water forms the most basic and critical component in the functioning of the biosphere and is indispensable for the global life support system [3]. The greatest utility of water for mankind is undeniable. Water is essential for drinking, other domestic needs, for agriculture and for industries and it is essential for the very human existence and thus, it will not be an exaggeration to say that “water is the driving force of all nature.” For human beings, clean

water is essential for life; drinking, food preparation, and sanitation. Today, in various parts of the world, the search for safe and potable drinking water has turned to be a daily crisis. Millions of people, including children, die each year, from largely preventable diseases caused by lack of access to clean water [3]. Thus, clean water which is considered as a universal asset, and once considered as a bounty of the nature, is getting fast depleted. The time is not so far when water will become more precious than oil and wars will be fought for water [4]. Day-by-day, demand for fresh and potable water keeps increasing, further depleting the natural water sources, from rivers, streams and the underground water resources.

India is a country of plentiful natural resources including numerous streams, lakes and other water bodies. The yearly precipitation in various parts of this country is adequate to support a human population that is near 1.4 billion, apart from the other creatures and plants. Amidst bounty, there are various places in India where people struggle for water. If the utilization of water is not planned and overseen economically, the nation would confront an extreme water emergency in the near future, which may negatively influence the fate of the country. “Water, water, everywhere, nor any drop to drink”, the lament of the great English poet, Samuel

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Taylor Coleridge [5], may thus soon be a reality. Experts on water management have given a warning that the world is moving towards an intense water scarcity and pure water will be a rare commodity very soon.

In *D. M. Singhvi vs. Union of India* [6], the High Court of Rajasthan stated the significance of water in the following words: "There can be no subject more vital for mankind than water. It is the key to survival of life on earth. A well-managed society is one that knows how to treat its waters with care, with prudence and with respect" [3].

## SIGNIFICANCE OF GROUNDWATER

Water can be broadly classified as the surface water and ground water [7]. While 'surface water' denotes the water bodies on the surface of the earth such as lakes, ponds, rivers, streams, reservoirs, river channels, snow cover, etc., the 'groundwater' is the water found at the underground aquifers [3]. Groundwater can be defined as water occurring beneath the surface of the land, filling the pore spaces of rocks. It is said to occur in underground rivers and lakes known as the aquifers [8]. Underground aquifers mainly comprise of "gravel, sand, sandstone, or fractured rock, like limestone". These materials are permeable because they have large connected spaces that allow water to flow through [9]. Major part of the fresh water holds are stored either in the soil known as the aquifers, or bedrock cracks underneath the ground. The region where water fills the spring is known as the immersed zone (or immersion zone). The top of this zone is known as the water table [10].

Groundwater plays a great role in human lives as groundwater constitutes the major portion of the world's drinking water [11]. The indiscriminate use of groundwater has resulted in various problems, and the scientific studies reveals that if groundwater is exploited at this rampant rate, there will be depletion of the same [12]. The problems relating to groundwater can be classified as the problems arising out of over extraction, and, the problems caused by pollution. Both these problems have stemmed out of industrialisation and urbanisation [3]. Withdrawal of exorbitant amounts of groundwater and contamination of the same can deny of this characteristic asset to the future generations. Experts suggests that it is important to utilise accessible water assets for the human advantage while not just forestalling and controlling its exhaustion and debasement, yet additionally creating it considering the present and future requirements. Water is a multipurpose asset and it is important to see that its different uses ought not to clash with one another and it tends to be delighted in its totality by man and other living creatures. Thus, its right allocation and quantitative and qualitative conservation are the primary tasks for the plans for water management [13].

### Problem of Pollution of Groundwater

The groundwater is in danger of pollutants arising from seepage, septic tanks, agricultural and industrial wastes, and so on [3]. The reasons for groundwater pollution likewise incorporate use, spillage, or removal of pesticides, manures, petrol hydrocarbons, modern synthetic compounds and other natural and inorganic by-products. The contamination can also result from geologic sources and changes in the existing land use [14].

The causes of groundwater pollution can be classified into two. Firstly, degradation of groundwater due to the natural phenomena and secondly, through human action [15]. High levels

of arsenic and fluorides are the major groundwater pollutants. Arsenic usually occurs naturally in alluvial aquifers, fluoride is more of a problem in hard-rock aquifers and is directly linked to overexploitation of groundwater resources [16]. In terms of human-induced degradation, salinization is the biggest single threat to aquifer sustainability, which results in salt water intrusion resulting from aquifer pollution [17]. A major cause of salinization is excess application of irrigation water, increasing water tables, and inducing naturally occurring salts to be drawn upward towards the surface of the soil through capillary force [3].

### The Problem of Under Utilisation of Groundwater in India

Most research related to groundwater management focuses on overuse and abuse, but there are areas where overabundance is the issue and where additional use is possible [3]. In this way, in spite of the exceptional development in use and degradation, there are water zones where the groundwater issue is not an issue yet rather an opportunity. Eastern parts of India have vast groundwater potential that is not being properly used [18]. Overabundance of groundwater, which results in the problem of waterlogging, is a serious concern in certain parts of India, especially, large areas in the Eastern parts of India, such as West Bengal, do not yet take full advantage of their groundwater resources [3]. The water assets and its use should be overseen well to guarantee manageability. This is particularly important in respect of groundwater which, if over exploited may lead to disaster, since 80% of our country's drinking water needs are met by groundwater [3]. As an asset for the humankind, groundwater must be saved for the future generations. There are additionally still some zones where considerable asset advancement could occur, relating to the effective utilization of groundwater. Therefore, underutilization is also a serious groundwater management issue.

### Need for Management of Groundwater

Recent studies on groundwater uses are self-explanatory because the groundwater reserve is under intense pressure [20]. It is the responsibility of the State to provide water for irrigation and other purposes. However, in the last four-five decades, there has been a dramatic shift in the water supply regimes in India. From the canals maintained by the State, which were used by agriculturists for irrigation purposes, there is an increase in the use of motor pumps by the individuals. The indiscriminate pumping of groundwater without following the sustainable approach has led to the over exploitation of the groundwater resource [3]. The excessive misuse or extreme withdrawal, contamination and pollution of the groundwater will end up in the denial of this resource to the future generations. Hence there is a compelling need for the preservation of groundwater.

Over exploitation of groundwater is a result of the extraction of groundwater using modern technology [13]. The cost of over exploitation of groundwater includes, the decline of water table, salinization of aquifers, the abandonment of wells from which water can no longer be pumped, etc. [20]. Over exploitation without giving time for its natural recharge will adversely affect the water table thereby decreasing the quantity of extractable ground water [3]. Contamination and defilement of groundwater likewise increases with industrialisation. When the water source is polluted inside the ground, it is highly unlikely to clean it up. The natural process of self-purification is too slow for humans to

depend upon [21]. Therefore, the aftereffect of the contamination of groundwater added to pollution will lead to irreparable disaster.

#### RIGHT TO WATER UNDER THE INDIAN LEGISLATIVE FRAMEWORK

The current structure of laws in India on water is portrayed by different Statutes, Rules, policies and strategies that were evolved over a period of many years. The current legal framework governing water management incorporates the age-old common law standards and Irrigation Acts from the British colonial time frame. However, the later resolutions for the guidelines on the water quality acknowledge the legal acceptance of a basic right to water. Though the Constitution of India, as it was enacted, did not contain any specific provisions for the protection of environment or water resources, by the 42<sup>nd</sup> Constitution Amendment, Article 48-A was inserted in the Constitution stipulating that the “State shall endeavour to protect and improve the natural environment including forest and wildlife of the country”. Article 51A (g) provides that “it shall be the duty of every citizen of India to protect and improve the natural environment including forest, lakes, rivers and wildlife and to have compassion for living creatures”.

Further, Article 21 of the Constitution has been very liberally interpreted by the Indian judiciary so as to include a wide variety of rights which are essential for an individual to live a life with human dignity. The right to live with human dignity was further expanded by the Indian courts to include the right to a wholesome and clean environment, which also includes the right to clean air and water [22]. Giving regard to right to life under Article 21, the courts identified most vital necessities of life, such as, air, water and soil, which cannot be permitted to be misused and polluted so as to reduce the quality of life of others. The increase in environmental awareness since 1980's has also generated an increase in the environmental cases reaching the courts.

In Dehradun Quarrying Case, [3] the Rural Litigation and entitlement Kendra alleged that the illegal limestone mining in Mussoorie - Dehradun area was decimating the delicate biological systems nearby. The Hon'ble Supreme Court of India legitimized the closure of mining procedure as it was considered to be a price that must be paid for securing and protecting the privilege of individuals to live in a sound climate with least unsettling influence of the ecosystem. Further, in Chhethriya Pradushan Mukti Sangarsh Samithi vs. State of U.P, [3] the Hon'ble Supreme Court, was close to declaring the “Right to environment” as a fundamental right covered under Article 21. Sabhyasachi Muharjee, C.J. observed: “every citizen has a fundamental right to have the enjoyment of quality of life and living as contemplated in Article 21 of the Constitution” [23] Further, in Subash Kumar vs. State of Bihar [24] the Hon'ble Supreme Court held that “right to live... includes the right to enjoyment of pollution free water and air for full enjoyment of life” [25]. In Charanlal Sahu vs. Union of India, [3] it was further held that “the right to life includes the right to enjoyment of pollution free water and air for fuller enjoyment of life”. Thus, through these cases, the scope of Article 21 was thus widened by the Court by reading into Article 21, the “right to a wholesome environment and the right to enjoy unpolluted air and water” [26]. Moreover, if anything endangers or impairs the quality of life in derogation of law, a citizen has the right to move the Supreme Court under Article 32 of the Constitution.

In F.K.Hussain vs. Union of India, [3] the High Court of Kerala held that “the right to sweet water and the right to free air are the attributes of life, for, these are the basic elements which sustains

life itself”. The Court further observed that safeguards must be evolved to stop withdrawal of groundwater beyond a cut off level, and also emphasised on imposing restrictions on the extraction of groundwater and to introduce a system of effective monitoring at all levels [27]. In Puttappa Honnappa Talwar vs. Deputy Commissioner, Dharwad, it was held that the right to life under Article 21 included the right to have access to clean drinking water. Further, in the case of S.K Garg vs. State of U.P, [28] the Allahabad High Court observed “the right to get water is a part of the right to life guaranteed by Art. 21 of the Constitution”. Therefore, the right to wholesome environment, which includes the right to pollution free clean water and air, now forms part of the bundle of rights under Article 21 of the Constitution.

Thus, the fundamental right to water has been enunciated by the Indian courts inside the rubric of the right of citizens to have ‘clean’ drinking water as a feature of the right to environment ensured under the right to life under Article 21. Thus, the courts have been securing the right to not have water sources contaminated. Additionally, we can see that the fundamental right to water, albeit not explained as a different right, has been considered as an indivisible piece of the right to a clean environment and the right to life.

In M. C. Mehta vs. Union of India, [29] the Apex Court of India looked into the impact of mining on the groundwater table. Mining was done underneath the ground level and thus the groundwater was extricated. The Court tracked down that the miners were really mining the groundwater. The decline of groundwater level in the towns has been credited to excessive extraction of groundwater for domestic and industrial needs.

In Perumatty Grama Panchayat vs. State of Kerala [30], because of the unnecessary abuse of the groundwater by the Company and the significant issues like drinking water shortage in the Perumatty Grama Pachayat, the Panchayat chose not to renew the MNC's permit for the production of carbonated beverages. On appeal against this order, the Government ordered the Panchayat to constitute a team of experts from the Departments of Groundwater and Public Health and the State Pollution Control Board to conduct a detailed investigation [31]. The examination found the high grouping of calcium, and magnesium particles in the testing samples gathered from the area. These synthetic compounds polluted the ground unreasonably and rendered the water below unfit for consumption. The Government allowed the company to continue the operation of the plant. However, it fixed the limit of water to be drawn out, on the ground of protection and preservation of the water resources [32]. The main problem before the High Court was about the jurisdiction of the Panchayat to restrict the permit held by the company. The High Court permitted the said company to extricate groundwater within a given limit, upholding its ‘Right to Water’.

On further appeal [33], in 2005, the Supreme Court issued a notice based on an application by the Perumatty panchayat which sought a stay on the decision of the Kerala High Court, allowing the plant the use of five lakh litres of groundwater daily [34]. While trying to wrest its ‘natural’ right to this groundwater, attributable to its permit more than 35 acres of land, the company covered the soil with cadmium and lead, and because of its bottle washing measure, drained groundwater levels and turned it salty. Before any further appeal by the Panchayat, the company decided to close its plant in Plachimada.

## Statutory Framework in Relation to Preservation of Groundwater

Early legislations in India relating to the protection of environment by and large centred on preventing of contamination of the environment. However, this pattern slowly gave way to the enactment of laws with the aim of 'ecological assurance' and later, this has moved further to incorporate a more extensive range of laws for the 'protection and safeguard' of the natural resources and environment.

Initially, the subject groundwater was governed by common law standards connected to land possession and ownership, to a great extent. The Indian Easement Act, 1882 [35] incorporates these principles, which faced serious challenges in the question of large-scale extraction of groundwater by the owners of the land. This provision was misused by the multinational companies for the extraction of groundwater for meeting their commercial motive, which has resulting in serious concerns [36].

The Water (Prevention and Control of Pollution) Act, 1974 (Water Act), which aims at the prevention, control and abatement of water pollution, defines the term "stream", which also includes "subterranean water", which intends to include groundwater also. Groundwater contamination is one of the urgent water contamination issues, however the Water Act does not indicate specifically about groundwater contamination. The Water Act establishes Boards at the Central and State levels, to serve the aims and objectives of the Act. Apart from this, the Act has not given a particular consideration on the control of abuse and contamination of groundwater.

The National Water Policy, 1987 (Policy 1987) emphasizes the need for the mindful use of groundwater resources. The Policy 1987 also recommends for a resolving inter-State modality through acceptance of proper modifications in the proposed water plans [3]. This Water Policy was reviewed and updated in 2002 [37] and later in 2012. The National Water Policy, 2012 (Policy 2012) was released with an objective to plan and recycle resources for maximum availability. Apart from that, the Policy 2012 also suggests that artificial recharging projects should be undertaken so that the amount of extraction of the groundwater is less than the recharge and that guidelines must be issued for safety of storage dams and other water related structures [38].

Further, under Section 3(3) of the Environment Protection Act, 1986, [39] the Central Ground Water Board (CGWB) was constituted in the year 1997 for the purposes of "regulation and control of groundwater development and management in the country". The Board is entrusted with the responsibilities of "providing scientific inputs for management, exploration, monitoring, assessment, augmentation and regulation of groundwater resources" [15]. The objectives of the board also include "enhancing groundwater sustainability through artificial recharge and rainwater harvesting as a measure for checking the depleting trend of groundwater" [3].

The CGWB, established under the Ministry of Water Resources, Government of India, is the national apex agency entrusted with the responsibilities of providing scientific inputs for management, exploration, monitoring, assessment, augmentation and regulation of ground water resources of the country, in 1997 [40]. It also encompasses the responsibility of running State Ground Water Board (SGWB) in all states [41]. Objectives of the Ground Water

Board are specifically, "systematic and scientific development of groundwater, assessment and management in different Agro-climatic Zones and Hydrogeological formations for sustainability" [3].

The Central Ground Water Board prepared Draft Model Bill for the Control and Regulation of Groundwater in 1972, which was revised in 1996 and later in 2005, and finally the Bill was proposed with new amendments in 2017, and is still pending before the Parliament. The Bill has also inspired a number of States, which enacted legislations on groundwater in tune with the provisions of these draft Bills [3].

The Groundwater (Sustainable Management) Bill, 2017 [3], proposed an altogether different regulatory framework from the century-old, outdated, inequitable and environmentally unfriendly legal regime in place. Salient features of 2017 Bill include the realisation of fundamental right to life through provision of 'water for life' [41]. It visualizes that drinking water organizations which supply groundwater will agree with Bureau of Indian Standards determinations on water quality, and for individuals who rely upon groundwater for their necessities, it will be obligation of the Block, District and State groundwater offices to guarantee that BIS principles are followed. The Bill emphasizes social and climate sway evaluation through straightforwardness and responsibility, which would make the Groundwater Board better. Reformatory arrangements are remembered for Chapter 11 and it recommends discipline for doing any action that preferentially influences the nature of groundwater or its accessibility.

However, an assessment of the Bill shows that this Bill is also unsatisfactory to the current requirements of the country where groundwater is mostly relied upon for drinking and water system. The current arrangement of rules administering groundwater assignment is obsolete and is not in line with the logical comprehension of the association among surface and groundwater. The Bill also proposes itemised methodology for guideline which is hard to be followed evenmindedly. Moreover, the current lawful structure experiences an inbuilt powerlessness to give the premise to viable insurance of groundwater. This is connected to the atomised type of guideline that is proposed whereby the legitimate system restricts itself at regulating the particular cases of various landowners. Hence, these factors affirm the requirement for extremist changes to guarantee that the circumstance does not demolish further later on. The requirement for correcting the fundamental principles of groundwater law should likewise be connected to the improvement of more extensive lawful instruments that can give a more far-reaching guideline of groundwater than what exists today with its atomised guideline. There is subsequently a requirement for enactment in this sector to guarantee that the different elements of groundwater can be considered.

## State Legislations for Conservation of Ground Water

Water, being a State subject [3], has to be analysed from the State's perspective also. Over the last two decades, a number of States have enacted their own groundwater laws. This has led to major reforms in the legal regime governing groundwater in India [42]. In general, the State legislations require the rights to be realigned, the roles and responsibilities of the State as well as the general population. vis-a-vis groundwater resources. These laws have also resulted in institutional reforms and have also attempted to incorporate into groundwater regulation important norms of environmental law

such as conservation and sustainable use.

In response to the 2017 Model Bill, so far, 23 States and 5 Union Territories have adopted and implemented groundwater legislation in their respective States. These States are the Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Meghalaya, Nagaland, Punjab, Rajasthan, Uttarakhand, Arunachal Pradesh, Chhattisgarh, Haryana, Orissa, Tamil Nadu, Uttar Pradesh, West Bengal, Telangana, Maharashtra, Lakshadweep, Puducherry, Delhi, Chandigarh and Dadra & Nagar Haveli [43]. Accordingly, an ever increasing number of States and Union Territories are fortifying their domestic groundwater enactments and ranking it at par with surface water system, frequently by managing all water assets in a coordinated way dependent on the guideline of incorporated water assets the board. These urging advancements concerning law, establishments, and organization must be upheld to accomplish successful and feasible enhancements of groundwater administration and converse the worldwide pattern of groundwater exhaustion and corruption.

## INTERNATIONAL PERSPECTIVES OF RIGHT TO WATER AS A HUMAN RIGHT

In the international scenario, a number of conferences were convened and declarations were adopted recognising the significance of water [44]. In 2010, the United National General Assembly has recognized “the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights” [45]. Access to clean water and sanitation are thus recognized by the United Nations as Human Rights [46]. The Resolution reflects the fundamental nature of the basic requirements of water in every person’s life. It was identified that the “lack of access to safe, sufficient and affordable water, sanitation and hygiene facilities has a devastating effect on the health, dignity and prosperity of billions of people, and has significant consequences for the realization of other human rights” [47].

Dealing the right to water under the human rights framework offers an international recognition from which a concerted international cooperation and funding could flow. It helps in guaranteeing standards against which the protected legal right to water could be monitored. It also helps in building the accountability mechanisms that could empower the communities to advocate to ensure that water is safe, affordable, and accessible to everyone [48]. Thus, the UN acknowledges that clean drinking water and sanitation as integral to the realisation of all human rights. The Resolution also calls upon States and international organisations to provide financial resources and to help in the transfer technology to help other countries to provide safe, clean, accessible and affordable drinking water and sanitation for all [49].

Thus, UN-Water [50] looks over the tasks and work done by the UN entities and international organizations working on water and sanitation matters. Water is a finite resource having to serve exponentially more people and usages, and so ensuring everyone has access to a reliable supply is crucial to human survival and sustainable progress [51]. UN Water focuses on the Sustainable Development Goals, and decision-makers in the UN domain are now increasingly focusing on water resource management, ecosystem protection and water supply and sanitation as part of their policy and practice.

Consequently, water has been unequivocally perceived as a basic

liberty in global arrangements, international human rights law involves explicit commitments identified with admittance to safe drinking water. These commitments expect the States to guarantee everybody’s admittance to an adequate measure of safe drinking water for individual and collective uses. These obligations also require the States to progressively ensure access to adequate sanitation, as a fundamental element for human dignity, thereby protecting the quality of drinking-water supplies and resources.

## CONCLUSION

Quoting Justice Krishna Iyer, “The unconscionable industrialization, the unpardonable deforestation and the inhuman extermination of living species betray an exploitative brutality and anti-social appetite for profit and pleasure which is incompatible with humanism and conservationism.”

Water, being an essential and limited resource without which life would be impossible on earth, a well-established society must preserve and use water efficiently without any wastage. There is a need to create specific data sets incorporating all factors influencing groundwater replenishment and withdrawal, utilizing distant detecting method. Without such data sets, groundwater advancement plans would not be productive to have wanted effect. The aquifer planning at the ground level/local scale is an essential need prior to undertaking any water preservation program. The practical improvement of groundwater assets needs selection of an all-encompassing methodology, which includes examining boundaries identified with groundwater and other security dataset, like slant, geomorphology, lineament, soil, land-use, and so on. There is a need to have a well-planned extraction system thinking about future interest of water system and drinking water.

There is a need to generate spatial databases integrating all factors affecting groundwater recharge and withdrawal using remote sensing technique. In the absence of such databases, groundwater development plans would not be fruitful to have desired impact. The aquifer mapping at the micro-level/ local scale is a primary need before undertaking any water conservation programme. The sustainable development of groundwater resources need adoption of a holistic approach, which involves studying parameters related to groundwater and other collateral dataset, such as slope, geomorphology, lineament, soil, landuse, etc. There is a need to have a long term planning by considering future demand of irrigation and drinking water.

There is, additionally, a requirement for a more noteworthy attention to groundwater, its vital part in addressing water needs, its importance in the hydrological cycle, the reasons for decline, need to forestall over abuse, and so forth. Steps to improve the safeguarding and protection of groundwater without compromising the formative exercises of the country ought to be recognized. Law should perceive water as a scarce asset as well as an ally of life and nature. Strategies for sustainable utilization of groundwater ought to be made. Strict and rigid arrangements ought to be embedded in the resolutions to punish the companies which degrade the water assets. Besides, rules might be recommended for existing and new ventures to make arrangements for rainwater harvesting. The Authorities established under different resolutions for a similar reasons for water the executives should cooperate to meet the shared objective, i.e., preservation of water. A coordinated work of the Central Ground Water Board and the Pollution Control Boards is much needed as pollution is one of the greatest factors affecting

the groundwater quality. Innovation of new techniques resting on a strong science and technology base is needed to eliminate the pollution of surface and groundwater resources. Above all, water needs to be managed as a community resource held by the state, under public trust doctrine.

## REFERENCES

1. Trelease FJ. Water Law. 1974; 457.
2. Divan S, Rosencranz. Environmental Law and Policy in India. 2005;239.
3. <https://research.wou.edu/c.php?g=551307&p=3785494>
4. Bouwer H. Ground Water Hydrology. 1978.
5. Coleridge ST. The Rime of the Ancient Mariner. 1834.
6. Singhvi v DM. Union of India, AIR Raj. 2005;280.
7. [www.isro.gov.in/earth-observation/water-resources](http://www.isro.gov.in/earth-observation/water-resources)
8. Rodgers WH. Handbook on Environmental Law, Hornbook Series. 1977.
9. An insight on Legal Aspect of Groundwater.
10. Dinesh KM, Tushaar S. Groundwater Pollution and Contamination in India: The Emerging Challenge. 2012.
11. Government of India, National Groundwater Management Improvement Program: Environmental and Social Assessment
12. <http://mowr.gov.in/sites/default/files/ESSA-NGMIP-29Sep2016.pdf>
13. Organisation for Economic Co-operation and Development (OECD). The OECD Water Governance Initiative. <http://www.oecd.org/cfe/regional-policy/water-governance-initiative.htm>
14. Groundwater Governance: A Global Framework for Action Resources. <http://www.groundwatergovernance.org/resources/en/>
15. Kumar U, Kakrani B. Water Environment and Pollution. 2000; 99.
16. Shaji E. Groundwater Quality of Kerala – Are We on the Brink? 2008.
17. <http://www.disaster-research.net/drcv2011/paper/fullpaper36.pdf>
18. Mark G. Global Groundwater? Issues and Solutions, Annual review of Environment and Resources. 2009; 34:153-178.
19. International Groundwater Resources Assessment Centre, Groundwater of the World. [https://www.un-igrac.org/sites/default/files/resources/files/TBAmap\\_2015.pdf](https://www.un-igrac.org/sites/default/files/resources/files/TBAmap_2015.pdf)
20. Lacroix KM, Megdal SB. Explore, Synthesize, and Repeat: Unravelling complex water management issues through the stakeholder engagement wheel. 2016; 118.
21. Over-exploitation of Gr
22. “Institutional Framework for Regulating Use of Ground Water in India”. Final Report submitted by Institute for Resource Management and Economic Development. 2008.
23. Gaur V vs. State of Haryana, 2 SCC. 1995; 577.
24. Hussain FK vs. Union of India, AIR Ker. 1990;321.
25. Rural litigation and Entitlement Kendra, vs. State of Uttar Pradesh, AIR S.C. 1988;2187. Chhethriya Pradushan Mukti Sangarsh Samithi vs. State of U.P, 4 SCC 1990: 449.
26. Subhash K vs. State of Bihar AIR SC. 1991: 420.
27. Sahu C vs. Union of India AIR SC 1990:1480.
28. Hussain FK vs. Union of India AIR Ker. A scheme was evolved by the Lakshadweep administration to augment water supply by digging wells to meet increasing needs of islanders. 1990;321.
29. Thangal A vs. Union of India, KLT. 1990; 580.
30. Talwar PH vs. Deputy Commissioner, Dharwad AIR Kar. 1990;10.
31. Garg SK vs. State of U.P AIR. All. 1999;1804.
32. Mehta MC vs. Union of India, SCC. 1997; 11:312.
33. Hindustan Coca-Cola Beverages v Perumatty Grama Panchayat (2) KLT 554. 2005.
34. Perumatty Grama Panchayat vs State of Kerala, KLT. 2004;731.
35. Indian Easement Act 7(g).1882.
36. National Water Policy. 1987:7.1.
37. National Water Policy. 2002.
38. Environment Protection Act.1986;3.
39. Ministry of Water Resources, RD &GR Government of India, Ground Water Board.
40. Planning Commission of India, Model Bill for Ground Water Management. 2017.
41. [http://www.planningcommission.nic.in/aboutus/committee/wr/wg\\_groundwater\\_bill.pdf](http://www.planningcommission.nic.in/aboutus/committee/wr/wg_groundwater_bill.pdf)
42. Chapter 2 of the Bill. 2017.
43. List II under the 7<sup>th</sup> Schedule of the Constitution of India.
44. Sakthivel P, Amirthalingam S, Starkl M. A Study on Law Relating to Groundwater Recharge in India.
45. Ministry of Water Resources, RD &GR Government of India, Groundwater Management in India
46. <https://www.prsindia.org/administrator/uploads/general/1455682937~Overview%20of%20Ground%20Water%20in%20India.pdf>
47. United Nations Conference on Human Environment (Stockholm Conference, 1972), United Nations Conference on Environment and Development (1992), UN Millennium Summit (2000), World Summit on Sustainable Development (2002), and so on.
48. The UN GA Resolution (No.64/292) Right to Water and Sanitation. 2010.
49. UN Water, <https://www.unwater.org/water-facts/human-rights/>, (21/03/2021).
50. The PLoS Medicine Editors. Clean water should be recognized as a human right. PLoS medicine. 2009; 6: e1000102.
51. UN-Water, Coordinating the UN's work on water and sanitation.