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Groundwater Management Governance in India

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Abstract:

Water scarcity problem in India has become grave and the present per capita availability of water is 1486 cubic meters in the year 2021 (Acharya, 2021). Per capita availability of water below 1700 cubic meters is considered as water stressed and if this number falls to 1100 cubic meters the country may be declared as water scarce and water insecure. One of the most important aspects of achieving water security is to work on the conservation and recharge of groundwater (Mishra et.al., 2021). State plays a pivotal role in ensuring efficient groundwater governance and implementation of relevant laws and policies. This conceptual paper is an effort in capturing a snapshot of the present government machinery in India to manage its groundwater resources. Various government websites, policy papers, bill documents and reports were reviewed to understand the hierarchical structure of groundwater governance in the country. Impact of each of their work on others was studied to understand how implementation and its pace would be affected. The laws, ministry, departments and ongoing policies that constitute the government machinery for groundwater management have been presented at the end. The insights shared herein may be of help to anyone looking to work as a stakeholder in groundwater management. Researchers looking to contribute to groundwater scenario of the country may find easy access to the governance structure. Anyone studying policy implications of national level policies may also find it helpful to

understand how information and power flows in the system to ensure smooth implementation. Literature review carried out to look for a similar snapshot of present groundwater governance did not bring to surface any work capturing such a comprehensive discussion as covered in this paper.

Keywords:

Groundwater Management, Groundwater Management Governance, Groundwater Legislation, Groundwater in India

Introduction

One of the reports on status of water in India by NITI Aayog notes that in absence of necessary measures to curb the water crisis existing in the country, the availability of potable water will go down to half of its requirement by 2030. Besides drinking water, other priority areas like irrigation, industry and sanitation are bound to face more critical challenges if the state of affairs isn't brought under control. It is not a matter of contest that one of the most important aspects of water management is the groundwater development and management. As groundwater is a shared resource, the role of the State in ensuring sound groundwater governance cannot be overstated. Various laws and Supreme Court judgments have reaffirmed the role of State in ensuring Right to Water to the citizens of the nation. The study of present governance structure for efficient groundwater management is vital to understand how stakeholders may contribute in mitigating the groundwater crisis. Literature review of research performed in this area indicates that while critical analysis of various aspects of groundwater governance exists, the need for a comprehensive snapshot of the ongoing efforts of the State towards achieving success in this field is not successfully met. The last few years have seen expedited efforts in formation of an integrated Ministry, Measurement Index as well as Special schemes focused towards problem solving for water crisis. This paper is an effort towards arriving at a comprehensive understanding of the latest integrations and formations for efficient groundwater management governance in the country. Research was conducted to fulfill the following objectives:

i) To attain a comprehensive understanding of the governance machinery for Groundwater Management in the country

ii) To understand the hierarchy encompassing the various stakeholders of this system

Information regarding all the aspects of the subject was collated by studying and analyzing government websites, audit reports, research articles and any other online material available as part of the secondary data. The findings were then discussed with relevant officials in some important government departments as part of primary data so as to validate the findings and perspectives attained earlier. The understanding arrived at has been presented in the form of a flow-chart model of the Groundwater Management Governance in the country. The paper then arrives at some important conclusions, which are comprehensively presented in the end.

"Model Groundwater (Sustainable Management) Bill 2017"

"Model Groundwater (Sustainable Management) Bill 2017" is an advisory legislation based on which every state of the country is expected to form it's individual customized legislation, after due consideration of the various factors and aspects unique to the state like it's topography, water resource availability, priority water extraction areas, to mention a few. The first version of a Model Bill dealing with the matter of Groundwater was drafted in 1970 – "Model Bill to Regulate and Control the Development and Management of Ground Water, 1970". Over the years the Bill went through multiple revisions to meet the need of changing times and changing paradigms. Various legal developments like the decentralization related reforms of the 90's, access to water being recognized as one of the fundamental rights and water resources being recognized as a public trust were all inculcated in the original bill up to 2005.

The latest version, the Model Groundwater (Sustainable Management) Bill, 2017, was put down by the Ministry of Water Resources, River Development & Ganga Rejuvenation and is an advisory piece of legislation to be used as reference for states to put forth customized legislation to address the increasingly grave situation of the groundwater crisis. The integration of the above-mentioned legislative changes extends a new basis for regulation that views groundwater as a public resource which the State is bound to safeguard and manage. It not only allows the state the power to action for exercising measures at aquifer level, it renders the state responsible to address the ongoing overexploitation of groundwater leading to ever decreasing water tables.

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The Bill Lays down the 4 Basic Principles – "Non-discrimination & Equity", "Subsidiarity and Decentralization", "Protection, Precaution and Prior Assessment" and "Integrated Approach". All the following aspects of the Bill have been laid down keeping these principles at its core. The legal status of water is acknowledged and then "Groundwater Protection Zones" and "Groundwater Security Plans" have been defined. The Bill further delves into the Institutional framework through which the Bill's activities are to be exercised. It then lays downs the mandatory duties of all groundwater users and states the authorization rules for its abstraction for various kinds of users. The Bill then moves towards monitoring aspects like assessment and transparency including important tools like Social Audits. Monitoring and assessment give way to recognition of offenders and hence the Bills follows the course of listing down the offenses, due penalties for offenders and mandatory liabilities to be fulfilled. It takes into account the importance of dispute management and covers various aspects like avoidance, maintenance and conciliation. The Bill concludes by closing the loop about aspects like drill to be followed for funds collected under the act, effect of the act on various other laws, power attributed to State Government, local authorities and powers of making regulations and removal of difficulties.

Some of the salient features of this Bill can be said to be i) It applies the doctrine of public trust to water, similar to the ongoing trend worldwide ii) Referring to a precautionary principle such that groundwater regulation is backed by a strong environmental perspective iii) Centering around an institutional structure wherein bottom-up approach leads to each government level can be called upon by levels above them iv) Clearly stating the statute of Drinking water being top-priority of Groundwater use v) Proposing innovative substantial regulatory measures like protection zones and security plans for groundwater. One aspect that the Bill might have fallen short is the scope for a process of consultation with various cross-sections users.

As per the present status, 20 States/UTs have put in place relevant legislation for groundwater development and management which the various stakeholders of the groundwater extraction, usage and management are bound by. The rest of the states are in the process of forming a similar legislation. The road to a water secure nation is being paved through these legislative developments.

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Ministry of Jal Shakti

Ministry of Jal Shakti was formed under the Government of India in 2019 by the merger two existing ministries – "Ministry of Water Resources, River Development & Ganga Rejuvenation" and "Ministry of Drinking Water and Sanitation". To understand the importance of this merger step, it is important to understand what the mandates of the earlier ministries. "Ministry of Water Resources, River Development & Ganga Rejuvenation" came into being for formation and implementation of rules for the development as well as regulation of the water resources in India. The "Ministry of Drinking Water and Sanitation" came into being for the overall policy framing, management planning & funding as well as coordination of programs of drinking water and sanitation in India. The merging of the two ministries was a well considered step with an integrated approach as a central pillar. To add to this, the ministry has also got off on the right foot by making the Jal Shakti Abhiyan a citizen participation-based initiative. This initiative has placed the onus on the people too to ensure a new approach to solving the problem of water.

To understand the role of the Ministry in a comprehensive manner, it's important to have a look at its vision, mission and function. The vision with which it was created was to propagate the idea of 'optimal sustainable development', which includes 'maintenance of quality of the existing water resources and their efficient use'. The mission the ministry is expected to achieve is that of 'Integrated Water Management' (IWM). It is important to note that by accepting IWM as an important mission the Ministry and its scope is aligned with the international initiatives related to water as the way forward for sustainable development and management. The functions or the ministry are an extension of its vision and mission and cover various aspects of i) Planning and Policy formulation ii) Technical guidance, scrutiny and monitoring iii) Infrastructure and research support iv) Central Financial Assistance & External Finance from World Bank, etc. v) Overseeing various schemes and initiatives for Irrigation as well as Groundwater Development vi) Formulation of a national perspective for water-balance and development vii) Mediation and Dispute resolution related to inter-state rivers and projects viii) Flood Control, Flood Forecasting for Ganga and Brahmaputra ix) International talks and negotiations around water and Indus Water Treaty x) Effective mitigation of pollution as well as rejuvenation of Ganga.

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It is important to note that one main aspect missing is clarity on specifics as to how to tackle the herculean problem of groundwater depletion at hand. The ministry has been formed with a broad stroke approach, lacking clear targets or priorities. There has also been ambiguity as to where from the promised investment of Rs. 3.5 Trillion will be brought in and exactly in what specific activities will it be spent. Post-covid, situation looks graver as the present machinery and set-up lacks focus on prioritization of tasks or a systematic plan to move things for the better.

Central Ground Water Board

Central Groundwater Board (CGWB) came into being in 1970 under the Ministry of Agriculture, Government of India as a result of renaming of the "Exploratory Tube wells Organization". In 1972 it was further merged with the "Ground Water Wing of the Geological Survey of India". CGWB is a scientific organization consisting of multi-disciplinary experts who are Hydro-geologists, Geophysicists, Chemists, Hydrologists, Hydrometeorologists and Engineers. It is formed of four main wings: "Sustainable Management & Liaison (SML)", "Survey, Assessment & Monitoring (SAM)", "Exploratory Drilling & Materials Management (ED&MM)" and "Water Quality & Training and Technology Transfer (WQ&TT)".

CGWB mainly engages in the following activities:

- Conducting groundwater management studies
- Carrying out exploratory programs for drilling
- Monitoring levels and quality of groundwater
- Maintaining a network of observation wells for groundwater
- Implementing artificial recharge demonstrative schemes and recharge augmentation rainwater harvesting

Besides these, it also performs the following activities too:

- Carrying out joint periodic assessment of replenish able groundwater resources with concerned State Government agencies
- Performing Supplement activities like remote sensing and GIS research, geophysical studies as well as groundwater modeling exercises

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- Engaging in special studies such as groundwater depletion, groundwater contamination, water balance, etc.
- Organizing capacity building activities Central/State Government organizations personnel engaged in various activities in groundwater sector along with its own personnel
- Conducting campaigns for mass awareness on water conservation and judicious use of groundwater
- Generating data so as to provide various studies that can act as scientific base for water resource planning involving various stakeholders
- Advising various state level and central level user agencies on groundwater planning and management
- Providing technical know-how for scientific groundwater exploration

Central Ground Water Authority

Central Ground Water Authority is a statutory body operating under the aegis of Ministry of Home Affairs (MHA). It was constituted to regulate and control development and management of ground water resources in the country under Section 3 (3) of the Environment (Protection) Act, 1986. It was the result of a Public Litigation (PIL) raising concerns about the overexploitation of groundwater resources leading to alarming declines in the groundwater levels, presented to the Honorable Supreme Court of India in 1996. The Authority was conferred with the following powers:

i) To issue directions and take measures in the matters referred to in various sections of the said Act

ii) To resort to penal provisions as instructed under relevant sections of the said Act

iii) To issue necessary regulatory directions for the management, control and development of groundwater

iv) To exercise powers for the appointment of officers as per section 4 of the Act

The main activities the CGWA is involved with at present are:

1. Groundwater Development Regulation
2. Industries and Projects Clearance

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3. CGWA representation in various Expert Committees
4. Management of Groundwater Pollution from Geogenic Sources
5. Registration of persons and agencies employed for Water Well Construction
6. Dealing with Legal Issues related to Groundwater Management

The above have resulted into various achievements at multiple levels. CGWA has provided the relevant technical reports by conducting spot surveys. It has also assisted the Honorable Supreme Court and various High Courts on various legal matters related to water conservation including highway and flyover projects, protection of water bodies, etc. CGWA also identified the vital need for rainwater harvesting and hence has been organizing country wide mass awareness & training programs for same, with the intention of communicating its importance for groundwater recharge. These activities also ensure dissemination of cost-effective technologies to various government, non-government and private sector stakeholders. The awareness program also took ample support of electronic and print media for effective promotion. Now, the need for the hour is to come up with an integrated ground water development and management plan based on principles of sustainability. Besides the stakeholders mentioned above, other stakeholders like industrial and farmer associations if included to this group the chances of achieving success faster in the present endeavors will improve.

National Water Policy

The first National Water Policy was adopted in September, 1987 for governing the process of planning and development of water resources so as to ensure their optimal utilization. Review and updating of the original draft took place in 2002 and 2012. However, NITI Aayog's latest data analysis shows how India is facing its first water crisis and if timely precautionary measures aren't taken then India's potable water demand is expected to outstrip supply by the year 2030. Hence, one more draft update of the policy needs to take place. Some important aspects that have changed since the last draft update may be listed as below:

- Prioritization of water usage needs to be redefined based on the changes in the last decade
- Policy parameters need to be setup with regards to revitalization of rivers, as many of our rivers and rivulets have dried up

- Budgeting needs to be redone to cover multiple levels be it basin or sub-basin
- Modulation and tracking of water flow may now take the support of innovations in technology
- "Composite Water Management Index 2.0, 2018" by NITI Aayog's need to be inculcated in the policy
- Decrease of Spring sets in Himalayas and its implications need to be inculcated in the policy
- Natural challenges like climate change, extreme rainfall, etc need to be taken into consideration in the updated policy draft
- Command Area Development needs to be executed to ensure that the 21 million hectares of land set aside for irrigation reaches the farmers through construction of small channels

A drafting committee has been constituted to work on the updating process and the new draft is expected to be announced in the coming few months. If all the above concerns are taken into consideration the country is bound to be guided by a comprehensive and integrated water policy soon. This in turn may lead to more efficient groundwater management, taking off the pressure the country is facing at present with respect to water insecurity.

Indian National Committee on Ground Water

Indian National Committee on Groundwater is one of the 3 Indian National Committees constituted to co-ordinate the R&D program headed by Water Resource Engineering under the Ministry of Water Resources, Government of India. Basic, applied as well as action research is encouraged and supported in the form of financial assistance in the form of grants to (i) academicians in IITs/Universities/ recognized laboratories for R&D (ii) Central/State Government Water Resource/Irrigation departments (iii) Non-government Organizations. The Chairman of Central Ground Water Board Chairs this committee, ensuring priority agendas are given due consideration during screening of the research proposals.

The main domains for which proposals are welcome are: i) Groundwater Recharge ii) Groundwater Quality iii) Climate Change Impact on Groundwater iv) Groundwater – Surface water and its interrelation v) Groundwater Management vi) GIS Solutions & Remote Sensing

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applications vii) Investigation of Geophysical nature viii) Mathematical and/or Simulation modeling. The various entities eligible to avail funding are: a) Central & State Govt. R&D institutes or labs b) Organizations of MoWR c) IITs, Recognized Engineering and Agricultural Colleges, Recognized Universities as well as WALMIs d) NGOs, non-profit Private R&D institutions and/or organizations under DSIR (Department of Scientific and Industrial Research) that are capable of carrying R&D. As far as eligibility for proposal type is concerned, those proposals which don't investigate any new techniques, those mainly involved in data collection or application of known data analysis techniques and those where end-user of research is not well identified are bound to be rejected.

Some of the successfully completed projects listed on the website of this committee have been on the following titles:

1. "Geohydrological Study for augmentation of spring discharge in Western Himalaya"
2. "Study of fluvial geomorphology and tectonics of Khari-Mashi drainage basin, Rajasthan for database preparation and groundwater recharge capability assessment"
3. "Ground Water Flow Modeling and aquifer vulnerability assessment studies in Yamuna – Krishni Sub basin, Muzaffarnagar Distt., U.P"
4. "Institutional framework for regulating use of ground water in India"
5. "Development of Models for the cleanup of Cr (VI) contaminated Aquifers using bio-remediation"
6. "Development of defluoridation Media for contaminated ground water and its lab to field application"
7. "Identification of sites for artificial ground water recharge in Upper Ganga Plains, using remote sensing – GIS"
8. "Causes effects and remedial measures of Arsenic contamination in ground water aquifers in parts of West Bengal"
9. "Impact of Urban Industrial and Agricultural Pollution in Surface and Ground Water in and around Hyderabad and Secunderabad, A.P"
10. "Study on Ground Water Contamination through Municipal Landfills in the NCT, Delhi"

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About 8 more projects are ongoing and are being carried out in Orissa, Chennai, Gujarat, Rajasthan and Jharkhand.

Ground Water Management and Regulation Scheme

Central Ground Water Board (CGWB) launched the Ground Water Management and Regulation (GWMR) Scheme as a Central Sector Scheme in 2007-08. The objectives this scheme was set-up to achieve were i) Aquifer delineation and characterization to & ii) Ground water management development plans. However, "National Aquifer Mapping and Management Programme (NAQUIM)" has been the priority activity under GWMR. While the national area identified to be covered under NAQUIM studies was nearly 25 lac sq kms, to total area covered till now is about 22 lac sq kms. The aquifer maps arrived at and management plans further prepared have then been forwarded to the State agencies so that suitable demand and supply side interventions can be planned and executed.

Besides this, the scheme is also an instrument to carry out other CGWB activities like:

- Groundwater level as well as quality monitoring
- Dynamic groundwater resources assessment in collaboration with States/UTs
- Groundwater withdrawal regulation as well as control for certain States/UTs
- Demonstrative projects for recharge in some select areas under water stress
- Scientific infrastructure improvement to ensure technological upgradation

It is important to note that the findings of this scheme help in bridging the knowledge gaps so as to empower the stakeholders for necessary sustainable groundwater management all over the country.

- A report of the scheme audit was released by the "Comptroller and Auditor General of India (CAG)" in December 2021, providing findings from performance audit for the period of 2013-2018. Important observations followed by relevant recommendations of CAG mentioned therein are listed below:
- Increasing the observation wells used by CGWB for water level assessment to 50,000
- Expediting the revision process of the Model Bill
- Enactment of legislation on groundwater in all the 33 states/UTs

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- Keeping a check on the groundwater extraction percentage, especially in case of states which were non-complaint
- Ensuring that the 2-yearly assessment of groundwater resources takes place as per prescribed intervals without fail
- Effective co-ordinations between CGWA and state-agencies for enforcement of penal provisions as per "Environment Protection Act, 1986" for complying with NOC conditions
- Reviewing the strategy for utilizing allocated funds for mapping and management of groundwater and ensuring more efficient utilization of allocated funds
- Assessing the progress under all targets as per the SDGs
- Strengthening the organization through review of the CGWB mandate
- Fund allocation and utilization under the scheme for 4 consecutive years including present year are as under:

Year wise Funds allocation & utilization for last 4 yrs		
Financial Year	Allocation (Rs. in Cr)	Expenditure (Rs. in Cr)
2019-20	257.41	251.33
2020-21	140.80	138.06
2021-22	180.24	180.19
2022-23	390.00	49 (up to 30th June 2022)

(Source: pib.gov.in)

Atal Bhujal Yojana

Atal Bhujal Yojana is a special scheme launched for groundwater management under the Ministry of Jal Shakti on 25th December, 2019. The primary objective behind it is "To improve the management of groundwater resources in the water stressed areas of the selected States". Integration of multiple central and state schemes may take place to bring about community-led implementation of appropriate investments/management actions under Atal Bhujal Yojana. Some of the key areas expected to witness results are: (a) A strong framework

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for institution building (b) Effective monitoring & disclosure of groundwater data (c) Efficient planning and implementation of groundwater interventions. The implications of the scheme mainly be seen on (i) Women, marginal farmers, and agricultural laborers (ii) Groundwater management agencies of central and state government (iii) Flood and drought prone population, especially rural poor (iv) Ministries of agriculture as well as environment (v) Civil society organizations & NGOs (vi) Research as well as educational institutions (vii) Students & researchers and (vi) Private sector. One of the main goals of Atal Jal is to arrive at a community-led sustainable groundwater management that can be scaled up. Another aim of the scheme is to bring about community level behavioural change for fostering sustainable groundwater management through awareness programs and capacity building in the participating states.

The states identified as water stressed and hence worthy of attention, as per the scheme and the groundwater agencies responsible for groundwater management therein are:

Gujarat	"Gujarat Water Resources Development Corporation Limited under the Department of Water Resources"
Haryana	"Ground Water Cell under the Department of Agriculture"
Karnataka	"State Ground Water Directorate under the Water Resources Department"
Madhya Pradesh	"Ground Water Division under the State Water Resources Department"
Maharashtra	"Ground Water Surveys and Development Agency"
Rajasthan	"Ground Water Directorate under the Public Health Engineering Department"

(Source: ataljal.mowr.gov.in)

The scheme has been backed by detailed planning regarding implementation, management and co-ordination aspects in detailed. Hierarchically, at the central level implementation of the Program is to be lead by a "Program Management Unit (PMU)", whose establishment is under the MoWR, RD&GR. The PMU is to be responsible for all the important management aspects like coordination with state level agencies, fm and procurement, result monitoring and evaluation as well as communications. A "Technical Support Agency (TSA)" at national

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level will support the PMU by running a national communication campaign to positively impact behavioral changes for program success. At the state level, Steering Committees are to be formed the participating states to overlook the ground implementation of program at the state and local level. Each of the states further have a nodal agency assigned along with Program Implementation Agencies (PIAs), which are further responsible for various operational and techno-commercial aspects. PIA is responsible for need based and adequate support for preparation and implementation of "Water Security Plans (WSPs)". Further, the responsibility of implementing the Program at the district level will lie on government institutions in the district, block and Gram Panchayat (GP). The state PIA supported by TSA will be responsible for ensuring these agencies are able to perform their tasks well with required assistance and are monitored efficiently for their achievement fulfillments.

"Composite Water Management Index – Round II, 2019"

"Composite Water Management Index (CWMI)" has been developed by the NITI (National Institution for Transforming India) Aayog to open up the possibility of effective water management in India. It is the first of its kind comprehensive collection of water data at the country level and uses well structured questionnaires as well as focus group discussions to excavate qualitative data on water. It was developed through collaborative efforts with various stakeholders at national and state backed by a brawny process for data validation. It is a very important step for encouraging "competitive and cooperative federalism" in country's governance and management of groundwater through a culture of data-based decision-making.

The CWMI 2019 measured the status of all the Indian states on an exhaustive list of water indicators and reported relative trends from the past. This ensures creation of a shared frame for comparative improvement in water management in India and highlights the specific problem areas that need improvements. Some of the expected outcomes from the CWMI exercise are i) Establishment of clear baseline and bench-mark on key water indicators for every state ii) Identification of high-performers and under-performers as well as progress over time, thus inculcating a culture of constructive federalism iii) Identification of areas for deeper engagement and investment. Eventually, NITI Aayog plans to develop the Index into a composite, national-level data management platform for all water resources in India.

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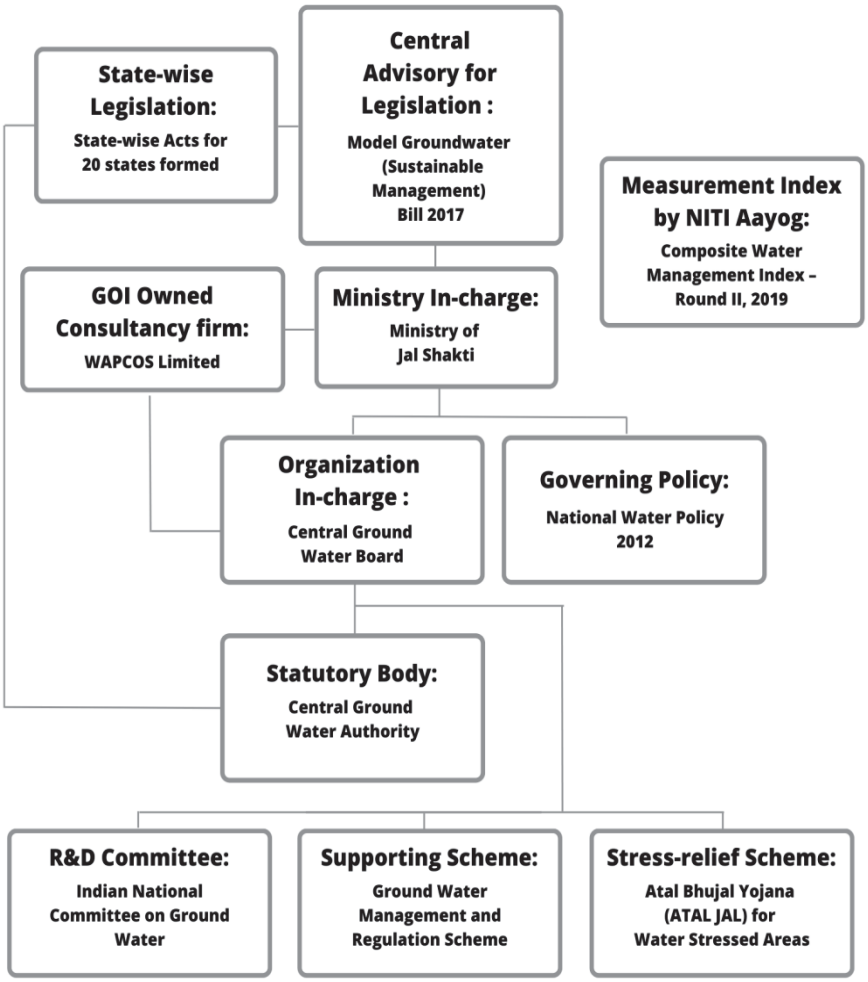
WAPCOS Limited

WAPCOS Limited is a technology-driven Consultancy & Engineering, Procurement and Construction (EPC) organization which came into existence on June 26, 1969, under the Companies Act, 1956. It operates under the aegis of the Ministry of Jal Shakti and has now been recognized as a 'Mini Ratna-I' Public Sector Enterprise with strong presence in the country as well as the world. It offers services like infrastructure development, water resources and power generation. Its main activities are "pre-feasibility and feasibility studies", "master and regional development plans", "detailed engineering reports", "commissioning and testing", "operations and maintenance and capacity building" as well as "resource development in areas of competence".



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Conclusions

After careful study of each aspect of the present governance machinery from groundwater development and management in India, one is able to arrive at a comprehensive understanding of how each of them are related to each other and how some of them act as compasses or catalysts for others in their planning and decision-making. The scenario presents a perspective of hope and success towards achieving water security for the nation. Instead of standalone and individualistic efforts by various departments and organizations, the push is towards a more efficient and wise approach so as to mitigate redundancy and resource mismanagement. Some important conclusions can be listed as: i) the overall shift in the Groundwater Management Governance machinery has been towards a more integrated approach, with due importance being given to collaborative efforts by all stakeholders ii) there has been an introduction of planned efforts in ensuring citizen participation as an imperative step in achieving water security iii) accountability and result-oriented approach have been placed at the centre of every effort at all levels of governance iv) effective efforts and support towards R&D and Innovation are seen at all stages.

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