

Report

of

Expert Committee on issue related to Groundwater Protection, Conservation and Regulation

On directives of Hon'ble National Green Tribunal in M.A.No. 107/2019 in
Original Application No. 176/2015

Ministry of Environment, Forest and Climate Change
Government of India



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<u>Content</u>		
<u>Sr. No.</u>	<u>Particulars</u>	<u>Page No.</u>
1.	Introduction	01
2.	Existing institutional framework for Groundwater Management	04
2.1	Existing Institutional Framework	05
2.2	Development of regulation mechanism by CGWA	06
2.3	Order of National Green Tribunal Principal Bench, New Delhi: M.A. No. of 2019 INO.A. No. 176 of 2015	07
3.	Deliberation by Expert Committee	11
4.	Recommendations and suggestive measures	19
A)	Industry/ mining /infrastructures projects	19
B)	Agriculture	22
C)	Drinking and Domestic Use	24
D)	Institutional Frameworks for monitoring and supervision	25
E)	General Recommendation	26
F)	Summary and Recommendations on ground water impact studies in light of projected data for the next 50 years (in phased manner with action plan for each decade)	29
G)	Proposed Decadal Action Plan	30
	Annexure - I Hon'ble NGT order dated 03.01.2019	
	Annexure - II Summary and recommendation on Groundwater impact studies in light of projected data for the next 50 years: Report of Sub Committee	
	Annexure - III List of members of Expert Committee on the issue related to Groundwater conservation	

1. Introduction

Water is essential for life, living and livelihood. Sustainable development and efficient management of water is an increasingly complex challenge in India. Increasing population, growing urbanization and rapid industrialization combined with the need for raising agricultural production generates competing demands for water. Groundwater has steadily emerged as the backbone of India's agriculture and drinking water security. India is the largest groundwater user in the world, with an estimated usage of around 230 cubic kilometers per year, more than a quarter of the global total. From millions of private wells, rapid exploitation of groundwater has been observed in the last five decades resulting in consequential aquifer depletion, which are disturbing attainment of the development goals, for sustaining economic growth and local livelihoods, and for environmental and fiscal sustainability. Furthermore, climate change will put additional stress on groundwater resources; while at the same time it will have an unpredictable impact on groundwater recharge and availability. Like many developing countries in semi-arid and arid regions, groundwater situation has been getting increasingly precarious in India (GSDA 2018, World Bank 2010).

Hon'ble NGT took a note on publication of NITI Aayog, India is placed 120th amongst 122 countries in water quality index. Most states have achieved less than 50% of the total score in augmentation of groundwater resources, highlighting a growing national crisis. As per the report, about 54% of India's groundwater wells are decreasing in levels and 21 major cities across the country are expected to run out of ground water by 2020. Almost none of States have built the infrastructure required to recharge groundwater in over exploited and critical areas. States such as U.P., Bihar, Rajasthan etc have not put in place any regulatory framework for managing the groundwater. These states produce 20-30% of India's agricultural output and groundwater accounts for 63% of all irrigation water. Therefore, unsustainable extraction in these states also poses a significant food security risk for the country.

Contribution of ground water is nearly 62% in irrigation, 85% in rural water supply and 45% in urban water supply (MoWR, RD & GR, *Dynamic Groundwater Resources of India: As on 31st March 2013*). Though groundwater is an annually replenishable resource but its availability is non-uniform in space and time. Technically, dynamic ground water refers to the quantity of ground water available in the zone of water level fluctuation, which is replenished annually. Hence, the sustainable development of ground water resources warrants precise quantitative assessment based on reasonably valid scientific principles. National Water Policy, 2012 has laid emphasis on periodic assessment of ground water resources on scientific basis. The trends in water availability due to various factors including climate change must also be assessed and accounted for during water resources planning. To meet the increasing demands of water, the National Water Policy, 2012 advocates direct use of rainfall, desalination and avoidance of inadvertent evapo-transpiration for augmenting

utilizable water resources. It also states that safe water for drinking and sanitation should be considered as pre-emptive needs followed by high priority allocation for other domestic needs (including needs of animals), achieving food security, supporting sustenance agriculture and minimum ecosystem needs. Available water, after meeting the above needs should be allocated in a manner to promote its conservation and efficient use.

The annual water availability, replenishment to ground water resources and its abstraction have also been assessed in the report published in 2017 (as on 31st March, 2013). According to the report 447 billion cubic meters (bcm) of annual water replenish to groundwater and net groundwater availability is estimated to be 411 bcm. Out of this ground water availability total abstraction is estimated as 253 bcm, which reflects 62% of groundwater is being abstracted. Pattern of groundwater abstraction is also noted from report of years 2011, 2009 and 2004 which are in order of 62%, 61% and 58% respectively. The development of ground water in different areas of the country has not been uniform and over abstraction in different zones have resulted increase in OCS area.

Ministry of Water Resource, River Development and Ganga Rejuvenation (MoWR, RD&GR) estimates long term ground water level trend, which is computed generally for a period of 10 years. The significant rate of water level decline has been taken in to consideration, which is between 10 to 20 cm per year depending upon the local hydro geological conditions. Based on the stage of ground water development and trend of groundwater levels, the groundwater resource assessment units (block/mandal/ firka/ talukas) are; 'Safe', 'Semi-critical', 'Critical' and 'Over-exploited' areas (OCS areas). The criteria for categorization are given below.

Table 1: Criteria for Categorization of Assessment Units

Stage of Ground Water abstraction	Significant Long Term Water level Decline trend		Category
	Pre-Monsoon	Post-Monsoon	
$\leq 90\%$	No	No	Safe
$> 70\%$ and $\leq 100\%$	No	Yes	Semi-Critical
$> 70\%$ and $\leq 100\%$	Yes	No	Semi-Critical
$> 90\%$ and $\leq 100\%$	Yes	Yes	Critical
$> 100\%$	No	Yes	Over-Exploited
$> 100\%$	Yes	No	Over-Exploited
$> 100\%$	Yes	Yes	Over-Exploited

Apart from the four categories mentioned above, blocks where the entire assessment area is having poor quality groundwater are demarcated as 'Saline'.

As per groundwater assessment report published in June, 2017((Source: MoWR, RD & GR, *Dynamic Groundwater Resources of India: As on 31st March 2013*), MoWR, RD&GR , total 6584 assessment units (Blocks/ Mandals/ Firka/Talukas) have been assessed in the country, of which 1968 fall in the categories of overexploited, critical and semi-critical areas that counts 30% depleted units. Among total assessed units, 1034 counted as exploited areas, 253 units as critical areas and 681 units as semi-critical. Apart from this 96 units are assessed to be saline areas. From the reports of years 2004, 2009, 2011 and 2013, total numbers of OCS areas are reported as 1615, 1494, 1985 and 1968 respectively. As per the latest assessment in categories of OCS areas Delhi is ranked first as 82% of total number of assessed units followed by Rajasthan (81%), Punjab (81%), Haryana (75%), and Tamil Nadu (59%).

In order to regulate groundwater abstraction in Over Exploited/ Semi-critical areas, CGWA notifies area (blocks / talukas / mandals / firkas areas) under Environment (Protection) Act, 1986 for regulation of ground water development and management. In these notified areas, abstraction of ground water is not allowed for any purpose other than drinking and domestic use. For monitoring and supervision of notified area, CGWA has empowered district level authorities of State Government under section 4 of Environment (Protection) Act, 1986. CGWA has notified total 162 areas in the country till 2012 out-of 1033 identified Over Exploited areas.

2. Existing institutional framework for Groundwater Management and Directives of Hon'ble National Green Tribunal

According to Government of India (Allocation of Business) Rules, 1961 (as Amended up to 31st January, 2017), the responsibility of development, conservation and management of water, overall national perspective of water planning and coordination in relation to diverse uses of water and interlinking of rivers is with Ministry of Water Resources, River Development and Ganga Rejuvenation (Now Ministry of Jal Shakti).

To assess & review the water scenario and to meet the competing water demands for various uses in the country, Ministry of Jal Shakti formulates a National Water Policy time to time for laying down priorities. Meeting to these objectives, an Apex body "National Water Resources Council" (NWRC) was first constituted in March 1983 under the Chairmanship of Hon'ble Prime Minister to look into this aspect. The NWRC adopted the National Water Policy in September 1987. In order to review the progress of implementation of the stipulations of the National Water Policy for reporting to the NWRC and also to initiate effective measures for systematic development of the country's water resources, the "National Water Board" was constituted in September, 1990 comprising Secretary, Ministry of Water Resources as Chairman and Chief Secretaries of all the States / UTs, Secretaries of concerned Union Ministries and Chairman, Central Water Commission (CWC), as Members.

The National Water Policy of 1987, broadly prioritized the aspects related to water allocation for irrigation, drinking, water rates, flood control and management, land erosion, drought management including groundwater development with other related aspects. On the groundwater development aspects the policy emphasized *"periodic reassessment on scientific basis of ground water potential, taking into consideration of the water viability. Exploitation of the groundwater resources should be regulated as not to exceed the recharge possibilities, as also to ensure social equity. Groundwater recharge project should be developed and implemented for augmenting the available supplies. Integrated and coordinated development of surface water and groundwater and their conjunctive use, should be envisaged right from planning stage and should form an essential part of the project"*¹.

In 2002, the NWRC approved 'National Water Policy' in its 5th meeting held on 1st April, 2002, which was based on similar principle as envisaged in National Water Policy of 1987. Subsequently after a gap of 10 years the policy was further revised in 2012. As per the last policy opted in 2012, main objectives laid therein are; to take cognizance of the existing situation, propose a framework for creation of a system of laws and institutions ; and draw plan of action with a unified national perspective. In the present scenario of water resources and their management in India, several new

1. National Water Policy 1987, pp.9, Ministry of Water Resources, GOI
2. National Water Policy 2012, pp.1-2, Ministry of Water Resources, GOI

However, water intensive units were not exempted and were required to adopt mandatory recharge of 50% of the proposed quantum of ground water withdrawal. In semi-critical units, mandatory condition of recharge equal to quantum of withdrawal for water intensive industries and 50% of withdrawal for non-water intensive operations was imposed. In critical assessment units water intensive industries were required to recharge 200% of quantum of ground water withdrawal and other proponents were required to recharge 100% of quantum of ground water withdrawal. In Over-exploited units, no NOC was granted for new water intensive industries. For other proponents, mandatory condition of recharge of 200% of quantum of withdrawal was imposed. In notified areas, no NOC was granted for new projects.

Additional guidelines for saline ground water abstraction in notified areas were framed, which were made effective from 25.04.2013. In such areas, saline groundwater withdrawal was permitted subject to the conditions that withdrawal should not contaminate the fresh aquifer lying below / above the saline aquifer. Issuance of NOC for existing users was made mandatory in compliance to order of Hon'ble NGT in OA No. 204/2014 dated 15.04.2015, which states that *"It shall be obligatory upon Central Ground Water Authority to ensure that any person operating tubewell or any means to extract groundwater should obtain its permission and should operate the same subject to law in force, even if such unit is existing unit or the unit is still to be established."* Accordingly the guidelines were again modified and the current guidelines are effective from 16.11.2015. Exemption upto 100 m³/day in safe areas was removed. All existing as well as new projects are now required to obtain NOC for ground water withdrawal. Mandatory condition of recharge is same as that in 2012 guidelines. In notified areas, NOC to industries existing prior to date of notification was being granted.

Guidelines to allow food parks/ agro based industries in notified areas were framed, which were effective from 31st August, 2016. Setting up of food parks/ agro based industries was permitted with the condition that units will be only for low water intensive crops and net annual ground water saving due to change in cropping pattern should be more than 30%. No water intensive industries are allowed within the food parks. However, in pursuance of NGT order dated 28th August, 2018 and 3.1.2019, CGWA has stopped issuing NOC to existing as well as new industries in OCS areas. NOCs in these areas are also not being renewed.

2.3 Directives of Hon'ble National Green Tribunal (NGT)

In original application no 176 of 2015 (M.A. no. 107/2019) in the matter of Shailesh Singh Vs Hotel Holiday Regency, Moradabad & Ors, the Hon'ble NGT, Principal Bench, on 03.01.2019 has directed on the issues related to groundwater Conservation and its fast depletion in recent year, with other different 10 applications. Hon'ble NGT observed it as serious cause of concern for long term impact on livelihood and sustainability of human being. The order dated 03.01.2019 is at Annexure-I.

In further, about 60% of the irrigation needs, 85% of rural drinking water needs and 50% of urban water needs are met through ground water. As per order, India extracts most groundwater. Globally, 25% of total annual global annual water is extracted in India and the extraction level is going up continuously. Depletion of ground water not only creates crisis for drinking water in absence of inadequate surface water being available in certain areas where there may be drought conditions, but also affects e-flow in rivers and can also increase salinity in soil.

In the said order the Tribunal noted that:

"Availability of groundwater resources as on 31.03.2009 is on CGWA website. 802 over-exploited units, 169 critical units, 523 semi-critical units have been notified for regulation. Authorized officers have been nominated. The guidelines provide that permission to extracts groundwater is not given in such areas for any purpose other than the drinking water. The permission is given only if water supply department is not able to supply such water. The NOC is granted subject to conditions laid down in the guidelines. In non-notified areas, NOC is granted for new industries or for expansion, subject to the conditions relating to recycle/re-use. It is further pointed out, in the said guidelines it is mentioned that 162 areas have been notified for regulation but more areas can be notified periodically. There are 1071 over-exploited units, 217 critical units and 697 semi-critical units. NOC is to be granted for drinking and domestic purposes only in the notified area. In non-notified areas, it is granted for industries, for infrastructure and mining."

Tribunal also noted that the Environment (Protection) Act, 1986 had an overriding effect as held in M.C. Mehta (Supra) and no State Legislation could override the Environment (Protection) Act, 1986. Thus, the mandate of CGWA was to override any State regulatory framework. Doing so was the right of CGWA coupled with the duty for achieving the object of the Environment (Protection) Act, 1986.

- i) CGWA repeatedly disowned its responsibility on the plea that regulation of groundwater was a State subject, contrary to the mandate in the judgement of the Hon'ble Supreme Court in MC Mehta (Supra).
- ii) CGWA was failing to regulate drawal of groundwater in OCS on the ground that it had not issued a notification except for some areas, and without such notification, there was no need for regulating extraction of ground water even in OCS.
- iii) Extraction of groundwater for commercial purposes was being allowed in OCS just by a mechanical condition that the groundwater will be recharged, without ensuring compliance of such condition.
- iv) Under groundwater was being allowed to be extracted for illegal construction, bottling plants, swimming pools etc. without any impact study or effective steps for rain water harvesting for recharge of the groundwater.
- v) CGWA was repeatedly taking the plea that charges were being collected for permitting drawls of underground water for commercial purposes in OCS against the Precautionary Principle, Sustainable Development as well as Inter-generational Equity Principles.

- vi) Difficulties of agriculturists needed to be addressed in a phased manner by persuading the agriculturists to switch over to less water consuming crops and to consider use of treated sewage water instead of extraction of fresh underground water, wherever viable.
- vii) Untreated effluents are not to be discharged in the water.

Hon'ble NGT also suggested the CPCB may constitute a mechanism to deal with individual cases of violations of norms, as existed prior to Notification of 12.12.2018, to determine the environment compensation to be recovered or other coercive measures to be taken, including prosecution, for past illegal extraction of ground water, as per law. All the matters relating to illegal extraction of groundwater by individuals are disposed of with these directions.

The Hon'ble NGT on 03.01.2019 also pointed out the followings:

"In the revised guidelines the situation has been made worst by liberalizing the regime of control against extraction of ground water in OCS areas even for commercial/ industrial purposes. There is no study undertaken of the likely impact for such liberalization on the ground water resources and there is no projected estimation as to how the revised policy will result in better conservation of ground water which is necessary for compliance of the precautionary Principle, Sustainable Development Principle as well as Inter-generational Equity Principles. It seems that the revised policy is a sort of knee jerk reaction in response to observations of this Tribunal. It appears that MoWR has not undertaken any strength, weakness, opportunities and threats (SWOT) analysis to ascertain the weakness of old policy and the threat scenarios it offers. It is silent on robust institutional mechanism on surveillance and monitoring of its ground implementation. It rather abdicates its authority in form of delegation to field units without any checks and balances to regulate ground water extraction, on scientific lines and environmentally sustainable manner. Despite stating that the guidelines shall be applicable pan-India, the notification does not cover the States of Kerala, Karnataka, Andhra Pradesh, Telangana, West Bengal, Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir and the UT of Delhi. The serious flaws pointed out are:

- i. *Liberally permitting extraction of ground water and justifying the same on the plea that charges have been prescribed even in OCS areas for commercial/ industrial purposes.*
- ii. *Liberally permitting extraction of ground water on the ground that condition was imposed for rain water harvesting without any data of effective compliance of such conditions or even possibility of this being done.*
- iii. *Having exempted categories in OCS areas for purposes other than drinking water, including swimming pools, commercial and industrial uses. Reference has been made to the statistics to show deteriorating status of conservation of water and crises of access to water being available to the common man, as well as its requirement for ensuring e-flow in the river."*

The operative part of Hon'ble NGT Order dated 03.01.2019 is at paragraph no. 29, 30 & 31, which is reproduced below.

"The MoEF&CC is directed to constitute an Expert Committee by including representatives from IIT Delhi, IIT Roorkee, IIM Ahmedabad, CPCB, NITI Aayog and any other concerned agency or department to examine the issue of appropriate policy for conservation of ground water with a robust institutional mechanism for surveillance and monitoring with a view to enhance access to ground water for drinking purposes in OCS areas by way of appropriate replenishment practices which can be properly accounted and measured for as well as to sustain the flood plains of rivers in terms of e-flows and other water bodies. The MoEF&CC and MoWR, RD&GR may finalize the issue of subject remain inter-se with regard to groundwater reserve and its quality."The committee may also indicate the projection of its impact study in light of projected data for the next 50 years (in phased manner with action plan for each decade). Thereafter, fresh guidelines be issued by the concerned Ministry.

Furtherance to order dated 03.01.2019, Hon'ble NGT vide its order 07.05.2019 also directed Central Pollution Control Board (CPCB) to evolve a mechanism to deal with cases of violations, including prosecution and coercive measures to check illegal extraction, including scale of deterrent compensation. In this order, MoEF&CC has to come out with an appropriate policy consistent with the mandate. Being entrusted with the responsibility of protecting groundwater, the CGWA and all other authorities must cooperate and collaborate in the exercise of coming out with a policy which results in checking further depletion of groundwater and enhancing replenishment. MoEF&CC is directed to furnish the report of Expert Committee by 30.06.2019.

3.0 Deliberation by Expert Committee

In order to comply the directions of Hon'ble NGT's order dated 03.01.2019 in OA No. 176/2015 and other connected matters, Ministry of Environment, Forest and Climate Change (MoEF&CC) constituted the Expert Committee on 29.03.2019 under the Chairmanship of Joint Secretary, MoEF&CC. The Committee comprising of Expert Members from IIT Roorkee, IIT Delhi and representatives from Ministry of Water Resources, River Development & Ganga Rejuvenation (MoWR, RD&GR), NITI Aayog, Central Pollution Control Board (CPCB), Ministry of Mining, Ministry of Drinking Water & Sanitation, Ministry of Agriculture, IA- Division and NRCD MoEF&CC including Central Ground Water Authority (CGWA) to examine and deliberate the issues related to groundwater conservation and give suitable recommendations before Hon'ble NGT. As per the order, representative from IIM, Ahmedabad is also to be member of the Expert Committee, however Institute has expressed unwillingness.

Apart from mutual discussions, Expert Committee met four times on 09.04.2019, 07.05.2019, 04.06.2019 and 13.06.2019 in MoEF&CC. Detailed deliberation of the committee is given under.

3.1 The first meeting of Expert committee was held on 09.04.2019 wherein the need was recognized to know the functioning and mandate of CGWA, which has been regulating groundwater in the country and also to implement the proposed guidelines on groundwater conservation. MoWR, RD & GR (Now Ministry of Jal Shakti) through CGWA has notified the guidelines for regulation and conservation of groundwater vide S.O. 6140(E) dated 12th December, 2018. These guidelines are to be effective from 1st June 2019. In the order of Hon'ble NGT dated 03.01.2019, it is directed that the impugned notification may not be effective in view of serious shortcomings. The committee noted that the stipulations of guideline are not meeting to the requirement of groundwater protection and conservation; rather it is emphasized for regulation through Water Conservation Fee in lieu to groundwater extraction in OCS area. The committee also took the cognizance of Hon'ble NGT order, which emphasized that recharge is not taking place in OCS areas. In OCS areas, unregulated extraction of ground water is further adding to the problem. There is no showcase by CGWA to show improvement in water tables in OCS areas on account of their past efforts. The Committee endorsed that there is a dire need for strict regulatory regime in OCS areas and not to permit use of groundwater except for drinking water purposes where supply of drinking water is not otherwise available.

While discussing existing monitoring mechanism, the Committee observed that field level monitoring is not effective and lacking to ensure recharge of groundwater, meeting to the conditions of NOC given by CGWA. No Scientific tool is being employed at field level monitoring in this regard. Mere making of provision for recharge, without actually happening will not justify of any permission for extraction of groundwater. The need for involvement of Ministries of Agriculture, Mining and Water & Rural Sanitation was felt in the Expert Committee as these are directly connected to policy related aspect to groundwater.

3.2 The committee has examined the data published in report: Dynamic Groundwater Resources of India by MoWR, RD&GR (Presently renamed as Jal Shakti), CGWA and also discussed methods of assessment. From the reports of years 2004, 2009, 2011 and 2013, the committee noted that numbers of OCS areas are uneven fluctuating pattern (1615, 1494, 1985 and 1968 respectively) which is primarily based on assessment and physical conditions of observation wells. Detailed deliberations held on this aspects and committee realized that there is inconsistency in collection of data by the states and CGWA. Experts from IITs highlighted the conditions of few observation wells, which is one reasons for inadequate assessment of the OCS along with water development data. Finally it was emphasized on improvement of assessment/ observation wells so that proper assessment of OCS could be achieved.

While discussing report titled Dynamic Groundwater Resources of India published in June 2017 (Status as on 31.3.2013), the committee noted the use of ground water for domestic and industrial uses are upto 24.76 billion cubic meters, out of total available groundwater of 253 BCM. This is only 9.8% of the total water being drawn for this purpose. As against this, irrigation alone consumes 228.3 BCM and it works out to 90%. The excessive conjunctive use of surface and groundwater and scope of improving the water use efficiency in the surface water irrigation has been recognized by the committee. On the other hand localised impact due to excessive abstraction of groundwater by industrial use, resulting numbers of OCS areas in the country, cannot be overlooked.

In 2015, Indian government committed to the UN Sustainable Development Goal 6, which promises that by 2030 everyone will have access to clean water, decent sanitation and good hygiene. The human right to water must take priority ahead of other competing demands.

3.3 With regard to notified area, the Expert Committee observed that merely 162 areas are notified in the country till 2012 out of 1033 Over Exploited areas confirmed by CGWA. It is the matter of grave concern that CGWA has not made efforts in notifying the areas wherein groundwater was severely affected, and even they have stopped notifying the area in 2012. It is therefore concluded that areas which are identified as over exploited, should be declared as Notified areas for protection and conservation of groundwater. Notification of the area ensures ban on extraction of groundwater for new/ expansion projects other than drinking purposes.

3.4 The second meeting of Expert Committee was held on 7th May, 2019. While taking cognizance of Hon'ble NGT's direction regarding ground water impact studies in light of projected data for the next 50 years (in phased manner with action plan for each decade), the Expert committee proposed to set up a Sub-committee as the matter entirely involves the technical aspects and related to scientific studies along with futuristic requirement for groundwater protection. The representative of IIT, Roorkee, IIT, Delhi along with MoWR, RD&GR (Now Ministry of Jal Shakti) has been given the task to give their report. The sub-committee was assigned to compile available studies on existing groundwater scenario of the country and need for comprehensive scientific

research work for predicting the impact on groundwater, which will enable the committee to present recommendations on groundwater usage. MoWR, RD&GR assigned CGWA representative on their behalf for this sub-committee report. The sub-committee shall prepare a small report with recommendation for decadal action plan for the next 50 years in phased manner.

3.5 The committee also discussed in-house process of issuing the NOC by CGWA seeking groundwater permission. Presently, permissions are granted at Regional Office and Central Headquarter levels to the proponents seeking NOC upto 10 m³/ day and more than 10 m³/day respectively. The committee observed that there is no scientific scrutinization of experts and as such there is no scientific review committee within CGWA for this purpose. The committee felt strong need of scientific scrutinization, particularly for those projects seeking permission of groundwater extraction more than 100 m³/ day.

Currently, Central Ground Water Authority is issuing NOC for withdrawal of ground water by industries, mines, infrastructure projects in non-notified areas subject to conditions of mandatory recharge, monitoring of ground water abstraction, ground water level and quality monitoring etc. In notified areas, NOC for new tubewells is given for construction of tube wells for drinking and domestic purpose only by the concerned District Magistrate/ District Collector, who is the authorized officer by CGWA, subject to condition of specified diameter of tube well and capacity of pump. A period of 6 months is given for compliance of conditions. At present, site inspections are carried out by Regional Offices at the time of renewal of NOC. Regional Directors are advised to check compliance in a few cases. The proponents are also required to submit self-compliance along with documentary proof.

As per CGWA, NOC are being granted on basis of consent issued by respective State Pollution Control Boards/Committees (SPCBs/PCCs) for Industrial Operation and other activities. In this regard, Committee agreed that consent or any permission given by SPCBs/PCCs or other agencies should not be basis for issuing NOC by CGWA particularly in OCS area. Permission by CGWA should be based on scientific groundwater assessment. Further it was realised that respective SPCBs/PCCs shall require comprehensive examination of industrial unit/project activities seeking consent in OCS areas. Permission to new unit in OCS may not be given by CGWA as well as SPCBs/PCCs.

3.6 Ministry of Agriculture reported that about 95% of farmers fall in small and marginal land holding. Further, lands are fragmented at different locations for the same farmer, therefore compulsory registration and monitoring of almost all farmers' fields may not be feasible. In this respect, best suited option should be the promotion of efficient water utilization crops and its associated technologies shall be promoted by respective department in the State and Central Government. Further, as per the Seventh Schedule of Constitution, agriculture and Water being State subject and the States are empowered to take any regulatory action in the matter.

It is a fact that cropping patterns are governed by agro-climatic and socio-economic suitability. It is brought to the notice of Committee that Indian Council of Agriculture Research (ICAR) has identified negative list of Indian Districts for Cultivation of Water Guzzling Crops (Sugarcane and Rice) according to their climatic and edaphic factors.

It was informed that Department of Agriculture Cooperation & Farmer Welfare (DAC&FW) has been implementing per Drop More Crop component of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) since 2015-16 in the Country. This scheme mainly focuses on water use efficiency at farm level through precision/micro irrigation. Besides promoting precision irrigation (Drip and Sprinkler Irrigation System), this component also supports micro level water storage or water conservation/management activities to supplement source creation. The committee observed that there has been achievement shown by the states in implementation of micro-irrigation practices from 5.72 to 11.58 lakh hectare of land from 2015-16 to 2018-2019 respectively.

After having detailed discussion on use of groundwater in agriculture sector, the Committee opined that being single largest consumer of groundwater, registration for the entire bore wells is important for monitoring and inventory purposes. However, for wells irrigating larger area should be regularized by CWGA through a proper mechanism. User friendly mobile App for farmers needs to be developed. For the purpose of monitoring and supervision of groundwater withdrawal in agricultural field, support of Krishi Vigyan Kendra (KVK) shall be explored and instituted in consultation with Ministry of Agricultural, Cooperation & Farmers Welfare.

While emphasizing demand side management strategies for minimizing the use of ground water, use of treated sewage after secondary treatment for agriculture considered to be mandatory for those areas near to urban centres and have close proximity to sewage treatment plants. In this regards, Municipality/Corporation/Boards are instructed to make necessary arrangements to provide distribution networks with existing and proposed STPs for use of treated sewage and in this regard, concerned irrigation department of states needs to play important role. They shall reduce the fresh water conveyance to canal and distribution networks accordingly so that necessary flow could be maintained in rivers. This would also help in maintaining e-flow in river through such type of water conservation measures for irrigation practices.

3.7 In the third Committee meeting held on 04.06.2019, it was noted that due to inadequate manpower and improper institutional arrangement in CGWA for grant of NOC produces the consequential impact to groundwater protection. While taking a note of strong contention by Hon'ble NGT on the institutional mechanism for surveillance and monitoring of CGWA for groundwater regulation, the committee observed that only 4-6 technical official is currently deployed at headquarter level for management of NOC and other related works for groundwater management. CGWA reported, at present 6 officers are working in Regional offices for monitoring and supervision of permission

granted by CGWA. The Authority is headed by the Chairman, who is also in-charge of Central Ground Water Board (CGWB).

Weak monitoring mechanism also resulted to un-control and illegal extraction. It is also seen that vision for long term protection with granting NOC has been overlooked. The Committee observed shortage of manpower in CGWA as well as in CGWB for technical assessment, regular site inspections and also, to check violations.

The committee also noted that online self-compliance system is exercised by CGWA for proponent for their submission after issuance of NOC. Show cause notices have been issued by the respective Regional Offices to the firms for non compliance of any of the conditions mentioned in the NOC. It was reported that in case of no response from the firm, the concerned DC/DM or the authorized officer is directed to seal the tube wells installed by non-compliant firms. At present, there is no provision of penalty on the defaulting firms. There is however, proposal for imposing penalty for violation of each of the mandatory conditions of the NOC. The proposal shall be placed in the next meeting of the Authority for approval.

The committee also noted that there is no lateral co-ordination between State Pollution Control Boards (SPCBs) and CGWA, and Regional Groundwater Board & Local Bodies. Presently no applications are submitted for taking permission by Municipal Authorities/ Boards to CGWA. Further in connection to impose penalty for illegal groundwater extraction, CPCB will have to submit a reply to Hon'ble NGT in compliance to direction issued for assessing environmental compensation or penalty charge for illegal abstraction of groundwater.

3.8 The committee had a detailed discussion on directions passed by Hon'ble Supreme Court in LA No. 32 in W.P (C) No. 4677 of 1985 dated December 05, 1996. The direction given by Hon'ble Supreme Court may be read as "The Central Government in the Ministry of Environment and Forests shall constitute the Central Ground Water Board as an Authority under section 3 (3) of the Act. The Authority so constituted shall exercise all the powers under the Act necessary for the purpose of regulation and control of ground water management and development. The Central Government shall confer on the Authority to power to give directions under section 5 of the Act and also powers to take such measures or pass any orders in respect of all the matters referred to in sub-section 2 of section (3) of the Act."

From above direction, it is clear that functions of Board were to be merged with the new Authority. With the discussions with CGWA, the Board termed as CGWB performs the function of a subordinate office of MoWR, RD & GR with the responsibilities of providing scientific inputs for management, exploration, monitoring, assessment, augmentation and other related works of ground water resources of the country. While CGWA has been constituted with a regulatory powers covered under the Environment (Protection) Act, 1986 for the purposes of regulation and control of ground water development and management in the country. The Authority is presently engaged in issuing NOC. In this context, Committee is of strong view to have single

entity by merging CGWB and CGWA with the lines of direction given by Hon'ble Supreme Court.

3.9 With regard to Water Conservation Fee (WCF) Hon'ble NGT vide its order dated 13th July, 2017 in OA No. 200/2014 regarding Ganga matter, had directed that all users must pay for groundwater extraction. Keeping this in view, Water Conservation Fee was proposed in the new guidelines, which has been notified in December, 2018, wherein the charges collected from the users are proposed to be utilized by the concerned State Government / UT Administration on water conservation measures including rain water harvesting/ artificial recharge, restoration/ revival of water bodies, water conservation measures in agricultural sectors like micro-irrigation techniques, piped water channels etc.

3.10 The Committee also held discussion with industry representative in third meeting of Expert Committee wherein they have proposed "Water Conservation Fee (WCF)" may be part of guidelines to regulate the groundwater extraction. In this context, it was suggested to incentivize the charges if industry promotes the practice of recycle & re-use of treated effluent and conserve the water by possible recharging methods. Also WATSCAN software was briefed before committee, which is aimed for availability of groundwater, surveillance, extraction, conservation/ recharge measures and also to monitor any adverse impact on aquifers & environment. The committee agreed to the suggestions to be shared with CGWA. While agreeing to the suggestions, Industry representative also emphasized to implement appropriate policy for use of groundwater in agriculture sector as "biggest consumer".

3.11 MoEF&CC under provisions of Environment Impact Assessment (EIA) Notification, 2006 of Environmental (Protection) Act, 1986 regulates the activities/ processes/mining & mineral extraction/infrastructure projects etc. by granting Environmental Clearances to the activities/ process impacting or exploiting natural resources. As reported by IA-Division, no specific restriction is being imposed for industry/ mining/ infrastructure/ power plant etc. seeking Environmental Clearance on the application proposing to use groundwater in OCS Area. Though terms of reference prescribes the certain conditions like study of hydrology, use of treated sewage water and treated effluent to have less burden on fresh water and other means of recycle and reuse by technology up-gradation, there is no specific instruction with respect to groundwater in OCS area.

In order to have additional safeguard other than CGWA, committee recommended that MoEF&CC should not consider the grant of Environmental Clearances to those new projects/expansion projects coming up in OCS areas, which are proposing the use of groundwater.

3.12 In the fourth meeting held on 13.06.2019, Ministry of Mining gave presentation on their GIS based surveillance system adopted for illegal mining for Decision Support System. Committee opined that this GIS based model monitoring system may be

Considered for illegal extraction of Groundwater. This GIS based monitoring should be in coordination with different Agencies/ users dependent on groundwater extraction. The committee agreed to the suggestion and proposed that CGWA should work out to develop GIS based platform for assessment and monitoring of groundwater for to different user for longer term assessment.

3.13 With regard to use of groundwater for drinking purposes in the rural area, Ministry of Drinking Water & Sanitation (Now with Ministry of Jal Shakti) has furnished several suggestions to the committee. The Expert Committee observed that almost all the suggestions are appropriate and maybe part of recommendations.

3.14 The Committee suggested an Institutional framework of CGWA with CGWB, which henceforth treated as CGWA for effective monitoring and supervision of groundwater in the country. The committee opined that existing institutional system needs only change with requirement of National Water Board (NWB) for taking all major policy decision required to promote CGWA and to take groundwater management initiative country wide. Committee noted that NWB is already inbuilt body within MoWR, RD & GR, which is mandated to initiate effective measures for systematic development of the country's water resources and to review the progress of implementation of the National Water Policy for reporting to the National Water Resource Council (NWRC). This "National Water Board" was earlier constituted in September, 1990 comprising Secretary, Ministry of Water Resources as Chairman and Chief Secretaries of all the States / UTs, Secretaries of concerned Union Ministries and Chairman, Central Water Commission, as Members. The committee was of strong view that NWB should meet regular interval and address the groundwater needs of the country as National Water Policy already included groundwater management aspects time to time. Further to facilitate NWB, Chairman CGWA may be included as a member. Further NWB is also proposed to meet other administrative and financial requirements of CGWA. In this regard NWB may be empowered with appropriate procedure in the government if the same does not exist in their constitution.

At the field level linkage with SPCBs/PCCs and Krishi Vigyan Kendra (KVKs) of all districts is also proposed. In this framework SPCB is included to provide details of groundwater information in their consent management, being issued to industries under Water (Prevention and Control of Pollution) Act, 1974. No consent shall be considered for units coming up in OCS areas and further on finding of any illegal groundwater extraction other than NOC by CGWA, shall be reported to CGWA for taking appropriate action. The spot assessment can be made through mobile app. However, CGWA will continue to perform their function as being done. The role of KVKs is to facilitate registration of groundwater extraction in rural areas as they have district wise centre. The independent functioning of these two agencies by providing the information only shall enhance the requirement of effective and robust monitoring of groundwater. The committee placed a strong need on strengthening of CGWA by having additional manpower, taking into huge quantum of works involved in the groundwater

management. The Chairman CGWA shall workout all requirements relating to finance, staff strengthening, etc and may take approval by NWB.

3.15 The sub-committee was also constituted to submit a report to indicate the projection of impact study in light of projected area for the next 50 years with decadal action plan as per directives of Hon'ble NGT. The Sub-committee presented its report in forth meeting held on 13.06.2019. In the report of the Sub-Committee, a comparison of OCS areas as per groundwater resource estimation for 2004-2013 presented. According to which, 11 States/Union Territories where changes in the percentage of OCS units have shown to be increased in states of Delhi, Haryana, Madhya Pradesh, Uttar Pradesh and West Bengal. It was proposed for groundwater modeling and/or statistical analysis of water level information in all OCS areas of the country. For this purpose a large scale pilot study is proposed to be conducted by using finite difference modeling e.g. MODFLOW software in collaboration with reputed academic institutes, having experience of groundwater modeling. With regard to groundwater estimation, it was discussed that the present method account only the ground water resource replenished in the zone of fluctuation i.e. difference between the post monsoon and pre-monsoon water levels. However, it does not take into account the saturated thickness of the aquifer. This is limited to shallow aquifers, while the withdrawal of groundwater by agriculture and industry is from both shallow and deeper aquifers. It was suggested for mapping of both shallow and deeper aquifers, effectively up to the depth of 200 to 300 meters for hard rock and alluvial soil areas respectively. After detailed deliberation, the Experts Committee finally agreed to recommendations and 50 years action plan submitted by the sub-committee. The report of Sub-committee is at Annexure-II. List of Expert Committee Members is provided at Annexure III.

4. Recommendations & Suggestive Measures

Pursuing to observations and directions of Hon'ble NGT in its order dated 03.01.2019, the Expert Committee held detailed discussions on the principle followed in the proposed guidelines issued on 12.12.2018 by CGWA for groundwater conservations, protection and regulation. Based on the deliberation held by the Expert Committee in its four meetings on identified gaps in groundwater management strategy, following major recommendations have been emerged for different sectors like industry/ mining /infrastructures projects, agriculture, drinking water as well as General recommendations on water conservations aspects for groundwater. Recommendations given hereunder also include the projection of its impact study based on scientific data for the next 50 years (in phased manner with action plan for each decade).

A) Industry/ mining /infrastructures projects

Water Conservation Fee (WCF)

4.1 Role of WCF emerges out to be crucial, but its utilization needs to be targeted in a transparent manner in the need based locations, with appropriate checks and balances. Further, industries/ projects desirous of utilising the amount in water conservation related activities may be allowed to do so, after verification of their proposal by a third party evaluation of the works actually done on the ground.

A policy framework of allowable conservation activities alongwith a scheme of equivalent "Water credits" may be formulated. Following points shall be taken into account in context of WCF.

- i. CGWA's NOC process should cover site specific technical information w.r.t. groundwater extraction (size of bore hole, pumping capacity, latitude & Longitude, OCS information, etc.) with user friendly online registration process using web based tool, whereby the risk of non-compliance is eliminated.
- ii. In case of OCS areas, abstraction of groundwater shall be considered only for drinking water purposes and only for important social infrastructure activities (e.g. community centres, hospitals, school, etc.) with suitable restrictions in view the restoration of groundwater resources.
- iii. WCF may be deposited in Central depository account to be maintained by Central Government for releasing the funds to State implementing agencies to ensure proper distribution, monitoring etc. Further it is to mention that the funds collected for OCS blocks can be utilized in OCS blocks only but the funds collected in safe blocks may be utilized in OCS blocks also with the approval of competent authority to undertake immediate intervention in water scarce regions.
- iv. From the money deposited as Water Conservation Fees, the DoWR/CGWA/State Government may identify groundwater recharging projects suitable for local hydrology and geology.
- v. Industry can be allowed to implement Ground Water Resource Augmentation or Conservation projects, including reduction of groundwater use. In this regard,

funds allocated for ESR (Enterprise Social Responsibility) & CSR (Company Social Responsibility) shall be utilized upto 50% for recharging the OCS areas in vicinity or within 10 km radial distance from project site.

- vi. There is need to develop checklist by CGWA for groundwater recharge projects in OCS area for project proponents seeking NOC. Presently, due to shortage of manpower, CGWA may consider empanelment of 3rd party certified consultants who shall be verify the project for obtaining NOC, so the issue of "Difficulty of assessment" may not arise. Appropriate online platform may be developed to display information so as to promote transparency and non-intrusive platform. All the industry should be made mandatory with appropriate technology (e.g. telemetry with cameras and connected to the servers of CGWB) to have continuous record with regard to the abstraction of groundwater.
- vii. CGWA may workout for using digital technology to strengthen the monitoring and supervision according to the requirement & availability of technologies. Further to strengthen monitoring, empanelment of 3rd party accredited auditors may be opted for evaluation of project using groundwater.
- viii. Proponent/ projects engaged in commercial sale of groundwater shall be charged highly in commensurate to their sale to market.

Permission/NOC by CGWA

4.2 In OCS areas, permission may be granted for further extraction only upto an amount of groundwater, which could be justifiable for recharge back/recycled. In case there is no possibility of further recharge, restriction should be considered on activities item-wise and capacity-wise. For example, production may be restricted phase-wise, and some items may be shifted for production elsewhere. The whole exercise may need to be planned in a rational manner. In OCS while giving permission for groundwater extraction for new / expansion projects, the CGWA should ensure adequate plan for recharging, replenishments measures and the same is implemented by project proponent. On other hand, MoEF&CC and State Authorities shall consider the grant of Environmental Clearances on basis of recommendations/ permissions by CGWA in this regard.

With regard to existing projects/activities, already in operation in OCS areas, an opportunity shall be given to project proponent for renewal of their NOC from CGWA within a year with a plan for reducing the use of groundwater. In this context, proponent shall be required to prepare time bound action plan with arrangements of recharging & replenishment project with recycle & reuse measures, exploration of surface water resources alongwith process modification, as feasible.

4.3 Similarly, while issuing the Consent to Establish or Consent to Operate to new/ expansion industrial projects/commercial establishments/Hotels etc. proposing the use of groundwater only in OCS area, the respective SPCBs/PCCs shall take cognizance of permission granted by CGWA and MoEF&CC and State Authorities. The above arrangement shall be continued till improvement in groundwater levels take place based

on basis of the study by CGWA/ MoWR, RD&GR (Now Ministry of Jal Shakti) or any empanelled independent institutions in commensurate with implementation of water management schemes and measures for OCS areas.

4.4 Large scale residential / commercial complex/ infrastructure projects are normally setup within and vicinity of urban area. It requires huge quantity of water during construction stage as well as for consumptive uses. Permission to use groundwater shall not be considered particularly in OCS area except drinking purpose. However, options of surface water and use of treated sewage (up to tertiary treatment) needs to be explored for construction of infrastructure. While examining application by CGWA, or granting Environmental Clearance by Center or State, this aspect should be taken into account thoroughly by the expert group. For the consumptive use of these infrastructure projects, recycle and reuse practice should be emphasized with rainwater harvesting techniques and needs to be monitored with effective supervision network, so that burden on groundwater is reduced. Water supplying agencies should be roped in to ensure dedicated water supply to these establishments for their consumptive use. Providing house to individual is utmost priority of Government but in any case groundwater use in water stressed area may not be more than 20-30% of total requirement for such infrastructure with more than 200% replenishment measures (Rainwater harvesting, recycle and reuse of treated waste water, implementation of recharge project in vicinity by project proponent, etc). Only by adopting this measure, sustainable goal could be achieved.

The quantity of water extraction less than $10\text{m}^3/\text{day}$ is regularized at regional office of CGWA. However, there is strong need of scientific scrutinization, particularly for those projects seeking permission of groundwater extraction more than $100\text{ m}^3/\text{day}$ at headquarter of CGWA.

The projects where groundwater abstraction is more than $500\text{ m}^3/\text{day}$ must have the provision of impact assessment on the ambient groundwater regime both quality and quantity wise. The impact assessment report to be submitted by the project proponent must include the long term changes in the groundwater quality and quantity due to its abstraction and its effect on the surrounding areas. The report should also demarcate the radius of influence being created due to high abstraction of groundwater from the specified location and its long term implication in the availability of groundwater for drinking/ domestic and agriculture purposes within the zone of influence. The project proponent has to submit the report at the time of renewal of NOC and necessary environmental compensation shall be levied for such projects in case of non-compliance. In the residential projects involving multiple agencies, cumulative impact assessment instead of standalone isolated assessment by individual agencies should be conducted to present a holistic picture. The CGWA shall provide the outline of the report on impact assessment to be taken by the project proponent and would also render guidance wherever required by the project proponent.

4.5 Ministry of Mining in collaboration with state departments may workout wise-use of water from dewatering operations from mining activity e.g. supplying water for the purpose drinking, irrigation, dust suppression etc. Funds in this regard shall be earmarked from their CSR provisions. The miners should prioritize this aspect in their environment management plan.

B) Agriculture

Registration for bore wells

4.6 The agriculture sector is the single largest consumer of groundwater. Indiscriminate and wasteful use of groundwater by farmers has been reported and highlighted by MoWR, RD&GR and CGWA. Assessment of groundwater uses in agriculture sector has now need of the hour for monitoring purposes as well as with restricted regulation without affecting food security. Therefore registration for the entire bore wells in agricultural sector is recommended through a proper mechanism of supervision only through mobile App wherein information of location, withdrawal capacity with size of pipe, etc. shall be filled up for inventory purposes. User friendly mobile App for farmers needs to be developed. As it involves massive works, it may be planned in phased manner by giving priority to OCS area first by 2022.

4.7 For the purpose of monitoring and supervision of groundwater withdrawal in agricultural field, support of Krishi Vigyan Kendra (KVK) shall be explored as they have 706 district wise centres across the country and they are engaged as knowledge centre for farmers. This may be instituted by Ministry of Jal Shakti/ CGWA in consultation with Ministry of Agriculture, Cooperation & Farmers Welfare. The KVK is already using Mobile App for farmers, wherein possibility to include the registration of groundwater extraction tool and linked to CGWA.

4.8 In case of farmers with individual land holdings more than 03-05 Ha (this assuming that optimal use for irrigation is on an average about 10 KL/H*a/day) or farmers with individual land holdings of less than 03-05 Ha but pooling for a common groundwater resource with a total collective area exceeding 03-05 Ha, may be covered under regulation with nominal charges by CGWA or its linkage with state authority or field offices. It may be monitored by the State or its designated authorities or through KVKs.

Utilization of treated sewage water from urban areas

4.9 While emphasizing demand side management strategies for minimizing the use of groundwater, use of treated sewage after secondary treatment for agriculture considered shall be made mandatory for those areas near to urban centres and have close proximity to sewage treatment plants. In this regards, Municipality/Corporation/Boards/Public Health Engineering departments may be directed to make necessary arrangements for providing distribution networks in existing STPs and proposed STPs for use treated sewage with the concerned irrigation

department. This will ensure water conservation practices through which surface as well as groundwater could be saved to certain extent.

4.10 State Government needs to play important role in reducing the fresh water conveyance to canal and distribution networks so that necessary flow could be maintained in rivers. Optimal water distribution to meet agriculture need together with other uses shall be assessed. This would also help in maintaining e-flow in river through such water conservation measures for irrigation practices. Ministry of Jal Shakti may provide financial support to state to make effective water canal conveyance system with the maintenance aspect.

Shift of cropping pattern and irrigation practices in OCS area

4.11 Water intensive cash crops in OCS areas may be discouraged/ discontinued by MoA&FW with active involvement with State Government. New schemes may be undertaken for groundwater recharge in OCS area targeting best irrigation practices for farmers. Appropriate policy needs to work out in this aspect which shall be reviewed time to time depending on availability of water and other related factors.

4.12 MoA&FW have shown achievement of states in progressive implementation of micro-irrigation practices under PMKSY scheme up to 11.58 lakh hectare of land in 4 years, this improved irrigation practices should be given priority and more focus in OCS areas with subsidy tools to farmers. Ministry of Agriculture through its schemes like PMKSY should classify the cropping practice on availability of groundwater and surface water and also agro-climatic & socio-economic suitability of farmers.

4.13 For better water resources management especially under water intensive crop scenario, understanding and implementation of "Water Footprint Assessment" based policies may be formulated and effectively be employed for crop planning/pricing/trading. Expertise available in National educational/research institutes (e.g. IITs) as well as reputed foreign institutions may be utilized in this regard.

Any lasting solution to India's water woes requires a review of the prevailing agriculture policy and practices, including the prevailing power subsidies in agriculture sector, which is one of the factors responsible for the over-exploitation of groundwater and consequent decline of water levels in various parts of the country. Attention also needs to be focused on the export policy of India, especially with regard to export of virtual water.

4.14 MoA&FW with the State Governments need to draw a Strategy of "Region-specific assessment and management of water resources" for different agro-climatic regions for farmers to produce crops that suit the Agro-climatic zones. By this measures, over-drawl of groundwater can be avoided and saved water can be used during summer for drinking water purposes.

4.15 It should be made mandatory that every single village /multi village Scheme using groundwater as a source should compulsorily have either a point recharge

provision or groundwater recharge structures using MGNREGA/IWMP funds for sustaining the water supply to rural areas. The rural water supply agencies should also be directed to register their tubewells with CGWA.

C) Drinking and Domestic Use

Optimal use of freshwater and best conservation practices

4.16 In OCS areas, groundwater extraction for drinking and domestic needs should be accorded to priority. For optimal use of groundwater in urban area, following may be adopted.

- i. Water supply through government water supply agencies is a major component of abstraction of groundwater. Presently no applications for taking permission by Municipal Authorities/ Boards are submitted to CGWA. This needs to be regulated through the system of permissions with conditions of groundwater recharge with effective monitoring. It will help in reducing wastages and augmenting the groundwater through recharge. It will also help the local bodies to commit water to users based on the actual availability of the resource rather on the capability of the distribution network and to plan the supply network matching with the groundwater resource in the area.
- ii. Individual households should in no case be permitted to use mechanized and energized means of abstraction of groundwater within the jurisdiction of local bodies which has ensured water supply to individuals through piped system. Municipality in this regard maybe empowered to check and disallow the groundwater extraction once pipe water supply is provided by them.
- iii. Wherever it is imperative that individual households be allowed to use energized means of abstraction, certificate could be obtained from the local Authority supplying water instead of a self affidavit. The certificate should, apart from certifying the inadequacy of the supply network to provide water should also mention that sufficient groundwater resources exist to sustain the permission.
- iv. The Telangana model (i.e. Mission Kakatiya) of having groundwater recharge shafts in ponds, lakes and tanks can be encouraged for groundwater recharge that would aid in sustaining the drinking water supply.
- v. There should be mandatory measures for water conservation by rainwater harvesting and adopting recharge methods. Proper plumbing and drainage systems to enable use of recycled water for flushing etc. may be promoted.

4.17 Large quantities of losses are taking place in water distribution networks in case of Multi Village Schemes using groundwater. Thus the distribution losses in the pipe lines (inter and intra villages) should be restricted upto designated values. Proper

monitoring and supervision is utmost important to maintain the losses to its minimum value. Scientific tools like SCADA system shall be used to detect losses.

4.18 Most cities and towns are using fresh Surface/groundwater for green belt as treated sewage is not available as the Urban Local Body has not installed the same. Also, treated sewage of quality suitable for use in public places is not generated in ULB infrastructure. Tertiary treatment can make the water usable for such use in public places. Therefore, Conservation of water in Public Parks, Stadiums, Community green belt, Compensatory Forest development, Bio-Diversity park developments, Road divider green belt, etc, may be achieved by adoption of drip irrigation against flood/pipeline/tanker irrigation in public gardens and use of treated sewage water (if option of micro irrigation is not available).

D) Institutional Frameworks for monitoring and supervision

4.19 Currently CGWA is wing of CGWB in Ministry of Jal Shakti. Following the Hon'ble Supreme Court order in IA no. 32 W.P.(C) no 4677 dated 05.12.1996 regarding constitution of CGWA, the Committee is of the view that CGWA & CGWB henceforth may be treated as CGWA for effective monitoring & supervision of groundwater in the country together with scientific assessment of groundwater data available within these two wings. This arrangement is important to maintain synergy between two existing institutions.

4.20 Regarding strengthening the existing institutional system, there is in-built framework within MoWR, RD&GR for purpose of groundwater management. However, this network needs to be synchronized and linked with concerted efforts. At the top level, National Water Board (NWB) is the Apex body for water resource management including groundwater, which may also take all major policy decision required for CGWA. The NWB, within MoWR, RD & GR, is mandated to initiate effective measures for systematic development of the country's water resources and to review the progress of implementation of the National Water Policy for reporting to the National Water Resource Council (NWRC). This "National Water Board" was constituted in September, 1990, comprising Secretary, Ministry of Water Resources as Chairman and Chief Secretaries of all the States / UTs, Secretaries of concerned Union Ministries and Chairman, Central Water Commission, as Members. The committee was of strong opinion that NWB should meet regular interval at once in a year and address the groundwater needs of the country as priority. To facilitate the NWB, Chairman CGWA may be included therein as a member. Further NWB is also proposed to meet other administrative and financial requirements of CGWA. In this regard NWB may be empowered with appropriate procedure in the government if the same does not exist in their constitution.

- i. At the field level linkage with SPCBs and KVKs of all districts is also proposed. In this framework SPCB will also include details of groundwater information in their consent management being issued to industries under Water (Prevention and Control of Pollution) Act, 1974. On finding of any illegal

- groundwater extraction other than NOC by CGWA, the SPCPs/PCCs shall report/ inform to CGWA for taking appropriate action. The spot assessment can be made through mobile app.
- ii. The role of KVKs is to facilitate registration of groundwater extraction in rural areas as they have district wise centre. The independent functioning of these two agencies by providing the information only shall enhance the requirement of effective and robust monitoring of groundwater.
 - iii. There is strong need for strengthening of CGWA by having additional manpower as huge quantum of works involved in the subject matter. The Chairman CGWA shall workout all requirements relating to finance, staff strengthening, etc and may take approval by NWB; rather going for prolong procedure of taking approval within Government.
 - iv. Post of Chairman, CGWA shall be equivalent to Additional Secretary of Central Government to Government of India like in case of CPCB, Chairman and National Mission for Clean Ganga. Chairman, CGWA shall be fully empowered to engage institutions or empanelled consultants of the country for effective collaborative support to CGWA in various scientific activities viz. monitoring, water quality assessment, water resource assessment at field level. This will result in rational utilization of various resources, distribution of responsibilities and successful/timely completion of a variety of tasks. It will also result in proper utilization of massive information being collected by CGWA and provide interesting emergent findings. An appropriate collaborative framework would need to be established for this purpose. The collaboration domain may also be widened to include other stakeholders (say Industry representatives e.g FICCI, CII), who are currently known to be providing resource assessment services to other partners (employing software like WATSCAN).
 - v. Presently there is no internal review committee within CGWA for scientific scrutinization of NOC's application submitted by the proponent. CGWA may constitute an internal technical review committee for scientific assessment and facilitation for grant of NOC, particularly for those projects seeking permission of groundwater extraction at headquarter level.

E) General Recommendation

4.21 Guidelines to be prepared from recommendation shall be applicable to Pan India; if state Government intends to make stringent norms/guidelines in their water policy they may do so depending on local site conditions. It shall be not be relaxed by state unless or until decision is taken by Apex Board in consultation with States.

4.22 Water Resource Estimation (GWRE) of groundwater shall be performed every 2 year and its report to be generated within 6 months for purpose of identifying OCS areas, notification of blocks, etc. with complete scientific assessment of aquifers, surface discharge with complete water recycle in 2 years.

- 4.23 Regarding compensation against violation with respect to illegal groundwater extraction, the stipulation being prepared separately by CPCB may prevail and enforced.
- 4.24 In order to maintain movement of base flow from river to groundwater, protection of flood plain in rivers zone/ stretches in vicinity of OCS area is important. In this regard approach for protecting natural groundwater recharge Zones may be adopted by MoEF&CC under Environmental Sensitive Zones (ESZ) / areas.
- 4.25 There must be periodic assessment of OCS areas in conjunction to Notified area as it forms the basis for grant of NOC in future and important for regularization of all developmental activities.
- 4.26 In urban areas it is noticed that large quantity of water is being wasted from overflow of overhead tanks/ storage. In order to have water conservation in urban areas, overflows from overhead storage tanks of individual houses/ establishment etc should be prevented with mandatory condition of providing electronic alarm/ burglar alarm and a provision of automatic shutdown of motor used for pumping of groundwater.
- 4.27 On the lines of GIS based surveillance system adopted for illegal mining by Ministry of Mining for their Decision Support System, similar tools can be considered by CGWA to identify for illegal groundwater extraction. Also, industry permitted for abstraction of groundwater should adopt use of automatic shutdown valves attached with cameras to limit only the permitted quantities for abstraction of groundwater.
- 4.28 The guidelines should also aim at the State, drawing up plans for the reclamation of degraded lands and taking other measures to minimize the surface and subsurface water logging through provision of adequate horizontal and vertical drainage systems.
- 4.29 State Government may consider the mobilizing of financial resource from NGO's, corporate house, religious trust, non-resident villagers, social groups for watershed programme for the groundwater recharge and augmenting water.
- 4.30 A System of incentives could also be worked out for agencies and industries using treated wastewaters for various legitimate purposes and implementing rain harvesting measures by individuals.
- 4.31 In OCS areas, approach for Capacity building of stakeholders for Demand Side Management of ground water and the CSR activities may be focused for improving groundwater conditions of the area.
- 4.32 Large number of cities located along the coastal belt has a groundwater or long distance pipeline surface water and treat them with RO for urban domestic

requirement. The domestic RO plants rampantly extract ground water and the water requirements are mostly met through illegal extraction of ground water. In this regard, permanent Infrastructure and Users shall be forced to pay for water with Flow meters for monitoring and its estimation for Water Conservation fee. The completion of project may be certified by owner of the premises with Geo-tagging.

4.33 The CGWA may undertake accreditation scheme through NABET / QCI/or such independent accreditation agencies as they deem fit, for accreditation of experts in hydrology, hydrogeology, rainwater harvesting program, industrial water audit and conservation, natural water bodies restoration and rejuvenation, irrigation water conservation program, ground water aquifer mapping and resource estimation, agricultural experts in low water intensity cropping, training and awareness programs in water conservation, inter river basin water management, saline water treatment, sewage water treatment for reuse, Water NGO's, etc. relating to Water conservation and management.

4.34 The CGWA may invite nationwide projects from accredited experts to independently identify projects for water management on the field of their accreditation. The project submitted to the CGWA may comprise of the following:

- i. Baseline
- ii. Gap/ Need Assessment
- iii. Design the project proposed for intervention
- iv. Estimate the water conservation potential
- v. Provide Bill of Quantity and cost estimation for implementation of the project
- vi. Propose post implementation measurement and monitoring program
- vii. Consultant fees for the project identification & assessment.

4.35 Construction of Check dams under Railway bridges, Road bridges, Culverts, Road and Railway underpasses, Overhead bridges and Flyovers, etc., along with Rainwater harvesting without causing inundation of land.

4.36 Also, all the concerned departments in the States or UTs have to take measures for restoration of all ponds or lakes within their jurisdiction as such restored water bodies helps in enhancement of water storage capacity especially during monsoons, groundwater recharge potential as well as availability of surface water during non-monsoon period.

4.37 CGWA may adopt best international practices to the suitability of the areas, as feasible. e.g. Israel. As a way forward, monthly/ quarterly Water Bill against permitted groundwater extraction could be considered by CGWA by giving price value to the water for long term protection of natural resources.

.) Summary and Recommendations on ground water impact studies in light of projected data for the next 50 years (in phased manner with action plan for each decade).

In respect of the advised projection study of the groundwater availability, likely impacts and the action plans over the next 50 years in a decadal mode especially for the OCS areas, the following summarized observations and recommendations be noted:

- i. Total water demand, as projected by the NCIWRD, is likely to reach 1180 BCM against the per capita availability of water which is expected to be less than 1000 BCM by the year 2025. From the year 1960 onwards dependence on ground water for irrigation has increased and surpassed surface water utilization from 1980 onwards. Number of irrigation tube wells has shown a continuous rise and has become the main source for irrigation.
- ii. Percentage of OCS assessment units has increased from 38.9 % in 2004 to 40.53% in 2013. Declining trend in ground water levels has been observed in selected pockets of OCS areas during the decade 2009- 2018.
- iii. The current method of assessment of dynamic resource by CGWA takes into account only the ground water resource replenished in the zone of fluctuation i.e. difference between the post monsoon and pre-monsoon water levels. It does not take into account the saturated thickness of the aquifer. This is limited to shallow aquifers, while the withdrawal of groundwater by agriculture and industry is from both shallow and deeper aquifers. This leads to ambiguities in the resource assessment. From XII Five Year Plan onwards, Central Ground Water Board has taken up National Aquifer Mapping and Management Programme (NAQUIM), which is aimed at delineating horizontal and vertical extent of aquifers in various hydro geological environments. So far 11 lac sq km area of the country has been covered under these studies. Another 2 lac sq km area shall be covered by the year 2020. During the period 2020- 2025, it is proposed to cover remaining 12 lakh sq. km area under aquifer mapping for delineation of aquifer disposition through demarcation of their lateral as well as vertical extents along with their characterization down to 300m & 200m depth in alluvial & hard rock areas respectively. These have also helped in delineation of Fluoride and arsenic free aquifers in the States of Uttar Pradesh, Bihar and Tamil Nadu. The studies till now on the basis of the generated information have helped in evolving aquifer management plans including various recharges and water conservation measures in different states and will continue to do so in future.
- iv. Considering the vast magnitude of work involved and information processing needed in future projection of ground water resource availability and assessment of the impact of various action plan scenarios, the committee recommends ground water modelling and/ or statistical analysis of water level

information in all OCS areas of the country. A large scale pilot study using finite difference modelling MODFLOW software is proposed to be taken up in collaboration with academic institutes having prior experience of ground water modelling. CGWA would prepare a detailed action plan in collaboration with IITR/IITD and a few National experts. Entire program of modelling studies would be implemented in Project mode. Priority of modelling studies would be accorded to areas where aquifer mapping under NAQUIM in OCS areas has been completed. Broad objectives of these studies would include ascertaining the decline in ground water levels in OCS areas due to agriculture and industry/municipal stakeholders in different scenarios. Models will be run to predict ground water situation in the business as usual scenario, and also for the scenarios if interventions like recharge and water conservation practices are implemented in agriculture and industrial sectors separately. Models will also take into account the climate change impacts. Modelling studies will help in ascertaining the long term sustainability of ground water regime and evolving decadal action for next 50 years.

- v. A perception of the applicability of the above stated exercise may be had from the preliminary findings of a small pilot study done for Delhi. Attempt was made to carry out both statistical as well as numerical modelling of NCT Delhi. Results of statistical model have indicated that percent error of predicted vs. observed water level varies from 3 to 13 %. This statistical model (ARIMA-1,1,1) is useful only for those wells which are having a distinct trend. The limitation of statistical modelling is that number of years for which prediction can be made depends on the availability of continuous long term historical data. With the continuous decline in water levels, the monitoring wells become dried up leading to limited/no availability of long term continuous data. Moreover, statistical modelling helps in predicting the water level at a point location.
- vi. Under numerical modelling study, model predictions were performed to estimate aquifer conditions for the next 15 years based upon projected ground water withdrawal. Model was run up to 2030 by keeping same recharge and ground water draft as that of year 2015. The model predicted that the ground water levels continue to rise where water logging exists and in remaining areas, the model predicted the declining trend of ground water level.
- vii. Committee also identifies an urgent need for shifting the basis of granting NOC from dynamic resource to aquifer wise resource estimation in order to manage ground water resources on a scientific basis.

G) Proposed Decadal Action Plan

As directed by the Hon'ble NGT, the subcommittee proposes the decadal action plans for next five decades encompassing activities that are desirable to achieve the objective of sustainability of the groundwater resource.

Action Plan by 2030(effective by 2020)

1. Registration & mapping of all drilling agencies by 2023
2. Complete aquifer mapping of entire map-able area of the country
3. Development of groundwater management model
4. Block/village level ground water management plan
5. Preparation of water security policy
6. Complete shift from block wise ground water resource assessment to aquifer wise assessment and management
7. Mapping of recharge area and identification of suitable source of runoff for each aquifer unit
8. Accreditation of groundwater consultants by 2023
9. Setting up of state groundwater departments in States/ UTs where such departments do not exist by 2022
10. Feasible adoption of drip and sprinkler irrigation techniques shall be worked out in country by 2025
11. Bureau of Water Use Efficiency may be set up and its mandate be finalized by 2023 for its effective implementation
12. Monitoring of all groundwater withdrawal through telemetry based digital flow meter
13. Installation of Telemetry DWLR on all monitoring stations by Central Ground Water Board as well as State Ground Water Organizations
14. Technology interventions to increase water productivity in agriculture and industrial sectors
15. Preparation and implementation of proposals for groundwater modeling studies and recharging project with priority of OCS area by 2022
16. Online monitoring of ground water quality

Action Plan by 2040

1. Capacity building of state ground water board/agency
2. Mapping of catchment, delineation and protection of springs
3. Implementation of Mega recharge project for water stressed areas
4. Refinement of aquifer parameters to capture heterogeneity through exploration and pumping test
5. Estimation of recharge rate based on different advanced techniques (eg. Isotope, tracer technique etc.)
6. Protection of recharge area with projected analysis

Action Plan by 2050

1. Establishing 2.5 lakh groundwater monitoring stations (one station per 10 sq.km)
2. Assessment of saline groundwater resources
3. Storage of fresh water in saline aquifers
4. Aquifer Storage and Recovery

5. In-situ remediation of polluted aquifers
6. Guidelines for protection of ground water quality in and around landfill sites
7. Guidelines for maintenance of ground water levels in and around wetlands
8. Study of surface water - ground water interaction
9. Solute transport modeling of polluted aquifers
10. Preparation of aquifer remediation plans
11. Plan to prevent sea water ingress
12. Monitoring of anthropogenic contaminants in ground water like persistent organic pollutants, heavy metals, pharmaceutical & personal care products etc.

Action Plan by 2060

1. Aquifer thermal energy storage
2. Assessment of Submarine ground water discharge to sea
3. Finding of fresh ground water in offshore areas
4. Monitoring of vadose zone moisture content
5. Identification and protection of ground water dependent ecosystems
6. Well head protection for public wells
7. Study of ground water microbiology
8. Study of Medical Hydrogeology (relationship between human health and ground water quality)

Action Plan by 2070

1. Development of methodology for drought alert based on groundwater levels
2. Development of Artificial Intelligence based decision support system for ground water management
3. Study of Trans-boundary aquifers both interstate as well as international