International conference and workshop on

Challenges on groundwater issues in the context of climate change in Tamil Nadu

Recommendations

Supported by

Consulate General
of the Federal Republic of Germany
Chennai

Organised by

Department of Geology
Anna University, Chennai

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6th and 7th September 2017

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Challenges on groundwater issues in the context of climate change in Tamil Nadu

The Concept

A conference and workshop on "Challenges on groundwater issues in the context of climate change in Tamil Nadu" was held on 6th and 7th September 2017 at the Raintree Hotel, St. Marys Road, Chennai. It was organised by the Department of Geology, Anna University under the support of the German Consulate General, Chennai.

This is vital in the context of Tamil Nadu more specifically for the city of Chennai, due to extreme climatic events which includes very heavy rainfall and floods that occurred during the year 2015 and severe drought during 2016. The Vardha cyclone also devastated Chennai in December 2016.

The conference was inaugurated by Mr. Achim Fabig, Consulate General of the Federal Republic of Germany at 9.30 a.m. on 6th September at the Raintree Hotel, Chennai, India which was presided over Prof. S. Ganesan, Registrar, Anna University. Prof. N. Rajendran, Director, Centre for International Affairs, Anna University gave the special address. Prof. L. Elango, Department of the Geology, Anna University, welcomed the gathering.

The first day of the conference and workshop was devoted to presentations by the experts, organised under four different themes to understand the problems pertaining to water issues. Each session was handled by two panelists, a chair person and a rapporteur. The panelists were chosen based on their field of expertise, consisting of an international expert and an Indian counterpart working together to arrive at a meaningful outcome and to encourage fruitful discussion. Around 60 experts, including 8 from France, Germany, Israel, Singapore, South Africa and South Korea have participated in the deliberations.

During the second day, representatives from all walks of life such as scientists, engineers from government departments, private water suppliers, legal experts, young researchers and students were invited. They appraised the salient features of the presentations made on the first day. Also, discussion on the pros and cons on the outcomes of the deliberations were encouraged. Totally, 75 experts participated in the deliberations.

Chennai receives an average of about 1400 mm of rainfall per annum. If this rain water is conserved and utilized, it can be adequately used by the population of the city at a higher quantity than the actual demand. A similar scenario is also prevailing in rest of the Tamil Nadu. Thus, the problem of water scarcity and flooding becomes a manageable issue. Therefore, the possible solutions to resolve the management problem was deliberated by dividing the delegates into four thematic groups. At the end of the deliberation, the recommendations of the workshop were arrived and they are presented below in both English and Tamil.

Recommendations

Short term goals

Improvement of administration of the water reservoirs

At present the land occupied by the reservoirs of the Chennai are maintained by an agency, whereas the stored water is supplied to the city by another agency. It is recommended that a single agency should own, operate and maintain the reservoirs that supply water to the city. This will enable periodical cleaning to prevent loss in the volume of storage due to siltation.

Desilting of reservoirs

The reservoirs that supply water to the city must be desilted and deepened so as to increase their capacity and the excavated soil could be used for strengthening the bunds. If the four existing reservoirs (Poondi, Cholavaram, Redhills and Chembarambakkam) are desilted and deepened by a metre, about (476 Mcft), 4.3% of water could be additionally captured and stored.

Rejuvenating local tanks/lakes throughout the state

The existing tanks and lakes present in the towns/cities/villages of the state should be desilted, cleaned and rejuvenated. Traditional water conservation methods could be employed.

Official certification and periodical monitoring of rain water harvesting structures

Though rainwater harvesting (RWH) structures have improved groundwater storage, they need to be cleaned periodically and maintained properly. To ensure this, the implementing agency needs to certify the efficient functioning of RWH structures on an annual basis. Enhanced awareness on the importance of RWH structures should be created among the public.

Additional subsurface storage tanks

During extreme rainfall events, the RWH structures may not cope with the inflow and hence buildings beyond two-storeys need to have subsurface tanks to store the additional water.

Weekly updated groundwater reports in online portal

Groundwater reports of every unit/blocks should be updated every week and uploaded on an online portal for easy access of the public and officials for efficient utilization of available resources.

Planning of agricultural cropping patterns based on consumptive use of water

Agricultural activities need to be practiced based on water availability and not by over-exploiting the groundwater resources. The availability of water for the forthcoming year could be estimated at the block level and based on that data, the farmers should be advised on seasonal cropping. Joint decisions (by government officials and farmers) about the cropping pattern for the year should be taken considering the availability and requirement of water, so that the usage does not exceed the threshold level. To ensure this, the Agricultural Department should have the responsibility of recommending the cropping patterns by estimating the water availability in the future.

Reducing the usage of chemicals and encouragement of organic farming

Usage of chemical pesticides for agriculture should be reduced since the organic pollutants in pesticides contaminate the groundwater and hence the concerned authorities should encourage organic farming.

Permeable roads as best alternative

Permeable roads must be laid at least in gated communities to facilitate the recharge of rainwater as well as to prevent the clogging of roads. However, care must be taken to prevent entry of contaminants into the groundwater zone.

Efficiency of drainage networks

The efficiency of drainage networks in the city should be improved. Regular monitoring and maintenance of the existing stormwater and sewer drains should be carried out. Stormwater drains need to be provided with recharge pits considering the formation characteristics atleast at a distance from 30 m to 50 m so as to increase groundwater recharge.

Reuse of treated grey water

Reuse of treated grey water should be promoted by suitable regulations which would result in the reduction of water demand and sewage. Reuse of wastewater should be made mandatory in all corporate offices, residential apartments, malls, multiplexes, commercial complexes, educational institutions etc.

Preparation of flood zone mapping

Flood zone mapping should be carried out especially for major towns and cities of the state. Management of flash floods should also be given due importance since most of the climate projection models predict heavy precipitation in shorter durations in the future.

Awareness on environmental preservation

Awareness should be created among public not only for preserving the environment and ecology but also on proper solid waste disposal (segregation at origin) - to avoid dumping of waste in the surface water bodies and wastelands.

Inclusion of additional parameters in water quality monitoring

Existing groundwater quality monitoring by state agencies should include additional parameters such as organic contaminants and hydrocarbons to carry out precautionary measures which reduces the risks considerably.

Legislatures to prevent sand mining

Sand mining within the river beds has become a greater concern for groundwater recharge in the recent years as it prevents the environmental flow of a river. To ensure adequate groundwater recharge from the river, regulations need to be strictly enforced for sand mining in the river beds.

Storing of water in abandoned quarries

Surplus water from rivers could be efficiently utilised by diverting it to abandoned quarries. This water could be stored in quarries during floods and can be used later. This also recharges the surrounding region.

Long term goals

Installation of dual water supply pipes

Water supply in newly developed layouts should be given in dual pipes with one for drinking purposes and the second pipe for other uses to save the cost of treatment. Mode of pipe laid water supply should be initiated and implemented throughout the state.

Implementation of water pricing

Water pricing should be implemented, and the user has to pay for his/her water consumption. This can be achieved by providing meters and the charges can be worked out in a similar manner as electricity consumption charges.

Demarcation of groundwater protection zones

Groundwater wellhead protection zones should be created. The well captured zones around the wells used for water supply should be notified and mentioned as regions used only for specific purposes in order to prevent groundwater contamination.

Formation of river regulation zone

River regulation zones should be formed wherein encroachments and illegal dumping of sewage along the river banks should not be allowed. Public participation in cleaning these areas and boosting of riparian zone by community forestry could be encouraged.

Development of river fronts

River fronts should be developed in urban regions by considering the ecological and socio-economical aspects.

Construction of check dams

Check dams should be constructed across rivers in possible locations to improve the groundwater storage and promote water supply wells at suitable distance by considering the river bank filtration.

Construction of additional managed aquifer recharge structures

Current study on climate change indicates that the rainfall in Chennai would decrease and high intensity rainfalls in lesser duration would be expected. Hence, stakeholders should be advised to construct managed aquifer recharge structures (recharge ponds) to conserve the water for improving groundwater storage.

Integrated drought and flood management studies

Drought management and flood mitigation should be carried out coherently so as to use the advantage of excess water during floods by storing it as groundwater to meet the water demand during droughts.

Legislative actions on bore wells and groundwater pumping

The legal framework should be formed for bore well construction and groundwater pumping. Rather than encouraging individuals to meet their water requirements by private wells, the state agency should supply the required water.

Inclusion of background values in quality standards

Development of general background values of groundwater quality at different regions needs to be brought out in order to identify the pollution in the future.

Integrated waste management scheme

Development of integrated waste management scheme should be made necessary for all towns/cities/villages which would prevent groundwater resources from contamination and help in generating fuel and power. Solid waste management should be practiced in every household and commercial buildings by segregating wastes at origin and composting which would prevent the waste getting into waterways.

Co-operative Government - Public forum

Co-operative management facility with Public-Government forum along with the association of experts and industries should be formed to manage groundwater resources.

Development of two-way drainage pipe networks

The two-way drainage system should be developed in future to collect the waste from the toilets and bath/kitchen separately which would considerably reduce the cost and improve the efficiency of water treatment and reuse of treated water.

Sewage network in rural areas

The state still has under-developed sewage system in semi-urban and rural areas where the sewage is dumped in wastelands and water bodies as such without proper treatment. To avoid this, proper sewer network should be developed in semi-urban and rural areas of the state.

Prevention of sea water intrusion

Groundwater pumping from private wells in coastal regions must be prevented in future and pumping rate from existing wells should be monitored to reduce sea water intrusion.

கருத்தரங்கின் பரிந்துரைகள்

குறுகிய கால திட்டங்கள்

நீர் தேக்கங்களின் நிர்வாகத்தினை மேம்படுத்துதல்

தற்பொழுது சென்னையில் உள்ள நீர்த்தேக்கங்களின் நிலத்தினை ஒரு துறையும், நீர் விநியோகத்தினை மற்றொரு துறையும் பராமரித்து வருகிறது. அவ்வாறு அல்லாமல் நீர் தேக்கத்தின் பராமரிப்பு மற்றும் நீர் விநியோகத்திற்கான முழு அதிகாரமும் ஒரே அரசு அலுவலகத்தின் கீழ் கொண்டுவருவதன் மூலம் நீர் தேக்கங்களின் பராமரிப்பு எளிதாக்கப்படுவதுடன், வண்டல்மண் படிதல் மூலம் நீர்த்தேக்கங்களின் கொள்ளளவு குறைவதையும் தடுக்க இயலும்.

நீர் தேக்கங்களில் சேரும் மண்படிவுகளை அகற்றுதல்

சென்னை நகருக்கு நீர் வழங்கும் நீர்த்தேக்கங்கள் தூர்வாரப்பட்டு, ஆழப்படுத்தப்பட வேண்டும். தூர்வாரப்பட்ட மணலைக் கொண்டு நீர்தேக்கங்களின் சுவர்களை பலப்படுத்த வேண்டும். சென்னையில் உள்ள நான்கு நீர் தேக்கங்களை (பூண்டி, சோழவரம், ரெட்டேரி மற்றும் செம்பரம்பாக்கம்) சுமார் ஒரு மீட்டர் ஆழமாக்கினால் 476 கியூபிக் மீட்டர் (4.3%) நீர் கூடுதலாக சேமிக்கலாம்.

மாவட்ட/மாநில அளவில் நீர் தேக்கங்களைப் புதுப்பித்தல்

நகரங்கள் மற்றும் மாநகரங்களில் உள்ள நீர்த்தேக்கங்கள் மற்றும் ஏரிகளைத் தூர்வாரி சுத்தப்படுத்தி புத்துயிர் பெறச் செய்ய வேண்டும், மேலும் பாரம்பரிய நீர் சேமிப்பு முறைகளைப் பயன்படுத்த வேண்டும்.

மழைநீர் சேகரிப்பு அமைப்பினை சுழற்சி முறையில் கண்காணித்தல் மற்றும் சான்று வழங்குதல்

மழைநீர் சேமிப்பு கட்டமைப்புகள், நிலத்தடி நீர் சேமிப்பினை உயர்த்தியுள்ளன. ஆதலால் அக்கட்டமைப்புகள் அவ்வப்போது முறையாக சுத்தம் செய்து பராமரிக்கப்பட வேண்டும். இதனை உறுதிப்படுத்துவதற்கு வருடாந்திர அடிப்படையில் மழை நீர் சேகரிப்பினை திறமையாக செயல்படுத்துவோர்க்கு அரசு சான்றளிக்க வேண்டும். மேலும் மழைநீர் சேமிப்பின் முக்கியத்துவம் பற்றி மக்களிடையே விழிப்புணர்வை ஏற்படுத்த வேண்டும்.

ஒன்றுக்கும் மேற்பட்ட நிலத்தடிநீர் சேகரிப்பு அமைப்பினை உருவாக்குதல்

தீவிர மழைப்பொழிவு நிகழ்வுகளின் பொழுது, மழை நீர் சேகரிப்புத் தொட்டியினால் சமாளிக்க முடியாது. எனவே இரண்டடுக்கு மாடிகளுக்கு மேலுள்ள கட்டிடங்கள் கூடுதல் நிலத்தடி நீர் சேகரிப்பு கட்டமைப்புகளை அமைத்தல் வேண்டும்.

அனைத்து தொகுதிகளுக்கான நிலத்தடிநீரின் அளவினை வாரந்தோறும் இணையதளத்தில் பதிவேற்றம் செய்தல்

ஒவ்வொரு வட்டாரங்களுடைய நிலத்தடி நீர் பற்றிய அறிக்கைகள் ஒவ்வொரு வாரமும் புதுப்பிக்கப்பட வேண்டும். இத்தகவல்களை மக்கள் மற்றும் அலுவலர்கள் எளிதாக அணுகுவதற்கு மின்னணு வலைத்தளங்களை உருவாக்கிட வேண்டும்.

நீர் இருப்பின் அளவினைப் பொறுத்து வேளாண் பயிற்களை சுழற்சி முறையில் விவசாயிகளைப் பயிரிட வலியுறுத்துதல்

அதிகப்படியான நிலத்தடி நீரினை உறிஞ்சுவதைத் தடுப்பதற்கும், வரும் காலங்களுக்கான நீர் தேவையினைப் பூர்த்தி செய்வதற்கும், விவசாய முறையில் மாற்றங்களைக் கொண்டு வந்து நடைமுறைப்படுத்த வேண்டும். கூட்டுறவுத் திட்டத்தின் மூலம் நீர்த்தேவையை அளவிட்டு ஆண்டின் பயிர் முறைகளை பற்றி முடிவு செய்ய வேண்டும். இதனை உறுதிப்படுத்துவதற்கான விவசாய துறைகளானது, வரவிருக்கும் ஆண்டின் எதிர்பார்க்கப்படும் நீரின் அளவினைக் கருத்தில் கொண்டு பயிர் முறைகளை பரிந்துரைக்கலாம்.

மிதமான அளவில் இரசாயன உரங்களை பயன்படுத்தவும் மற்றும் இயற்கை வேளாண்மைக்கு மாறவும் விவசாயிகளை வலியுறுத்துதல்

பூச்சிக்கொல்லிகளில் உள்ள ரசாயனங்கள் நிலத்தடி நீரை மாசுபடுத்துகின்றன. எனவே ரசாயன பூச்சிக்கொல்லிகளின் பயன்பாட்டினை குறைத்து நீரின் தூய்மையைக் காக்க இயற்கை வேளாண்மைக்கு சம்மந்தப்பட்ட துறை அதிகாரிகள் ஊக்கமளிக்க வேண்டும்.

வழக்கமான சாலைகளுக்கு மாற்றாக நீர் ஊடுருவக்கூடிய சாலைகளை அமைத்தல்

மழைநீர் ஊடுருவக்கூடிய சாலைகளை நிர்மாணிக்கப்பட்ட குடியிருப்புகளில் அமைத்தல் வேண்டும். இவ்வாறு அமைப்பதன் மூலம் மழைநீர் சாலைகளில் தேங்குவதைத் தடுக்க முடியும். இருப்பினும் நிலத்தடிநீரில் மாசுகள் சேராதவாறு தடுத்துப் பாதுகாக்க வேண்டும்.

மழைநீர் வடிகால் மற்றும் கழிவுநீர் கால்வாய்களை மேம்படுத்துதல்

வடிகால் அமைப்பின் செயல் திறனை நகர்புறங்களில் மேம்படுத்த வேண்டும். பயன்பாட்டில் உள்ள மழைநீர் வடிகால்கள் மற்றும் கழிவுநீர் வடிகால்கலின் கண்காணிப்பு மற்றும் பராமரிப்பு பணிகள் முறைப்படுத்தப்பட வேண்டும். மழைநீர் வடிகால்கள் அமைத்து அதில் நிலத்தடிநீர் சேகரிப்பு அமைக்கும்பொழுது 30 முதல் 50 மீட்டர் இடைவெளியில் அமைத்தல் வேண்டும்.

சுத்திகரிக்கப்பட்ட தண்ணீரைச் சுழற்சி முறையில் பயன்படுத்துதல்

கழிவுநீரிலிருந்து முறைப்படுத்தப்பட்ட வழிமுறைகள் மூலம் சுத்திகரிக்கப்பட்ட தண்ணீரினை பயன்பாட்டிற்கு வழங்குவதன் மூலம், நீரின் தேவை மற்றும் கழிவுநீர் வெளியேற்றத்தினையும் கட்டுப்படுத்தலாம். மேலும் மாநகராட்சிகள், பல்நோக்கு அடுக்குமாடி கட்டிடங்கள், குடியிருப்புகள் மற்றும் கல்வி நிலையங்களில் சுத்திகரிக்கபட்ட கழிவுநீர் மறுசுழற்சி நீர்ப் பயன்படுத்துதலை கட்டாயமாக்க வேண்டும்.

மழை வெள்ளப்பகுதிகளைப் பதிவிடுதல்

மாநிலத்தின் பெருநகரங்கள் மற்றும் நகரங்களில் வெள்ளப் பெருக்கு பகுதிகளை பதிவிடுதல் வேண்டும். திடீர் வெள்ளப்பெருக்கினை எதிர்கொள்ள வழிமுறைகளை செயல்படுத்துதல் வேண்டும். பருவநிலை மாற்றம் தொடர்பான ஆய்வுகள், எதிர்காலத்தில் குறைந்த நேரத்தில் கனமழை பெய்யும் வாய்ப்பு அதிகம் உள்ளதாக கணித்துள்ளதால் திடீர் வெள்ளப்பெருக்கு மேலாண்மைக்கு முக்கியத்துவம் அளிக்கப்பட வேண்டும்.

சுற்றுச்சூழல் பாதுகாப்பு விழிப்புணர்வினை மக்களிடையே ஏற்படுத்துதல்

சுற்றுச்சூழல் பாதுகாப்பு, திடக்கழிவு மேலாண்மை குறித்த விழிப்புணர்வினை மக்களிடயே ஏற்படுத்துவதன் மூலம் நீர் மற்றும் நிலம் மாசுப்படுவதை தவிர்க்க முடியும்.

நீர் தரம் கண்காணிப்பு முறைகளில் மேலும் கூடுதல் காரணிகளை பரிந்துரைத்தல்

மாநில நீர்வாரியங்கள் தற்போதுள்ள நிலத்தடி நீர் ஆய்வுகளுடன் நீரில் உள்ள கரிமம் மற்றும் ஹைட்ரோகார்பனையும் ஆய்வு செய்து நீரின் தன்மையைக் கண்காணிக்க வேண்டும். இவ்வாறு செய்வதன் மூலம் நீரினால் ஏற்படும் ஆபத்துகளை முன்னரே அறிந்து அவற்றைக் களைய முடியும்.

ஆற்றுப் படுகைகளில் இருந்து மணல் எடுப்பதை வரைமுறை படுத்துதல்

ஆற்றுப்படுகையில் உள்ள மணல் அகழ்வு சமீபகாலமாக நீர் நிலத்தினுள் உட்புகுவதற்குப் பெரும் சவாலாக இருக்கிறது. நீரோட்டத்தினைச் சுற்றியுள்ள நிலத்தடிநீர் உட்புகுவதற்கு, ஆற்றுப்படுகையில் மணல் எடுப்பதை ஒழுங்குமுறைப்படுத்தும் சட்டங்கள் இயற்ற வேண்டும்.

கற்சுரங்கங்களில் நீர் சேகரித்தல்

ஆறுகளில் உள்ள உபரி நீரைத் திசை திருப்பி கற்சுரங்கங்களில் சேமிக்கலாம். இவ்வாறு வெள்ளப் பெருக்கின் பொழுது நீரை சேமித்து வீணாகாமல் பயன்படுத்தலாம்.

நீண்ட கால திட்டங்கள்

இருவழி நீர் இணைப்பினை உண்டாக்குதல்

புதிய நகரமைப்புகள் மற்றும் குடியிருப்புகளுக்கு குடிநீருக்காக ஒரு இணைப்பும், மற்ற தேவைகளுக்கு மற்றொரு இணைப்பும் வழங்கல் வேண்டும். இவ்வாறு செய்வதன் மூலம் சுத்திகரிப்பிற்கான விலையை குறைக்க முடியும். இம்முறையினை மாநிலம் முழுவதும் செயல்படுத்த வேண்டும்.

தண்ணீருக்கான விலையினை நிர்ணயித்தல்

தண்ணீரின் விலையை நிர்ணயித்து பயனாளர் தண்ணீர் கொள்முதலிற்கு ஏற்ப தகுந்த பணம் செலுத்துதல் வேண்டும். மின் கட்டணத்தினை போல தண்ணீர் கட்டணத்தினை அளவீடு கருவிகள் கொண்டு அளவிடுவதன் மூலம் இதனை சாத்தியப்படுத்தலாம்.

நிலத்தடிநீர் பாதுகாப்பு மண்டலங்களை வரையறுத்தல்

நிலத்தடிநீர் பாதுகாப்பு மண்டலங்களை உருவாக்குதல் வேண்டும். இம்மண்டலங்களை சுற்றியுள்ள பகுதிகளை மாசு படாதவாறு பாதுகாத்து தண்ணீர் விநியோகம் செய்ய வேண்டும்.

ஆறுகளுக்கான ஒழுங்குமுறை மண்டலங்களை உருவாக்குதல்

ஆறுகளுக்கான ஒழுங்குமுறை மண்டலங்களை உருவாக்க வேண்டும். கடுமையான நிபந்தனைகளின் மூலம் சட்டவிரோதமாக ஆற்றின் கரையோரங்கள் மற்றும் ஆற்றில், கழிவுகள் கொட்டப்படுவதை தடுக்க முடியும். மக்கள் உதவியுடன் இவ்விடங்களை சுத்தம் செய்து மழை பொழிவினை உண்டாக்க கூடிய வனப்பகுதியை அமைக்க அரசு ஊக்குவிக்க வேண்டும்.

ஆற்று முகப்புகளை உருவாக்குதல்

சுற்றுச்சூழல் மற்றும் சமூக பொருளாதார அம்சங்களுக்கு முக்கியதுவம் கொடுத்து, நகர்புறங்களில் நதிமுகப்புகளை அமைத்தல் வேண்டும்.

தடுப்பணைகளைக் கட்டுதல்

பொருத்தமான இடங்களில் ஆற்றின் குறுக்கே தடுப்பணைகளை அமைத்தல் வேண்டும். இதன் மூலம் நிலத்தடி நீரினை மேம்படுத்த முடியும் மற்றும் ஆற்றின் நீரானது நிலத்தின் அடியில் குறிப்பிட்ட அளவிற்கு ஊடுருவி செல்ல ஏதுவாக அமையும்.

முறைப்படுத்தப்பட்ட கூடுதல் நீர்தேக்க அமைப்பினை உருவாக்குதல்

கால நிலை மாற்றம் குறித்த நடப்பு ஆய்வுகளின்படி சென்னையில் மழைபொழிவு குறையுமென்று எதிர்ப்பார்கப்படுகிறது. அதேசமயம் குறுகிய காலத்தில் அதிக மழை பொழிவு ஏற்படும் என்றும் எதிர்ப்பார்க்கப்படுகிறது. ஆகவே பயனாளர்கள் நிலத்தடி நீரை மேம்படுத்துவதர்கான மீள்பரப்பு அமைப்பினை அமைத்தல் வேண்டும்.

வறட்சி மற்றும் வெள்ளப்பெருக்கிற்கான ஒருங்கிணைந்த ஆய்வுகளை மேற்கொள்ளுதல்

வறட்சி மற்றும் வெள்ளப்பெருக்கிற்கான ஒருங்கிணைந்த ஆய்வுகள், வெள்ளப்பெருக்கின்பொழுது சேகரிக்கப்பட்ட நிலத்தடி நீரினைக் கொண்டு வறட்சி காலத்தில் நீர் பற்றாக்குறையைச் சமாளிக்க உதவும்.

ஆழ்துளை கிணறு அமைத்தல் மற்றும் நிலத்தடி நீர் எடுத்தலுக்கான சட்டங்களை உருவாக்குதல்

ஆழ்துளை கிணறு அமைத்தல் மற்றும் நிலத்தடிநீர் எடுத்தல் போன்றவற்றிற்கு சட்டங்கள் இயற்றப்படவேண்டும். தனியார் கிணறுகள் மூலம் நீர் தேவைகளைப் பூர்த்தி செய்வதை விட, அரசு நிறுவனங்கள் மூலம் மக்களுக்கு தேவையான நீரினை வழங்க வேண்டும்.

நிலத்தடிநீரின் தரம் பற்றிய தொடர்ச்சியானப் பின்னணித் தகவல்களை சேகரித்தல்

நிலத்தடிநீரின் பொதுப்பின்னணித் தகவல்களை பல்வேறு பகுதிகளில் இருந்து சேகரித்து ஆவணப்படுத்துவதன் மூலம் வருங்காலத்தில் நிலத்தடி நீரினை மாசுபடுத்தியவர்களை அடையாளம் காணுதல் முடியும்.

ஒருங்கிணைந்த கழிவு மேலாண்மை திட்டங்களை வகுத்தல்

ஒருங்கிணைந்த கழிவு மேலாண்மைத்திட்டத்தை நகரங்கள், பெருநகரங்கள் மற்றும் கிராமப்புறங்களில் உருவாக்க வேண்டும். இது நிலத்தடி நீர் வளத்தை மாசுபாட்டிலிருந்து தடுக்கவும், எரிபொருள் ஆற்றலை உருவாக்கவும் உதவும். திடக்கழிவு மேலாண்மை திட்டமானது, ஒவ்வொரு வீடு மற்றும் வணிக வளாகங்களில் செயல்படுத்துவதின் மூலம் திடக் கழிவுகள் நீர்நிலைகளில் கலப்பதை தடுக்க முடியும்.

அரசு மற்றும் மக்களின் கூட்டுறவு அமைப்பினை ஏற்படுத்துதல்

நிலத்தடி நீர் வளங்களை நிர்வாகிக்க அரசு மற்றும் மக்களின் கூட்டுறவு மன்றங்கள் அமைத்தல் வேண்டும். அம்மன்றங்களில் தொழிற்சங்கங்கள் மற்றும் வல்லுனர்களின் பங்கும் இருக்குமாறு அமைத்தல் வேண்டும்.

இருவழி வடிகால் அமைப்பினை உருவாக்குதல்

கழிவறைக் கழிவுகள், குளியல் (அ) சமையல் கழிவுகள் தனித்தனியே பிரித்து இரண்டு கழிவுநீர் வடிகால்களில் பெறப்படுவதன் மூலம், நீர் சுத்திகரிப்பின் திறன் மற்றும் சுத்திகரிக்கப்பட்ட நீரின் மறுசுழற்சியை மேம்படுத்த இயலும்.

கிராமப்புறங்களில் கழிவுநீர் வடிகால் அமைப்பினை உருவாக்குதல்

மாநிலத்தின் பெரும்பான்மையான கிராமப்புறங்கள், நகராட்சிகள் மற்றும் விரிவாக்கப்பட்ட மாநகராட்சிப் பகுதிகளில் கழிவுநீர் வடிகால் கட்டமைப்புகள் அனைத்துப்பகுதிகளுக்கும் விரிவாக்கப்படவில்லை. இதன் விளைவாகவே தரிசு/புறம்போக்கு நிலங்கள் மற்றும் நீர்நிலைகளில் சுத்திகரிக்கப்படாத கழிவுநீர் தேங்கும் நிலை உள்ளது. மேற்குறிப்பிடப்பட்டப் பகுதிகளில் விரைவாக கழிவுநீர் கட்டமைப்புகள் அமைப்பதன் மூலம் இப்பிரச்சினைகளை சரிசெய்ய இயலும்.

கடல் நீர் ஊடுருவுதலை தடுத்தல்

கடலோரப் பகுதிகளில் உள்ள தனியார் கிணறுகளில் இருந்து நீர் எடுப்பதை தடை செய்தல் வேண்டும். ஏற்கனவே இருக்கும் கிணறுகளில் இருந்து எடுக்கும் நீரின் அளவினை கண்காணித்தல் வேண்டும். இதன் மூலம் எதிர்காலத்தில் கடல்நீர் ஊடுருவுதலை தடுக்கலாம்.

About the Conference and Workshop

Objective

The conference and workshop was aimed to address the broad issues related to groundwater use and shortage in supply of water in Tamil Nadu with particular reference to the city of Chennai. The main aim of this conference was to identify ways and means of achieving long-term and short-term goals for meeting the domestic and agricultural needs.

Scope

This workshop brought the experts, young researchers and students together from government, private sector and educational institutions to deliberate upon the lessons learned from the research studies, projects implemented and tools available to bring out the full breadth of ideas for the benefit of community.

The conference achieved fruitfulness by bridging the gap between the parties engaged in water resources management and governance to assess the possibility of formulating new policies at different levels.

Representatives from government departments (Public Works Department, Central Groundwater Board, Chennai Water Supply and Sewerage Board, Tamil Nadu Water Supply and Drainage Board, Chennai Metropolitan Development Authority, Chennai Development Authority, Chennai Corporation, Pollution Control Board etc.) private water suppliers, legal experts, farmers, researchers, students were invited to arrive the meaningful recommendation.

Themes/Concepts

- Best practices of design and application of water resource management techniques.
- Ecological imbalance due to extreme climatological events.
- Hydrology of extreme events and its impact on humans.
- Urbanisation and its impact on water resources.
- Waste water reuse.
- Water policy and climate change.

Agenda followed

Day 1

Wednesday 6th September 2017

10:30 - 11:35	**Session 1**	**Chair Person:** Dr. R. Sakthivadivel **Rapporteur:** Dr. Hannes Neugebauer
10:30	**Dr. R. Sakthivadivel** *Centre for Water Resource, Anna University, India*	Impact of climate on river basins of Tamil Nadu and ameliorative measures suggested
10:40	**Mr. Georg Schedel** *Water Management Board of Bavaria, Germany*	Groundwater protection as a societal virtue – approaches in Germany and Bavaria – approaches for Tamil Nadu?
10:50	**Dr. K. Brindha** *Hydrology and water resources, NUS, Singapore*	Balancing floods and groundwater depletion by Managed Aquifer Recharge
11:00	**Dr. Heejun Suk** *Korea Institute of Geoscience and Mineral Resources, South Korea*	Artificial recharge and numerical simulation in Korea: Current issue of riverbank filtration system in Korea
11:10	**Prof. B. S. Murty** *Indian Institute of Technology Madras, India*	Flood problems in Chennai: Way forward
11:20	**Session summing up**	
11:35 - 12:40	**Session 2**	**Chair Person:** Prof. Florian Einsiedl **Rapporteur:** Prof. S. Parimala Renganayaki
11:35	**Mr. Fabian Musche** *University of Applied Sciences (HTWD), Germany*	Flood proofing of riverbank filtration
11:45	**Prof. E. Vetrimurugan** *University of Zululand, South Africa*	Experiences of managing scarce water resource in South Africa
11:55	**Prof. Eilon M. Adar** *Ben-Gurion University, Israel*	Novelties and innovations in integrated water systems of groundwater, rivers, treated and desalinated water
12:05	**Prof. Florian Einsiedl** *Technical University of Munich, Germany*	An overview about the self-purification potential of groundwater systems
12:15	**Mr. Tushar Alekar** *Messe Muenchen India P Ltd*	Introducing IFAT INDIA and apprising about the recent developments with the event
12:25	**Session summing up**	
12:40	**Lunch**	

13:30 - 14:45	**Session 3**	**Chair Person:** Dr. Heejun Suk **Rapporteur:** Dr. K. Brindha
13:30	**Dr. Martin Höckenreiner** *GAB, Germany*	Handling of brownfields
13:40	**Prof. Harald Weigand** *University of Applied Sciences (THM), Germany*	Groundwater hazards related to the production of leather tanning chemicals in the area of Kanpur, Uttar Pradesh: Problem dimensions and mitigation strategies
13:50	**Dr. Hannes Neugebauer** *Deutsche Bahn AG, Germany*	Coping with threats to groundwater (from the liable party's point of view with examples of hydrocarbon contaminations)
14:00	**Prof. S. Janakarajan** *South Asia Consortium for Interdisciplinary Water Resources Studies, India*	Traditional water bodies as the most essential groundwater recharge structure
14:10	**Prof. K. Palanivelu** *Centre for Environmental Studies, Anna University, India*	Impact of Climate Change in predicted rainfall at Chennai
14:20	**Prof. N. K. Ambujam** *Centre for Water Resource, Anna University, India*	Energy-Water Nexus in Ground Water dependent Agricultural System –A Case Study of Theni District in Tamil Nadu
14:30		**Session summing up**
14:45 - 15:50	**Session 4**	**Chair Person:** Prof. N. K. Ambujam **Rapporteur:** Dr. Martin Höckenreiner
14:45	**Prof. B. V. Mudgal** *Centre for Water Resource, Anna University, India*	Integrated approach to flood modeling: Chennai - a case study
14:55	**Dr. D. Gnanasundar** *Central Ground Water Board, Chennai, India*	Groundwater scenario of Tamil Nadu
15:05	**Dr. M. Senthilkumar** *Central Ground Water Board, Chennai, India*	Aquifer mapping and recharge initiative in Chennai basin
15:15	**Prof. L. Elango** *Department of Geology, Anna University, India*	Groundwater issues in Chennai and possible solutions
15:25		**Session summing up**
15:40		**Tea**
15:55		**Discussion**

Day 2

Thursday 7th September 2017

9:30	**Salient aspects of sessions by Rapporteurs:**		Dr. Hannes Neugebauer Dr. S. Parimala Renganayaki Dr. K. Brindha Dr. Martin Höckenreiner
10:30		**Tea**	
11:00		**Open discussion**	**Chairperson:** Prof. B. S. Murty **Co-chairperson:** Prof. B.V. Mudgal
12:00	**Group discussion – 4 groups**	**Moderator**	Prof. S. Janakarajan Mr. Georg Schedel Prof. B. V. Mudgal Prof. Harald Weigand
13:00		**Lunch**	
14:00	**Group discussion – 4 groups**	**Moderator**	Prof. S. Janakarajan Mr. Georg Schedel Prof. B. V. Mudgal Prof. Harald Weigand
15:00		**Presentation by the moderators**	
16:00	**Conclusion session**	**Panelists**	Prof. S. Janakarajan Prof. B. V. Mudgal Prof. Eilon M. Adar Dr. Hannes Neugebauer
16:30		**Tea**	

Panel sessions

The key points of each sessions were highlighted by the rapporteurs

Session 1

- Modification of irrigation tanks by various coping measures considering the present land use changes and climatic conditions.
- Development of threshold of insignificance for groundwater considering prevention and after care background values.
- Solving multiple problems by a single solution. Handling of droughts and extreme flood by conjunctive flood and drought management methodology.
- In order to prevent groundwater depletion, artificial recharge system should be considered together with riverbank filtration system.
- Sustainable drainage system should be developed, and micro-level investigations are necessary.

Session 2

- Bridging the gap between water demand and supply can be achieved by not only increasing the water use efficiency technique but also by production of new water (reclaimed water).

- Development of flood proof infiltration wells to avoid microbial contamination.
- Development of smart water grids resulting in sustainable water energy and land use.
- Water management practices focusing on problems pertaining to water demand which would bring out better efficiency.

Session 3

- Ecosystem should be preserved inorder to avoid the ecological imbalance and the tanks system should be rehabilitated.
- Cropping pattern should be taken care of energy consumption and optimized pumping rate in the region.
- Extremity analysis on rainfall has revealed that the wet days will increase, and high intensity rainfall may occur in near future.
- Improving public awareness on groundwater protection and development of legal framework on groundwater protection.
- Systematic approach on hydrocarbon contamination of groundwater should be formulated.

Session 4

- Water pricing could be employed in Chennai to curb extreme water usage.
- Integrated flood management should be practiced in the city taking care of technical, economical as well as social and political aspects of flood.
- Maintenance of the existing recharge structures and increasing the number of tanks and recharge structures along with modified crop pattern (less water intensive crops) would improve the water supply conditions of the city.
- Regional and micro-level aquifer mapping are made essential for the groundwater protection.

Open discussion

Group discussion

Groups			
Groundwater Resource Augmentation	**Groundwater Resource Protection and Contamination**	**Flood and Drought**	**Groundwater Management**
Mr. Georg Schedel	Dr. Harald Weigand	Prof. B. V. Mudgal	Prof. S. Janakarajan
Dr. Eilon M. Adar	Dr. Hannes Neugebauer	Dr. Habil Florian Einsiedl	Dr. R. Sakthivadivel
Mrs. Ch. Samurembi Chanu	Dr. G. Kanagaraj	Dr. Martin Höckenreiner	Dr. Heejun Suk
Dr. K. Palanivelu	Mr. R. Jeya Kumar	Dr. N. S. Magesh	Ms. Aditi Rosegger
Dr. E. Vetrimurugan	Dr. S. Parimala Reganayaki	Dr. K. Brindha	Dr. A. Yuvaraja
Dr. N. K. Ambujam	Ms. Monika Gonser	Mr. Fabian Musche	Mr. Tom Gablier
Dr. M. Senthilkumar	Dr. L. Elango	Dr. B. S. Murty	Mr. A. Subburaj
Mr. S. Raman	Mr. S. Raju	Dr. D. Gnanasundar	Mr. K. Vivekanandan
Mrs. G. B. Vydahi	Mr. R. Ashok Kumar	Mr. L. Vijayan	Mr. R. Vinoth
Mr. M. Rajendran	Mr. T. Ramjee	Mr. R. Rajamanickam	Mr. G. Gowrisankar
Mr. M. Thirumurugan	Mr. A. Suhail Ahmed	Mr. Simeon Joshua	Mr. V. Manivannan
Mr. S. Anbarasu	Dr. R. Rajesh	Mr. S. Manoj	
Ms. V. K. Haritha	Mr. S. Dhanamadhavan	Mr. P. Anandharuban	
	Ms. R. RamyaPriya		




Outcomes from group discussion

Groundwater Resource Augmentation

Rural aspects

- Control of illegal drilling.
- Avoid deep drilling.
- Development of flood-recharging wells.
- Check dams constructed and managed by the NGO's and the Government departments.

Urban aspects

- Flood storage in subsurface tanks.
- Curbing the illegal tapping of groundwater.
- Water pricing through installation of water meters.
- Grey water recharge.

Groundwater Resource Protection and Contamination

- Funding and development of complete sewerage supply networks.
- Periodical groundwater monitoring considering organic and microbial pollutants.
- Implementation of integrated waste management schemes.
- Database of general background values and preventive values of constituents in groundwater as a legislative framework.

Flood and Drought

- Flood zone mapping.
- Creation of detention ponds, recharge structures.
- Porous pavements.
- Increase in storm water drainage capacity and improving infiltration.
- Domestic sewage should not be let into the water bodies.
- Creation of river fronts for the Cooum and Adyar Rivers.
- Public participation should be strengthened more.
- Dual pipe water supply.
- Reuse of treated waste water.

Groundwater Management

- River bank filtration methods.
- Develop better institutional and legalized framework on groundwater ownership and management.
- Recharge measures.
- Revamp and revitalize the existing traditional rain water harvesting structures.

Details of workshop participants

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She is working to enable a sustainable water management in the complex rural South Indian setting of Auroville and its surroundings. She is interested in collaborations with researchers from outside the community and is also planning to conduct a postgraduate research on sustainable water management.

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He is a Water Resource engineer, working in the integrated hydrological modeling and comparison of the modeling software tools for the last one year. His ultimate objective is to serve the society with the findings as a water resource engineer.

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He has completed Master's degree in Applied geology and is doing Ph.D on hydrological investigation to understand fluid flow through fractured rocks and groundwater chemistry of Chinnar watershed, Perambalur district, Tamil Nadu.

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She is currently the Director of Centre for Water Resources at Anna University. She is specialized in the field of agricultural engineering, integrated water resource management and wastewater reuse.

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She is a Water Resource researcher with specialization in geochemistry, managed aquifer recharge and climate change. She has worked in Anna University (India), International Water Management Institute (Lao PDR) and National University of Singapore (Singapore) with projects focused on India, Lao PDR, Singapore, Malaysia and South Africa.

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He has completed his Master's degree in Applied Geology with specialisation in hydrogeology. Currently his research work is on numerical modeling of seawater intrusion in coastal aquifer, Chennai.

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His research activities are associated with complex groundwater systems, emphasizing the development of a novel Mixing Cell Model (MCM_{tr}) approach for steady and transient flow systems utilizing hydrochemistry and environmental isotopes coupled with a non-steady flow model. The MCM has been developed for quantitative assessment of groundwater flow systems and sources of recharge in complex basins with puzzling geology and scarce hydrological information.

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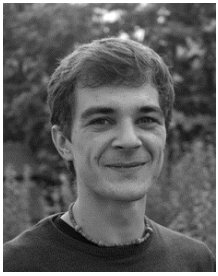
He has 35 years of experience in hydrogeology with special interests in groundwater quality and numerical modelling. He has published about 140 research papers in various journals and 5 books. He has supervised 21 Ph.D. studies until 2017. He is currently a Vice President of International Association of Hydrological Sciences.



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He is a civil engineer specializing in groundwater resources engineering. He is presently working as a young researcher on an Indo-German applied research project (NIRWINDU) on safe and sustainable drinking water production in India that focuses on riverbank filtration (RBF), flood proof RBF wells and innovative water disinfection and monitoring techniques.

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He is employed as an analytical chemist at a private laboratory for four years and is dealing with organic parameters and parameter groups. He is working at a local governmental board of the state of Bavaria named Water Management Board in Rosenheim since 1995.

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His area of specialization includes groundwater flow modeling, solute transport modeling, aquifer mapping etc. He was conferred with National Award by Government of India for his contribution in the field of Groundwater Exploration from the President of India.

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His area of research is mitigation of groundwater contamination. For the past three years, he has been working in the aspects of groundwater chemistry and mitigation of fluoride contamination.

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His research and teaching interests focuses on the groundwater ecosystem. His investigations are on hydraulic issues and biogeochemical processes in shallow and deep groundwater systems. The goal of his scientific work is to get a holistic understanding of the groundwater ecosystem for a future sustainable use of the drinking water resources, both in terms of quality and quantity.

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He had completed his Diploma in Geology/Paleontology. He has completed Ph.D. on mylonitic shear zone in NW Argentina. He has also worked as assistant researcher in Dept. of Geology, University of Tasmania, Australia. He is also an alumnus of the German National Scholarship Foundation and presently is the Co-chairman of the REFUGIO Munich institution (www.refugio-muenchen.de) that helps traumatized refugees.

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She has completed Master's programme in Applied Geology and Geomatics and have also worked in Groundwater department, Thrissur, Kerala for three months. Currently she is doing Ph.D. on experimental and field investigations of innovative measures to improve groundwater recharge.

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His research focus is on developing innovative numerical algorithms for simulating multiphase flow and multispecies transport in groundwater and developing analytical methods for analyzing solute transport and groundwater flow in aquifer.

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His current interests are urban water, climate change, delta vulnerability and food security, transboundary water disputes and water pollution. He is also currently holding the position of Professorial Research Associate at Centre for Water and Development, SOAS, University of London.

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He is a Civil Engineer with Master's specialization in Environmental Engineering and Management. Presently, he is working on a DST funded project on feasibility of riverbank filtration for rural water supply around check dam in non – perennial river.

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He has completed his Master's and Doctor of Philosophy in Applied Geology at University of Madras, Guindy. His interests are hydrogeology, geophysics and remote sensing. His current work is on chromium isotopes in groundwater and geochemical modeling around tannery region.

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His research interests include the study of climate change and its impact on land use and water resources. His research involves coupling the climate models with high-resolution field data to explore the physical, chemical, and ecological processes in complex river basin system. Presently, he is focusing on the influence of land use and climate on regional hydrology and groundwater quality in Tamiraparani basin, South India using geospatial technology and downscaled climate models from IPCC.

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He has completed his Master's programme in Applied Geology with specialisation in hydrogeology. He is now working in the aspects of groundwater quality and chemistry for past two years. Currently his research is on numerical modeling of seawater intrusion in coastal aquifer, Puducherry.

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He is currently doing his research work in the field of hydrogeology, hydrogeochemistry, geophysics and groundwater modelling. Previously, he has worked as a Junior Research Fellow in BRNS funded project during August 2014 - December 2016. In the meantime, he had worked as a guest scientist at the Divisions of Water Sciences, Dresden, Germany which was supported by the German Academic Exchange Service DAAD.

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He completed his Ph.D. in Geology at the Ludwig-Maximilian-University in Munich/Germany. He had worked 10 years in the area of environmental consulting and has headed mainly national and international projects on the investigation and remediation of contaminated sites. He has also conducted hydrogeological investigations for the geothermal use of groundwater.

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She holds a degree in social sciences and her research work focuses on issues of migration and labour market integration. She initiated and coordinated a real world labratory at the Heidelberg University of Education, the "ReallaborAsyl" in Germany with the cooperation of University of Heidelberg and the Centre for European Economic Research.

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His interests are in experimental hydraulics, integrated flood management and integrated water resources management with stakeholder's participation.

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He pursued the doctoral degree at Washington State University, Pullman, Washington and was awarded in 1989 by the WSU. Dr. Murty joined the faculty of Civil Engineering at I.I.T. Kanpur in July 1989, where he worked until the end of 1998. He moved to I.I.T. Madras, Chennai as a faculty member in December 1998, where he is currently working as a professor of Civil Engineering.

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He had a first-class career throughout his education. Presently, he holds additional responsibility as Director of Centre for Climate Change & Adaptation Research of Anna University. His research interests include CO_2 mitigation, pollution control through chemical and electro chemical routes, green chemistry, trace analysis of organics and heavy metals.

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She is specialized in the field of hydrogeology including hydrochemistry, hydrogeophysics and groundwater modelling. She has been the Principal Investigator on the research project on Managed Aquifer Recharge structures supported by the DST- WOS A. She also has experience in working under various projects funded by UGC, BRNS, DST in India, National Water Testing Centre, United Arab Emirates and European Commission.

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He is involved in Planning & Development, policy making process, w.r.t environmental protection, pollution control, cleaner technologies.

Name Dr. M. Rajendran
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He is in-charge of reviewing the hydrogeological studies, aquifer performance studies, water level fluctuation analysis and reviewing the groundwater potential assessment etc. throughout the state.

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He obtained his Ph.D. in Geology at Anna University, Chennai, India. His research interests are hydrogeology, hydrochemistry, geochemical modelling, groundwater modeling, groundwater monitoring and management, remote sensing and GIS.

Name Dr. S. Raju
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He has carried out regional geological mapping, specialised thematic mapping and geochemical mapping in Bundelkhand Complex, Uttar Pradesh. He has also involved in the research project on basic dykes of Bundelkhand and Dudhi Granitoid Complex, Southern Uttar Pradesh. He has also carried out specialised thematic mapping and was involved in research projects on granite associated rocks of Tamil Nadu.

Name Mr. S. Raman
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His expertise includes groundwater exploration, exploitation and assessment of water resources. He is also involved in delineating of aquifer zones and its characterization.

Name Mr. T. Ramjee
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He is an Electrical Engineer employed in CMWSS and is responsible for the operation and maintenance of the 300 MLD capacity water treatment plant located at Red hills and its allied transmission pipe lines.

Name Ms. R. RamyaPriya
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She has completed Master's in Environmental Engineering and Management and she is currently engaged in doctoral research. Her current research work involves estimating the carbon flux of Cauvery river, Southern India under the context of climate change under an ISRO supported project.

Name Dr. R. Sakthivadivel
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He has guided several Ph.D. and M.Tech students in their thesis work. He is a consultant to TWIC for transporting water from Neyveli to Chennai and is also consultant to Water resources department (Ground water) on the preparation of State Action Plan for National Water Management Mission and to CMWSSB on Small Water Bodies in Greater Chennai Corporation. He also acts as an adviser to Hindustan Unilever Foundation (HUF).

Name Mrs. Ch. Samurembi Chanu
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She is working as a JRF and is doing her Ph.D. on assessment of vulnerability of coastal aquifers to climate change by groundwater modeling in Chennai region under DST project.

Name Dr. M. Senthilkumar
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He is working as a senior hydrogeologist for the past 15 years in the apex body of the nation with a mandate to sustainable development and management of India's groundwater resources. He is responsible for aquifer mapping and devising management plans through various interventions of supply, demand side and through numerical modeling for sustainable groundwater management.

Name Mr. Simeon Joshua
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He represented the CII (SR) which handles wide range of development projects for the industry members for the CSR vertical.

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He has several years of expertise on various aspects of groundwater exploration, exploitation and aquifer mapping, He has worked in different capacitive in many parts of India.

Name Mr. A. Suhail Ahmed
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He is in charge of reviewing the seawater intrusion studies carried out all along the coast of Tamil Nadu. He is also responsible for reviewing the technical feasibility reports on the construction of artificial recharge structures by PWD and also reviews climate change reports with regard to groundwater level fluctuations qualitatively and quantitatively throughout the state of Tamil Nadu.

Name Mr. M. Thirumurugan
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He is working as SRF and pursuing his Ph.D. on radionuclide transport modelling from a proposed tailings pond. His interests are in the fields of hydrogeology, hydrogeochemistry, geophysics and groundwater modelling. He has visited Uppsala University in a student exchange programme during 2013-2014. Earlier, he had worked under the BRNS funded project during 2013.

Name Mr. Tom Gerard Gablier
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He is presently the water advisor to the Town Development Council (TDC) and have been involved in water management in and around Auroville for the past 30 years. He has worked as a managing executive of Auroville water service from 1986 till 1996 and as a managing director of AWS Harvest, working on water regional development from 1996 till 2001.

Name Ms. G. Vaishnavi
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She represented the development initiatives department of CII (SR) which handles wide range of development projects for the industry members for their CSR vertical.

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His area of research interest is hydrogeology with special emphasis on hydrogeochemical studies and solute transport modelling. He has received funding for his research work from NRF, DST, WRC, UNIZULU and IPN, Mexico.

Name Mr. L. Vijayan
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His duties are to ensure consistency and reliability in the implementation of quality system in water supply/sewerage and maintenance projects. He is responsible to review existing quality control procedures regularly on the basis of feedback from the field reports and suggest remedial measures wherever necessary.

Name Mr. R. Vinoth
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He has designed and installed many groundwater monitoring networks, involving a variety of drilling technologies, to characterize hydrocarbon impact under single and multiple aquifer conditions. His geological expertise involves environmental consulting field, including textile, agrichemicals and petroleum industries.

Name Mr. K. Vivekanandan
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He is having 35 years of experience in water supply and sewerage infrastructure investigation, design and DPR preparation besides execution and operation & maintenance facets. Presently he is heading the project development cell dealing with project formulation for water supply and sewerage sectors.

Name Mrs. G. B. Vydahi
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She is in charge of the water treatment plant of 270 MLD at Kilpauk and her duties are to ensure treated piped water supply to the city and operation and maintenance of water distribution stations and lorry filling stations and its pertained legal issues.

Name Dr. A. Yuvaraja
Designation UGC D.S. Kothari Post-Doctoral Fellow
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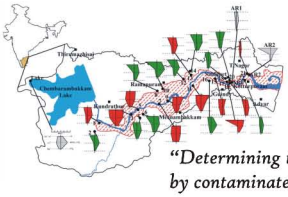
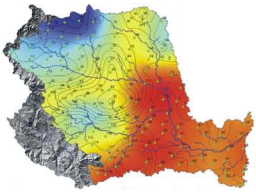
His interests are in micropaleontology and hydrogeology. His doctoral research was on identifying the evolution of the Indian monsoon using foraminiferal faunal and isotope data and total organic content of marine sediments from Ocean Drilling Program (ODP) Hole 730A in Oman Margin, northwestern Arabian Sea. He is currently working on carbon consumption by weathering in Bhavani river basin, Tamil Nadu, India.

"Most studies on water quality in the world have been precisely dedicated to major ion concentrations in addition with trace metals, where only limited studies are available considering the radioactive elements"

"Comparison of the dissolved load with other rivers of the world was also made, which reveals that the Cauvery River yields comparatively higher dissolved load per area than most of the rivers"



"Determining the antibiotic susceptibility of pathogens will help in the treatment of humans affected by contaminated water through an appropriate selection of prescribed medication"



"The contaminated wells can be restored using cost effect techniques such as managed aquifer recharge, thus diluting the concentration of trace elements with rainwater"