



Policy for Ground Water Management, Rain Water Harvesting and Ground Water Recharge in Uttar Pradesh

Roof Top & Surface Pavement
Rain Water Harvesting

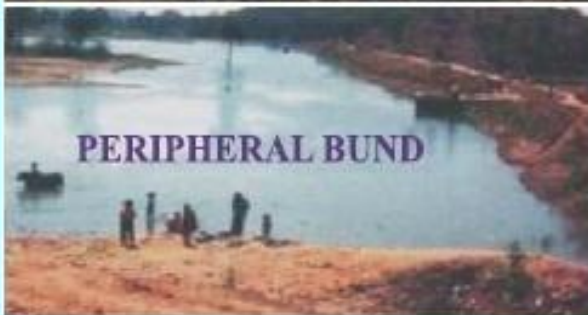


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GROUND WATER DEPARTMENT, UTTAR PRADESH

POLICY
for
Sustainable Ground Water
Management
in Uttar Pradesh

**Policy for ground water management, rain water harvesting and
ground water recharge in Uttar Pradesh**

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POLICY
for
Ground Water Management, Rain Water
Harvesting & Ground Water Recharge in the State

BACKGROUND

Uttar Pradesh is an agrarian state, where ground water resource has attained a prominent position as prime source of irrigation. This is assessed by the fact that nearly 70 percent irrigated agriculture in the state is mainly dependent on ground water resources. Further, most of the water needs of drinking water and industrial sectors are also fulfilled from ground water. As a result, the situation of over-exploitation has emerged in many rural & urban areas of the state and because of uncontrolled exploitation, pollution and ecological imbalance, this natural resource is seriously endangered.

For long-term management & planning and control of ground water exploitation, ground water conservation, harvesting and for effective coordination & monitoring of recharge schemes of different departments, the Ground Water Department has been declared as 'Nodal Agency' by the Government Order, dated 08 September, 2004.

The State Government is serious for the sustainable management of this resource alongwith its conservation and in this regard, the programmes like rain water harvesting, ground water recharge and aquifer management have been kept amongst the top priorities of the government.

At present, the management of ground water resources is quite challengeable, because integrated approach for executing and operating ground water conservation programmes is lacking at the state level and further as majority of schemes are running in isolation, the desired benefits are not being achieved. The main reason is that at present, there is no concrete plan for ground water management in the state.

Now this thinking is emerging at national level that the concept of "ground water management" should be applied in place of existing policy of ground water development/exploitation. It is worth mentioning that the Working Group on 'Sustainable Ground Water Management' constituted by the Planning Commission, Government of India, in reference to the 12th Five Year Plan, has emphasized in its report for integrated planning, monitoring and management of groundwater resources in the entire country, taking into consideration the goal of 'National Ground Water Management Programme'. Hence, top priority is accorded to aquifer mapping and aquifer based management in the entire country. It has also been stated in the report of working group that ground water resources should be given appropriate place in the policy decisions, programmes and plans.

Keeping in view the importance of integrated management of ground water resources and continuously increasing dependency on ground water in different schemes, the State Government has felt the need to prepare

“Comprehensive Ground Water Management Policy” in the state with the aim to implement rain water harvesting and recharge programmes in an integrated manner and to effectively minimize the existing level of ground water withdrawals through efficient water use techniques.

In this reference, in the meeting of ‘Executive Committee’ called on 28 June, 2012 under the chairmanship of the Chief Secretary, Government of U.P, the decision has been taken that responsibility be given to the Ground water Department to prepare comprehensive policy for ground water management, rain water harvesting and ground water recharge in the state. In this context, the Ground Water Department has been given the task of preparing comprehensive policy for ground water management, rain water harvesting and ground water recharge in the state, vide the government order dated 03 September, 2012, issued by the Chief Secretary, Government of U.P.

It is directed in the government order that all the departments would co-ordinate and work with the Ground Water Department, in this regard.

1. Preamble

‘Water is a natural resource, which is one amongst those five fundamental elements, that has created the universe. The importance of water in life is assessed by the fact that since ancient times, the development of human civilization has been taking place along the rivers, keeping in the view the availability and need of water. Though it is a limited resource, but despite limited availability, the resource is an important basis for the needs of human, living beings, along with food security and sustainable development.

Fortunately, most of the geographical area of Uttar Pradesh is overlain by the alluvial plain of Ganga-Yamuna rivers, which is one of the richest reservoir of ground water. In past years, to fulfill the various needs of this state, the dependency on ground water resources has excessively increased. Ground Water is an important component of ‘Water cycle’ and annual replenishment of this dynamic resource generally taken place from rain water and other resources, but without understanding these scientific aspects of this natural resource, with the mindset that the resource is unlimited, its unplanned and uncontrolled exploitation in irrigation, drinking water and industrial areas has taken place in past decades. Besides, there is no integrated system at present for the resource effective management and planning. These are the main reasons that the situation of regional inequality in ground water resources along with environmental imbalance has developed in the state and as a result, the resource is reaching to critical state in respect to the resource availability and quality.

In agriculture, industrial and urban areas after the decade of seventies, unprecedented development/withdrawal of ground water has been witnessed. While agricultural productivity has increased because of ground water based irrigation, the contribution of this resource is also the maximum in fulfilling the water demand of drinking water and industrial sectors. But, due to its unplanned and unlimited exploitation, adverse effects are also being noticed which mainly include problems like water level lowering, reduced availability of ground water, failure of tube wells, ground water pollution etc. Consequently, as a matter of concern, marked shortage is observed in ground water resource availability in many parts of the state, both in urban and rural areas.

There is a need of active initiative for effective solution of ground water crisis in the state in absence of an appropriate system for effective management, planning and conservation of this natural resource. Therefore, it has become a necessity to prepare a 'Comprehensive Policy' for consolidated management and effective conservation of ground water resources, so that sustainability be ensured for meeting the water requirements in different schemes/works and further the effective monitoring and implementation of ground water schemes being operated separately by different departments could be done in co-ordinated and integrated manner.

2. Challenges

- Ground Water in many parts of the State, is reaching to a stage of high stress from the point of view of quality as well as quantity due to which security of this natural resource has become a serious issue.
- Due to inequitable and unplanned development of ground water, the critical situation of over-exploitation as well as waterlogging has emerged in many regions.
- Policy efforts are needed towards judicious use of ground water and control of its unlimited withdrawal in both the urban & rural areas.
- Increasing pollution in ground water sources is affecting the sustainable supplies of potable water.
- Methodology for ground water assessment in urban areas is not decided and as a result realistic estimation of its availability is not being done.
- With respect to ground water problems, comprehensive and inter-disciplinary approach is required.
- Integrated and co-ordinated efforts are needed in reference to planning, management and use of ground water resources.

Based on the findings of different studies, four major problems in the State are identified as major challenges-

1. Availability of ground water resources affected due to widespread decline of ground water levels as a result of uncontrolled exploitation in many areas (rural/urban).
2. In canal command areas, crop productivity is affected due to water logging conditions emerged in the areas of shallow ground water level (0-3m).
3. Problem of potable drinking water and safe irrigation water supplies in many rural/urban areas due to chemical and bacteriological pollution, affecting ground water quality.
4. Problem of ground water recharge in Bundelkhand-Vindhyan region due to less ground water availability and high run-off of rain water.

3. Ground Water Scenario in the State

- In the State, ground water resources are mainly used in water based schemes-
 - Irrigation sector : 70 percent
 - Drinking Water : 80 percent
 - Industrial sector : 85 percent
- Growing dependency on ground water resources can be assessed by the fact that the rate of ground water development/ exploitation assessed as 54.31 percent in the year 2000, has increased to 72.16 percent in the year 2009.

The Most Stressed Blocks

- The finding of ground water availability estimation carried out in the year 2000, 2004 and 2009 have revealed that 07 blocks viz. Binauli (district Baghpat), Asafpur & Bisauli (district Badaun), Marhara (district Etah), Sambhal (district Sambhal,) Gangoh & Nakur (district Saharanpur) have been continuously categorized as over exploited/critical. Hence, from ground water point of view, the situation of these blocks is very serious and alarming.
- As per the resource estimation of the year 2009, in 13 over-exploited blocks, the stage of ground water development/exploitation is more than 150 percent if compared to the annual ground water recharge. The most critical situation is found in block Un and Shamli of district Shamli and block Nakur of district Saharanpur, where ground water development/exploitation stage is assessed respectively as 334.20%, 323.14% and 260.28 %.

- Large scale exploitation is being done from 41 lakh shallow tube wells, 25730 medium tube wells and 25198 depth wells in minor irrigation sector and 29595 state tube wells.
- Under the drinking water schemes, 5200 million litre ground water from 630 urban areas and more that 7800 million litre ground water from rural areas is being abstracted every day.
- In past years, ground water level decline is recorded in 630 blocks out of 820 blocks.
- As per ground water estimation (as on 31 March, 2009), 76 blocks are categorized as over-exploited, 32 as critical and 107 as semi critical in the State. In year 2000, the number of over-exploited/critical blocks was only 20, which has increased more than five times, i.e. 108 in the year 2009.
- In major cities, significant decline in ground water level is recorded at the average rate of 0.4m to about 1.0m per year, which is a serious situation. As per ground water level monitoring data, this decline is assessed at the rate of 91 cm per year in Meerut, 79 cm in Ghaziabad, 76 cm in Gautambudh Nagar, 70 cm in Lucknow, 68 cm in Varanasi, 65 cm in Kanpur, 62 cm in Allahabad and 45 cm in Agra.
It is clear that the stress on ground water resource is continuously increasing in the State.

4. Vision

- Setting of goals based on the principle of sustainable ground water management in the state, according to different hydrogeological conditions and implement these goals.
- Implementation of aquifer mapping and aquifer based ground water management in the entire state for integrated development, conservation and protection of ground water resources.
- Efficient management for the exploitation and use of ground water in the state as well as for its recharge and augmentation.
- Making provision for effective, regulatory and legal structure in the state for ground water exploitation, development, protection and conservation.

5. Goals

- To formulate aquifer based ground water management plan for the entire state for its implementation on priority on the principle of “participatory management”.
- To bring over-exploited/critical blocks into safe category by keeping stage of ground water development/exploitation below 70 percent relative to ground water recharge by integrated efforts.
- To implement integrated management of surface water and ground water for drinking water supplies in urban areas.
- To promote efficient use of water and to stop wastage of water by creating awareness.

6. Objectives

- To ensure regulated exploitation and optimum & judicious use of ground resources.
- To initiate National programme of aquifer mapping and aquifer based management in the state on priority basis in a planned way for the purpose of overall ground water management.
- To implement ground water recharge programme on a large scale in an integrated manner and to bring over-exploited/critical blocks into safe category in a time bound manner.
- To effectively implement conjunctive use of surface water and ground water.
- To promote efficient methods of water use in the stressed ground water areas.
- To give priority to the river basin/watershed approach in ground water management planning and conservation.
- To identify ground water polluted areas in order to ensure safe drinking water supplies in such affected region.
- To implement ground water conservation and recharging programmes by the concerned departments through participatory management approach in a co-ordinated and integrated manner.
- To make provisions of effective legal structures for ground water management.
- To promote research and training along with public awareness.

7. Strategy and Main Action Points

7.1 Aquifer Mapping and Aquifer based Ground Water Management.

- The National Programme of Aquifer Mapping and Aquifer based Management is proposed to be taken-up on a big scale for overall management of ground water resources.

In the Strategy formulation, following points have been given priority :-

- Ground Water development is the need of state, therefore long-term management and planning is the need of the hour, especially for the stressed areas like over-exploited/quality affected areas.
- For the proper augmentation/recharge of ground water and control of its pollution in the state, the immediate need is take appropriate steps for conservation, protection and development of ground water resources.
- For the judicious and optimum use of ground water resources, the need is to promote efficient irrigation techniques, to encourage low water consuming crops through appropriate changes in crop system, to promote soil moisture conservation and to promote demand side management & other water management methods.
- To decide minimum distance between ground water structures.
- Legal interventions for ground water exploitation, use, recharge and quality control.

- As such in future, strategy for execution of schemes related to ground water resource planning, exploitation, use and conservation will depend upon area-specific aquifer management plans.
- The plan is proposed to cover the areas identified under this national programme in next 10-15 years in a phased manner.
- The implementation of this major programme will be done in co-operation with Central Ground Water Board, Ground Water Department and other concerned state departments.
- Aquifer Mapping will also be carried-out under the state sector on priority basis during 12th five year plan.
- Based on the above mapping, aquifer based ground water management plan will be prepared, which will decide the direction of overall development, conservation and planning of ground water resources in the state.

Participatory Management

- Emphasis will be given to aquifer-wise ground water management by adopting the participatory approach.
- This programme is being observed as a major reform/initiative in the field of ground water management.

Programme of aquifer mapping and aquifer management is not simply preparing aquifer maps, but this programme would be a significant effort towards the effective solution of challenges related to water demand of next 50 years along-with achieving goal of efficient and participatory management in the entire country including this state. In future, as a result of this programme, management of ground water will be done as single aquifer unit.

7.2 Optimum Use of Ground Water and Planned Management of its exploitation.

It has now become imperative for the protection of ground water resources in the state that concrete interventions be applied for promoting its judicious, optimum and efficient use and also for its planned development/abstraction.

- It is generally observed that in ground water based supplies huge quantity of ground water usually goes waste due to faults existing in water distribution system. As per an estimate, in cities, large amount of drinking water is lost every day because of leakages in water supply distribution network, whereas in rural areas also, ground water goes waste due to field losses while traveling to fields from the tube wells. Besides, due to lack of adequate knowledge, excess irrigation more than the required water to the crops also amounts to excessive withdrawals of ground water.

(a) Management Interventions for Urban Areas

There are 630 urban bodies in the State, where majority of drinking water supplies are ground water based. As a result, ground water resources in many cities are under high stress. For sustainability of ground water sources in these stressed cities, emphasis would be given to take-up following 'Management Interventions':-

- To check about 40 percent losses due to leakages in water supplies, Jal Nigam would take effective steps, so that ground water is saved along with reduction in ground water withdrawals.
- In order to reduce the existing level of ground water withdrawals in the urban areas, need-based drinking water requirement be assessed and accordingly ground water resources be exploited. In this regard arrangement like rostering can be considered for controlled exploitation of ground water.
- Existing tubewells in the major cities, withdrawing ground water from the stressed aquifers, be closed in a phased manner and new tubewells be constructed in second aquifer group marked as alternate aquifers, based on the recommendations of Central Ground Water Board. This would be geo-scientifically appropriate for long term ground water management. In this respect, framing a concrete strategy be considered.
- In order to reduce the stress of ground water withdrawals within the urban limit, tubewells in new drinking water supply schemes be constructed in those peri-urban areas, where appropriate and potential aquifers are located. In such areas, battery of tubewells may be constructed to ensure sustainable supplies in the cities. Appropriate action at the level of Urban Development Department be considered in this respect.
- For sustainable drinking water supplies in the cities situated on the banks of river Ganga, tubewells could be constructed in the first aquifer group located upto 150m. Depth to ensure the water supplies, as revealed in the findings of scientific studies of Central Ground Water Board that potential aquifers of regional level

identified on both the banks of river Ganga. Findings of these studies be considered for appropriate action.

- For meeting the drinking water requirements, dependency on ground water be reduced and surface water based schemes be promoted.
- Ground Water auditing is proposed, keeping in view the balanced use and controlled extraction of ground water resources.

For the above, action would be taken-up at the level of Jal Nigam, Urban Development Department and Housing & Urban Planning Department.

(b) Management Interventions for Rural Areas

For providing irrigation to crops like Rabi, Kharif, Jaid, sustainable supplies of water is the foremost requirement in this agrarian state. Due to its easy availability, ground water resource has established as a major irrigation source in the state. This is the reason that maximum irrigation is being done from ground water sources. But in this process, ground water use has increased to unlimited extent and as a result, situation of over-exploitation has emerged in many areas. As, ground water is a limited resource, new options/approaches need to be applied to fulfill the growing demand of irrigation water in agriculture sector, so as to reduce ground water withdrawals to an effective level, especially in stressed areas.

- To check the field leakage during water transmission from tube well, to fields, 'pipe irrigation' as loss-free water distribution system be largely promoted by the Minor Irrigation and Irrigation (Mechanical) Department, so that wastage of water could be minimized.
- In areas, where irrigation is mostly dependent on shallow tubewells new tubewells would be constructed in relatively deeper strata (alternate aquifers).
- For the optimum utilization of ground water in the state tubewell based irrigation, sprinkler system be included by the Irrigation (Mechanical) Department, so that reduction in the pace of ground water withdrawal alongwith improved management of irrigation water could be ensured.
- Conjunctive use of canal water and ground water be promoted and in this context, policy action be considered at the level of Irrigation Department. With this approach, balanced and optimum use of surface water and ground water could be ensured and the water logging problem could also be solved.
- In over-exploited areas, farmers be encouraged to use canal water for irrigation.
- Efficient water use irrigation practices like sprinkler and drip system be promoted by the Agriculture Department on large scale focusing the stressed areas.
- For promoting low water consuming crops in stressed areas, the schemes be prepared and also possible changes be made in the crop-rotation as per the local acceptability by the Agriculture Department.

- Crops/species, found suitable in various agricultural studies for the over-exploited/critical and water logged areas be adopted and schemes be prepared by the Agriculture Department to popularize such crops amongst farmers.

National Mission for Micro-Irrigation

Scheme of micro-irrigation system like drip and sprinkler for providing irrigation to horticultural crops under the National Mission on Micro-Irrigation is operationized in all the districts of the state. For implementation of this scheme, over-exploited/critical blocks be given priority.

7.3 Rain Water Harvesting and Ground Water Conservation/Recharge

Ground water recharge method is an artificial augmentation technique, which is applied for recharging of ground water resource through different water harvesting/storage and recharge structures based on the local hydrogeological conditions.

In the past, desired results could not be obtained as majority of departmental schemes of rain water harvesting and groundwater recharge were executed in isolation and any significant impact of these schemes on ground water resources has also not been observed. Besides, there are also possibilities of duplicacy of works. It is imperative that the recharge schemes be implemented in an integrated manner based on geo-scientific norms, so that ground water situation could improve.

- Comprehensive technical guidelines for ground water conservation/recharge are being reworked by the Ground Water Department. Ground Water Recharge Manual will be prepared, which would include simple models and techniques of recharge.
- The traditional methods of rain water harvesting and recharge are not adequate. Keeping this in view, the Minor Irrigation and Irrigation (Mechanical) Department should consider to start pilot schemes for assessing the feasibility of those techniques of recharge, which could recharge on a large scale. The idea is that from the areas with abundant water or additional water available in canals etc., pumping could be done to recharge aquifers of stressed areas with huge quantity of water. But ensuring water quality will be essential before launching such schemes.
- For experience sharing, the findings of participatory watershed management implemented in Gujrat, Andhra Pradesh and other states would be considered for implementation in the state.
- Provision for impact assessment of recharge structures and their maintenance would be envisaged in the related schemes.
- For introducing a chapter related to rain water harvesting and ground water recharge in the syllabus of Class 4th to 12th, appropriate action be taken at the level of Education Department.

(a) Ground Water Conservation in Urban Areas

- Scheme to prepare comprehensive recharge plans for ground water stressed major cities is initiated by the Ground Water Department.
- The provisions of government orders for ground water recharging issued during past years will be reviewed and based on hydrogeological parameters, a comprehensive government order will be reworked by the Housing & Urban Planning Department and Ground Water Department.
- Roof top rain water harvesting system on buildings alongwith 'Combined Recharge System' be implemented on priority by the Housing & Urban Planning Department. With this system, previously constructed and newly constructed buildings/group housing schemes on all type of plots could be covered. In stressed urban areas, 'combined recharge system' would be the most appropriate technique for implementing rain water harvesting and ground water recharging on large scale in an easy and practical manner.
- In order to ensure maximum recharge of rain water from roof tops, the mandatory provision of installing recharge systems on the plots of size 300m and above be reduced to 200m, keeping in mind the practicability of this provision.
- In order to conserve surplus run-off which goes waste in huge quantity during monsoon season, the possibilities of 'pavement-storm water harvesting' be assessed and the Urban Development and the Housing & Urban Planning Department should consider implementation of such technique.
- For ensuring compliance of mandatory provisions of roof top rain water harvesting system and combined recharge system, effective arrangement of enforcement and monitoring be implemented by the Housing & Urban Planning Department.

Recharge Techniques for Urban Areas

- Roof Top Rain Water Harvesting-
 - Recharge pit
 - Recharge trench
 - Recharge well
 - Recharge shaft
 - Well (dug well)
 - Pond
 - Surface storage tank
- Pavement-storm Water Harvesting

- Before constructing recharge well structures, it should be ensured that any polluted water should not reach to ground water resources.
- Strict compliance of existing provisions, including rejuvenation of ponds, construction of new ponds in new housing schemes (both government and private) be ensured by the Housing & Urban Planning Department.
- Roof top rain water harvesting system is mandatory for government/ semi-government buildings. Strict compliance of this provision be ensured by all the departments.

- Establishment of 'Technical Cell' and appointment of experts for providing technical advice to the public be considered by the Development Authorities and the U.P. Housing & Development Board.
- For developing stressed cities as "Rain Water Harvesting City", possibilities of P.P.P. model and private sector participation be considered. In this regard, necessary action would be taken by the Urban Development Department.
- Website will be made interactive to provide informations regarding rainwater harvesting/recharge techniques.

(b) Ground Water Conservation in Rural Areas

- Integrated recharge plans will be prepared to bring over-exploited/critical blocks of the state into safe category. Action is initiated by the Ground Water Department.
- Implementation of these Action Plans would be implemented in an integrated manner by the Minor Irrigation, Jal Nigam, Land Development and Water Resources, Agriculture, Irrigation, Forest, Ground Water Department etc.
- The recharge schemes being run by the concerned departments would be included in the proposed works in the above action plans.
- Ponds, reservoirs and lakes be freed from encroachment to use them for water storage/conservation.

Master Plan

- Central Ground Water Board has prepared Master Plan for the Artificial ground water recharge for Uttar Pradesh, costing Rs. 9429.28 crore, which envisaged Rs. 1800 crore for Roof Top Rain Water Harvesting.
- In this plan, 110783.14 sqkm. area of the state is reported as suitable for recharge. It is proposed that about 5185 MCM water would be available for recharge.

- 'Recharge Activity Core Team' constituted in the stressed districts will be made more effective and to speed-up the rain water harvesting programmes, the Ground Water Recharge Task Force constituted at state level will provide required technical co-operation.
- Semi-critical blocks be considered as warning for the future. Hence, public will be motivated in such blocks to bring down the ground water withdrawals through public awareness programmes.

Suitable Techniques for Rural Areas

Recharge basin, ditch & furrows, flooding, pond/farm pond, peripheral bund, contour bund/contour trench, nala bund, checkdam, gabion, gully plug, percolation tank, sub-surface dykes, dug well recharge etc.

(c) Ground Water Conservation in Industrial Areas

- In Industrial areas, Pollution Control Board would ensure careful implementation of the rain water harvesting and ground water recharge techniques, which would be applied by using geo-scientific norms, so that any possibility of pollution reaching to ground water sources should not occur.
- In such areas, roof top rain water harvesting, recharge pit, recharge trench, storm water harvesting techniques be used only for surface storage. Due to risk of ground water pollution, recharge well method should not be encouraged.
- The polluted effluent of industries be treated for its maximum re-use and recycle.

(d) Ground Water Conservation and Watershed Programme

From the scientific point of view, micro watershed/micro basin approach should be adopted for comprehensive planning of rainwater harvesting and ground water recharge. In future, co-ordinated efforts are needed in this direction.

- Emphasis will be given to saturate each micro watershed by recharge structures.
- Despite adequate rainfall and high run-off in the rocky terrain of Bundelkhand-Vindhyan, the aquifers are not being recharged as expected. Micro watershed based integrated plans be prepared and implemented by the Minor Irrigation, Agriculture, Land Development & Water Resources department etc. for adequately recharging the aquifers in these areas.
- Under the "Integrated Watershed Management Programme" (IWMP), funded by the Government of India, rain water harvesting and recharge works are being implemented by the Agriculture and Land Development & Water Resources department. The condition is kept for this programme that these works be carried-out in such areas, which are un-irrigated or where irrigation facility is less than 30 percent. This programme cannot be implemented in those areas where irrigation facilities are adequate.
- Land Development & Water Resources Department has prepared a perspective plan for 85.09 lakh hectare area for 70 districts of the state under IWMP, where, as per the provisions of the scheme, different conservation works are proposed in about 4 lakh hectare area falling in 108 over-exploited/critical and 107 semi-critical blocks.
- In those areas within the over-exploited and critical blocks, where irrigation facilities are adequate, request be made to the Government of India to relax the above conditions for initiating the schemes of Integrated Watershed Management Programme.

(e) Impact Assessment and Maintenance of Recharge Works

- In the action plans of rain water harvesting and ground water recharge, it would be ensured that whatever works under this plan are executed or proposed, their impact on ground water resources be

assessed. Therefore, provision of impact assessment will be made in the recharge schemes and the responsibility of preparing impact assessment report will be of the concerned departments.

- In order to keep ground water recharge structures functional, provision for regular maintenance of these structures will be included in the schemes.

7.4 Setting Ground Water Regulation Process

At present there is no legal system in the state for ground water management and regulation.

- Under the existing government provisions, any government scheme of tubewell construction is not implemented in over-exploited/critical blocks.
- For rain water harvesting and recharging in Urban areas, the installation of roof top rain water harvesting system has been made compulsory with certain provisions in the building by laws. This system is also made mandatory for government buildings.
- For regulated & controlled exploitation of ground water resource and its harvesting/conservation in the state, formulation of practical and acceptable regulation process will be considered separately for both urban and rural areas.
- On the basis of "Chennai Metropolitan Area Ground Water (Regulation) Act-1987", preparation of separate ground water act for the urban areas of the state be considered.
- Minimum inter spacing between previously constructed/structures to be constructed for ground water abstraction be determined on scientific basis for source sustainability.
- The existing provision of issuing no-objection certificate for ground water development for the commercial, industrial, residential and road construction purposes will be made technically more effective.
- Intensive monitoring and control system for ground water pollution under Environment Protection Act be considered by the Pollution Control Board/Environment Department.

7.5 Continuous Monitoring of Ground Water Quality and Environment Protection

- The quality of ground water resources along with its adequate availability is also extremely important. The finding of studies conducted by various departments reveal that the situation of ground water pollution in many areas of the state is of great concern.
- Quality of ground water in many districts is affected by the contamination of various chemicals & heavy metals and adverse effects of such polluted ground water are noticed on the public health. Possibilities are indicated that such pollution prevalent in ground water may reach in food chain through irrigation water. Cases of adverse impact on ground water quality due to dumping of untreated effluent by the industries in the landfills have been reported.

- Large number of handpumps and irrigation tubewells are installed in the state, but provision to assess ground water quality is not there.
- An integrated action plan for mapping of ground water quality be prepared by the Ground Water Department. On this basis, GIS based comprehensive mapping of ground water quality will be carried-out with the co-ordinated efforts of U.P. Jal Nigam, Drinking Water and Sanitation Mission, Ground Water Department, Pollution Control Board/Environment Department.

The programme for preparing Village Drinking Water Security Plans has been initiated under the National Rural Drinking Water Programme of the Government of India. In Uttar Pradesh, in the first phase, comprehensive plans for drinking water security would be prepared for over-exploited Mauranipur block of district Jhansi and over-exploited Barauli Ahir block of district Agra with the objective to ensure sustainability of village wise ground water sources and monitoring of drinking water quality. This scheme needs to be extended to other stressed areas of the state.

- For continuous monitoring of ground water sources, action will be taken-up as per guidelines of Water Quality Assessment Authority constituted by the Government of India. For uniform protocol, the authority has issued water quality monitoring notification, 2005.
- At the state level, Water Quality Review Committee will be reorganized as per the direction of Water Quality Assessment Authority.
- Permanent monitoring stations be established in the urban and rural areas by the Ground Water Department for intensive monitoring of ground water quality.
- For monitoring of ground water level and quality in industrial units, the compliance of mandatory provision for piezometer installation would be effectively ensured by the Pollution Control Board.
- The co-operation of Ground Water Department, Pollution Control Board, Jal Nigam, Drinking Water and Sanitation Mission and other concerned institutions will be ensured for these works.

7.6 Ground Water Study and Research

Following study/research works will be carried-out by the Ground Water Department with the co-operation of other departments.

- According to the guidelines of Ministry of Water Resources, Government of India, blockwise Ground Water Resources Estimation will be done at an interval of every two years.
- Scientific norms for estimation of ground water resources in urban areas be formulated.
- Modern methods such as remote sensing, isotope method be used for ground water assessment.
- Districtwise GIS based ground water maps will be prepared.

- New investigations and research studies in ground water sector will be promoted:-
- Hydrogeological analysis for calculation of ground water flow, its availability, storage, specific yield and modern geo physical techniques (resistivity imaging, digital geophysical logging) will be ensured in ground water surveys.
- Ground water modeling will be initiated for future planning.
- Pilot study for base flow and ground water-river water interaction will be carried-out.
- Establishment of high level “Ground Water Research and Training Institute”, as a Centre of Excellence in the state will be considered for promoting the advanced researches and studies in ground water sector.
- Regionwise scenarios of existing ground water problems be prepared based on the available informations/data for ground water planning, assessment of its use and abstraction in different sectors, especially minor irrigation, drinking water and industrial areas alongwith estimation of resource availability, will be carried-out on priority basis. For ensuring concrete information on withdrawals being done at the private level in the cities, developing a monitoring arrangement be considered at the level of Urban Development Department.

7.7 Management of Ground Water Data

For efficient management of ground water resources, availability of diversified ground water data is the prime requisite. At present “integrated information system” for ground water is not available in the state. As such, assessment of ground water resource scenario is difficult while formulating sectoral plans. In the state, though there is a huge reservoir of ground water related data available with various departments, but as there is no consolidated arrangement for the management of such data, its proper use in different schemes could not be ensured.

- Organized approach for collection and analysis of reliable data of ground water resources available with different departments will be ensured.
- With the objective to ensure effective management of ground water data in the state, a GIS based efficient “Ground Water Data Bank and Information System” (State Ground Water Informatics Centre) will be developed, as per the need of various sectors in the Ground Water Department.
- Data/informations, except the classified data, will be available in the public domain through Website.
- Minor Irrigation, Irrigation, Jal Nigam, Pollution Control Board, Rural Development, Urban Development, Housing & Urban Planning Department and other concerned departments will provide the data/informations on regular basis as required.

- Following data/informations will be required from the departments:-
 - (i) Minor Irrigation Department
 - Blockwise data related to private/shallow, medium and deep tubewells.
 - Data of irrigated areas from ground water.
 - Data related to ground water recharge structures.
 - (ii) Irrigation (Mechanical) Department
 - Blockwise data related to state tubewells.
 - Data of irrigated areas from ground water.
 - (iii) Irrigation Department
 - Data related to irrigated area and maps of blockwise command/non-command areas.
 - Length of blockwise canals (unlined/lined)
 - Data of canal irrigated areas.
 - (iv) U.P. Jal Nigam.
 - Data related to ground water based drinking water schemes in rural and urban areas.
 - Ground water quality data.
 - (v) Rural Development Department
 - Data related to rain water harvesting/recharge.
 - (vi) Pollution Control Board.
 - Data related to ground water exploitation/use in the industrial sector.
 - Data related to ground water conservation/recharge.
 - Ground water level and quality data monitored in the piezometers installed in the industries.
 - Data of ground water quality.
 - (vii) Housing & Urban Planning Department
 - Data related to roof top rain water harvesting and rain water conservation schemes.
 - Data related to of ground water use/exploitation in housing schemes of government/private sectors.
 - (viii) Agriculture/Forest/Land Development & Water Resources Department
 - Data related to rain water harvesting and recharge.
 - Data of the watershed management works.
 - Informations related to efficient water use.
 - (ix) Remote Sensing Application Centre/State Water Resources Agency.
 - G.I.S. based data/maps and ground water related study reports/findings.

- (x) Data related to ground water use from Railway Department, data related to ground water use and its withdrawls in the residential premises of state government departments.
- (xi) Data related to rainfall (Indian Metereological Department/ Revenue Board)

Information/data will also be collected from other related departments, universities, scientific/technical institutions as per need.

7.8 District-wise Water Management Plan

- “Water Management Plan” will be prepared for every district based on the local hydrogeological conditions, which will be separate for urban as well as rural areas.
- Sensitive areas from ground water point of view will be delineated.
- For judicious use, regulated exploitation, conservation and security of ground water resources in each district, effective strategy and priorities will be decided through district level water management plans.
- For fulfilling sectoral needs and to overcome the existing ground water problems, short term and long term action plans will be earmarked in the district plans.

7.9 Training, Publicity-Extension and Public Awareness

Ground water resources have emerged as an inseparable part of development schemes in the state, in view of that, it has become imperative that the informations on different dimensions/aspects of ground water should reach the people at large.

- With an objective of public awareness, “Ground Water Week” being organized every year from 16th July to 22nd July would be made more extensive.
- For extensive ground water awareness, schemes will be prepared for propagating message of ground water conservation by launching large scale movement from “Panchayat to Panchayat” in rural areas and from “School to School” in urban areas.
- At government and non-government level, the capacity building and training programmes would be conducted in an effective manner. For this, desired co-operation would also be taken from the Water and Land Management Institute (WALMI), U.P. Administration and Management Academy, State Rural Development Institute.
- For development of Information- Education- Communication (IEC)related to ground water, action need to be taken at the level of Ground Water Department.
- Efforts be made to link industrial, commercial, mercantile, non-government organizations in ground water publicity, programmes.
- For ground water awareness, co-operation will be needed from Bhumi Sena of Agriculture Department, Water user association of Irrigation Department and Resident welfare committees in urban regions, civil defence and other active organizations.

7.10 Strengthening of Existing Institutional System

The need is to establish a well-defined institutional structure for ground water sector in the state.

- For new challenges of ground water, the Ground Water Department shall be strengthened with a new vision.
- In view of imminent crisis of climate change and new problems of ground water sector, the reorganization/strengthening of other departments related to ground water is also imperative with the overall goal of strengthening of institutional system. In this regard, study will be conducted to assess the possibilities/requirement of department-wise reorganization/strengthening.
- In the institutional system, such an arrangement would be considered for implementation, which may lead to integration of planning and development process related to ground water.
- Most of the departments of the state are dependent on ground water resources for their departmental schemes or fulfillment of water related needs, but presently, following departments are directly linked with ground water schemes/programmes:-
 - Minor Irrigation Department
 - Irrigation Department
 - Irrigation (Mechanical) Department
 - U.P. Jal Nigam
 - Agriculture Department
 - Housing & Urban Planning Department
 - Urban Development Department
 - Rural Development Department
 - Drinking Water and Sanitation Mission
 - U.P. Pollution Control Board
 - Industrial Development Department
 - Public Works Department
 - Forest Department
 - Construction Agencies under the control of State Government.

8. Formulation, Inter-departmental Coordination and Implementation of Schemes

- In preparing/implementing ground water based schemes, area-specific hydrogeological conditions and technical guidelines would be included by the concerned departments, so that there may not be any adverse impact on ground water resource and the scheme shall remain environmentally compatible.
- Presently, there is no separate arrangement available in the concerned departments for formulation of ground water related schemes. Therefore, to provide guideline/proper technical support and inter-departmental co-ordination, in the formulation of such schemes, a 'Separate Cell' with efficient expertise be established in Ground Water Department.
- All concerned departments viz. minor irrigation, agriculture, urban development, housing and urban planning, land development and water resources, rural development, panchyati raj, Jal Nigam, drinking water and sanitation mission,

industrial development, pollution control board, environment, forest, concerned central departments/establishments, other stakeholders shall maintain mutual co-ordination for achieving the objective of policy.

9. Monitoring and Review

- Implementation and compliance of provisions/guidelines of comprehensive ground water policy would be ensured at different levels in a time-bound manner. For its regular monitoring and review, “Comprehensive Ground Water Policy Monitoring and Review Committee” shall be constituted under the chairmanship of Agriculture Production Commissioner.
- For assessing the impact while achieving the goals, the committee can also take-up third party study as per the need.
- Checking of implementation, analysis and efficacy of different schemes related to ground water shall be done as per directives of the committee.
