RAJASTHAN GROUND WATER

VISION - 2025

RASTHAN GROUND WATER DEPARTMENT, JODHPUR

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Rajasthan Ground Water - Vision 2025

The State of Rajasthan encompasses an area of 3.42 lac km^2, in northwestern part of the country. The climate in general varies from arid to extreme arid in the western half of the State. The eastern half of the State has semi-arid climatic conditions. The southeastern and southern part of the State however has sub humid climatic conditions. The area west of Aravallies receives low and erratic rainfall less than 300 mm Fig. 1. Rainfall increases in the eastern part up to 900 mm. The draught in succession is a most common phenomenon of the western desert Rajasthan. Most of the western part of the State is devoid of well-developed drainage system. The state can be broadly divided into four main physiographic regions, Fig. 2. These are given as below:

Western Sandy Plains

1.1 Sandy Arid Plains.
1.2 Semi Arid Transitional Plain
  (a) Ghaghar Plain
  (b) Plain of Interior drainage
  (c) Luni basin

Aravalli Hilly Region

2.1 Northern hilly region.
2.2 Synclinal Range
2.3 Southern range & Bhorat Plateau

Eastern Plains

3.1 Plains of Mewar or Banas basin
3.2 Chappan Plain

Southeastern Pathar (Hadoti Plateau)

4.1 Vindhyan Scrap land
4.2 Deccan Lane Plateau

The Western Sandy Plains occupied by the Thar Desert is water scarce. The dynamic ground water resources are meager as such most of the water demand in the region depends upon exploitation of ground water from static resources. Ground water availability in other three regions largely varies with rainfall condition during a particular year. Population explosion combined with increase in per capita consumption of water has created tremendous pressure on the water resources. On the contrary the ground water resources are rapidly depleting and at places with deterioration in quality, availability of safe drinking water is regularly reducing. The Stage of ground water exploitation, which was just 35% in the year

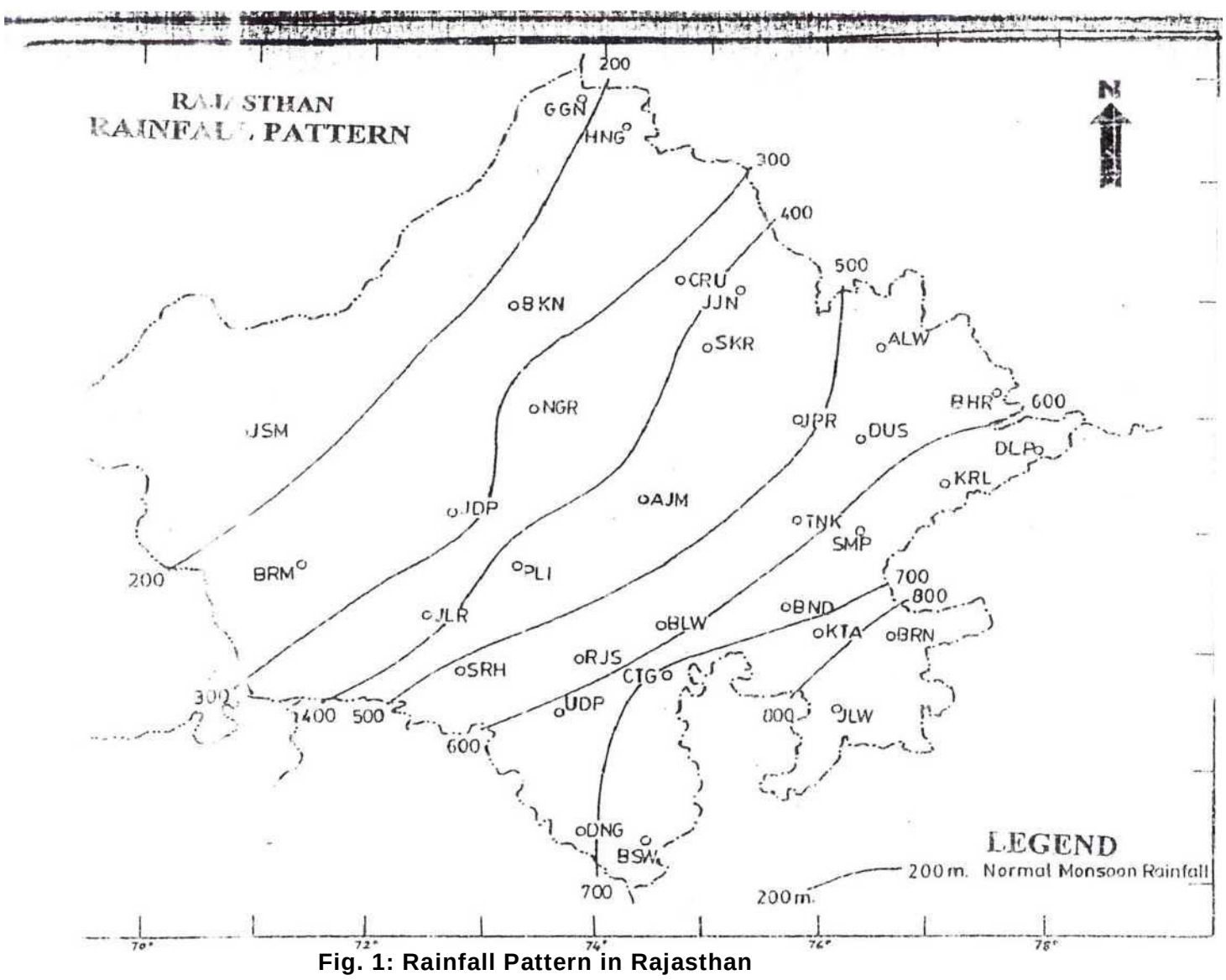


Fig. 1: Rainfall Pattern in Rajasthan

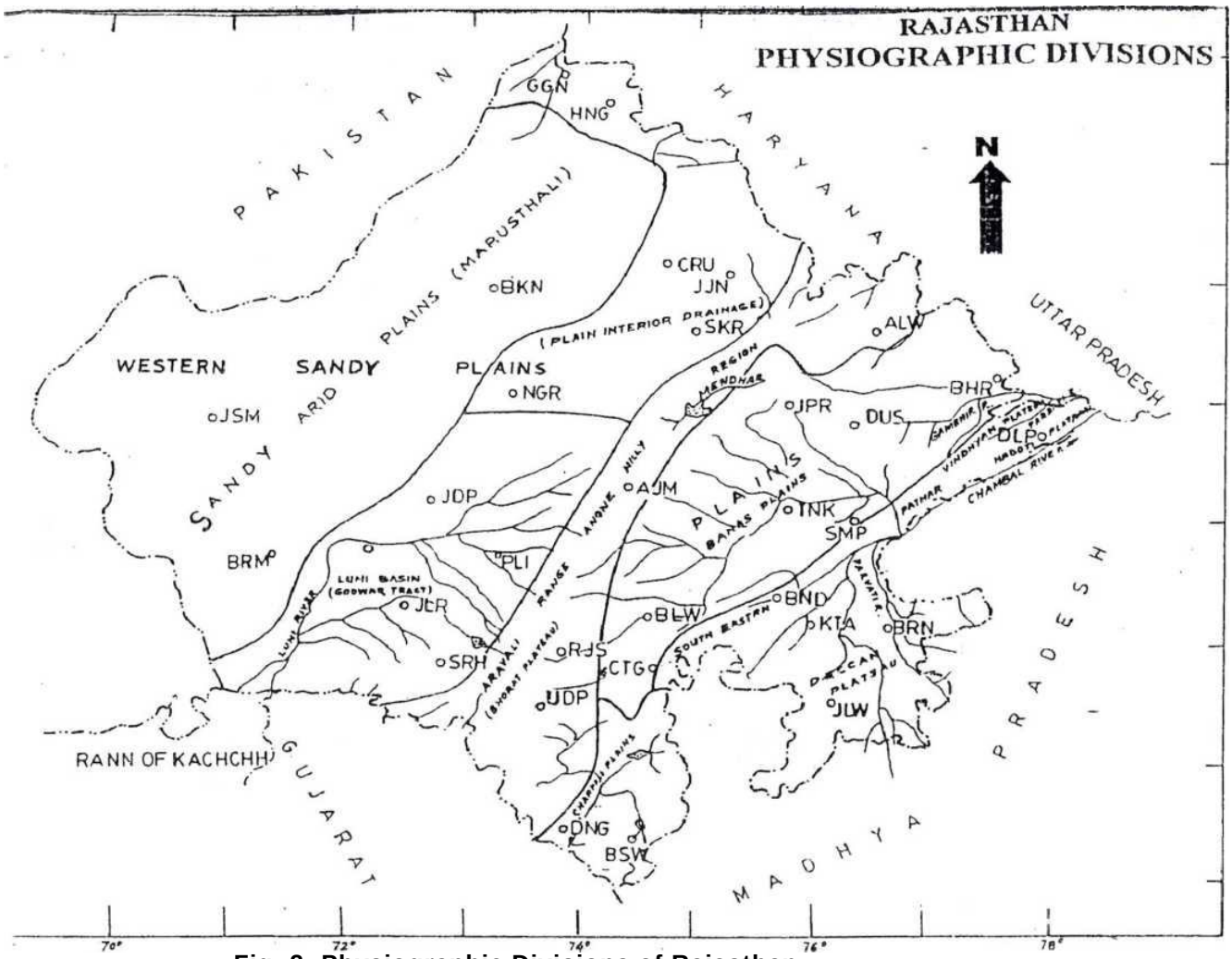


Fig. 2: Physiographic Divisions of Rajasthan

1984 has attained a level of 134.53% in the year 2009. Out of 239 blocks of the State presently only 31 blocks have been categorized in “Safe Category”, 16 blocks in “Semi Critical” and 191 blocks in “Critical and Over Exploited category”, Table-1. The block categorized as safe or semi critical are generally located in areas having saline ground water or low development activities in western part of Rajasthan. The ground water levels in major part of the state are depleting at alarming rate. The number of problematic villages in peak summer period are regularly increasing. This situation entails proper management and development measures be adopted for this vital resource without further loss of time.

GROUND WATER MANAGEMENT PROBLEMS

(a) Ground Water Level Depletion

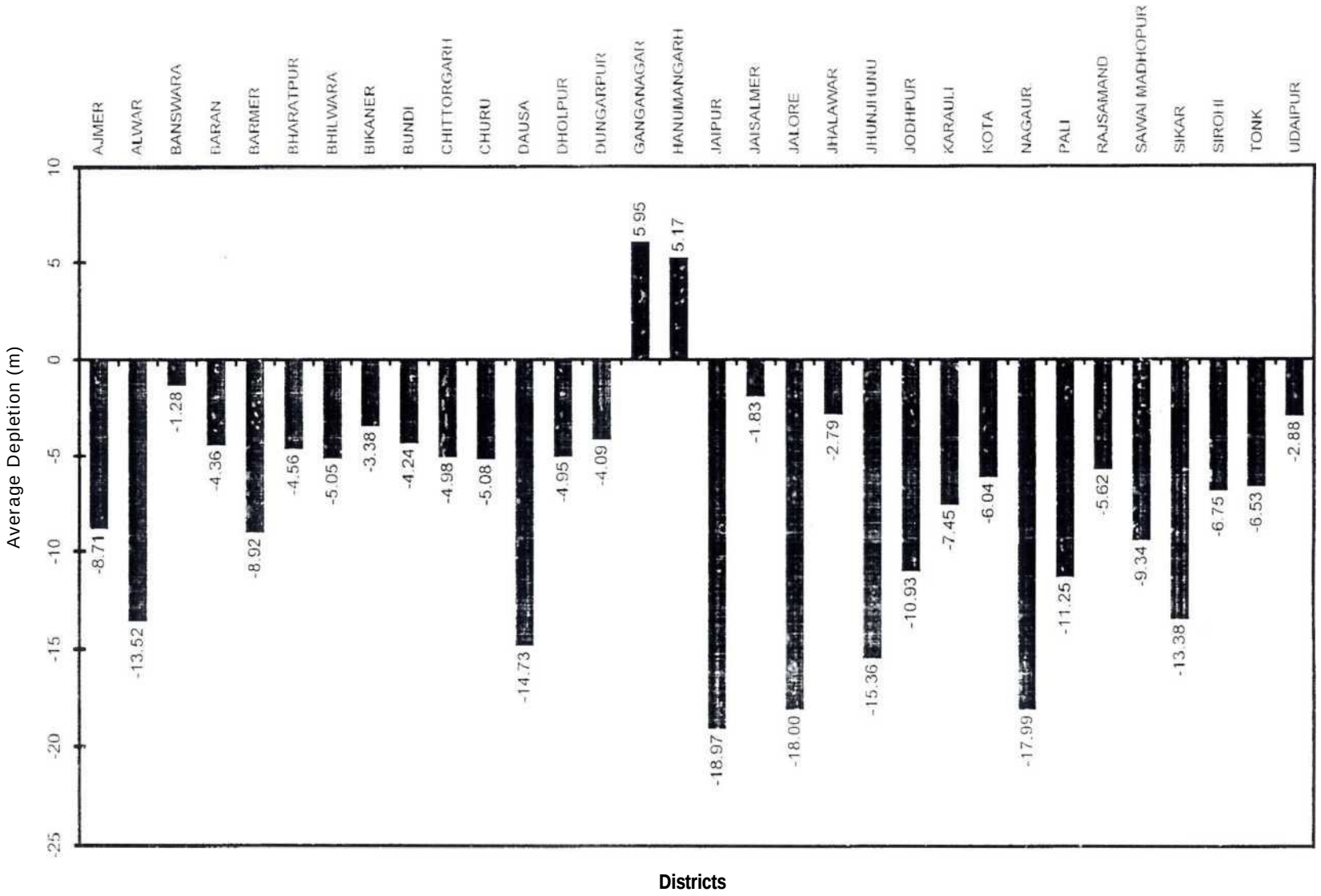
Analysis of long term water level trends since 1984 to 2009 reveal wide spread depletion of water

level in varied magnitude. Out of 33 districts of the state only 2 districts, Sri Ganganagar and Hanumangarh located in I.G.N.P. Canal Command area are only exceptions, which exhibit rising trend of water level. Remaining 31 districts of the State exhibit depletion in water level, Fig.3. It shows that 9 districts namely Alwar, Dausa, Jaipur, Jalore, Jhunjhunu, Jodhpur, Nagaur, Pali and Sikar districts have depletion of more than 10 m. Other 10 districts namely Ajmer, Banner, Bhilwara, Churu, Karauli, Kota, Rajsamand, Sawai Madhopur, Sironi and Tonk districts have depletion between 5 to 10 m. Remaining 11 districts comprising Banner, Baran, Bharatpur, Bikaner, Bundi, Chittorgarh, Dholpur, Dungarpur, Jaisalmer, Jhalawar, Pratapgarh and Udaipur districts have depletion less than 5 m. The water level depletion rates in general have been observed less in canal command area or area having saline ground water or where development activities are low. In other parts of the State water level trend largely varies with rainfall condition during a particular year.

(b) Industrial Pollution

Ground water quality is polluted at number of places due to discharge of untreated industrial effluents. The textile industries located in Balotra, Pali, Bhilwara and Sanganer are some of the examples where industrial effluents have polluted ground water quality.

FIG. 3: GROUND WATER LEVEL TREND IN THE STATE OF RAJASTHAN
(1984-2009)



(c) Sewage Pollution

Most of the Municipal areas of the State do not have proper sewage system. The sewage water is generally discharged into natural drainage course without treatment. The treatment plants of adequate capacity are thus required to be installed to treat sewage water before discharging into natural drainage courses.

(d) Water Logging

The State of Rajasthan has three major canal command area. These are Indira Gandhi Nahar Pariyojna (IGNP), Chambal and Mahi Canal Command Area. The water logging conditions are of concern in IGNP area. In other two areas, it occurs in localized pockets. To control water logging condition conjunctive use of surface and ground water resources will require to be given attention.

(e) Water Pricing

The rates of the domestic water supply are much lower than the actual cost. The under pricing of domestic water is main cause of indiscriminate use of water. The domestic water supply rates are needed to be revised keeping in view the actual cost incurred on it.

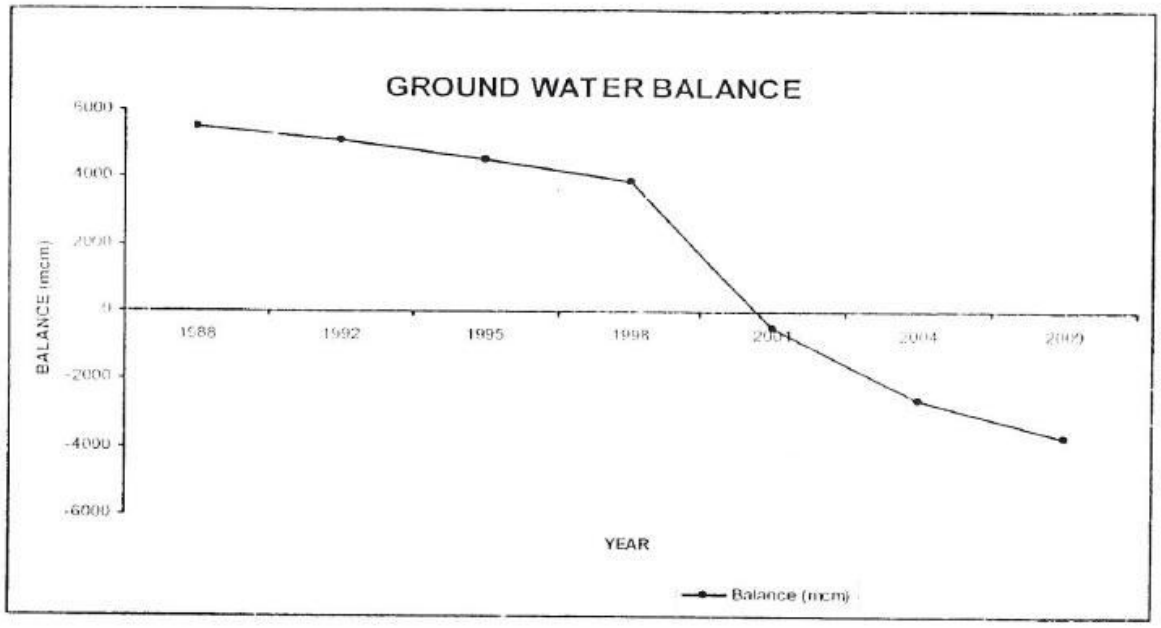
GROUND WATER RESOURCE VISION FOR 2025

Ground Water Resource Estimation

The ground water resource estimation in the state of Rajasthan is being carried out regularly as per GEC guide lines, table-1 &Fig.-1. The projected resource position of the resource by the year 2025 has been given as follows:

(i)	Annual Ground Water Replenishment	=	11156 mcm
(ii)	Ground Water Draft	=	21410 mcm
(iii)	Ground Water Balance	=	(-) 10254 mcm
(iv)	Stage of Ground Water Development	=	191.90%

Ground water replenishment in the State mainly takes place through monsoon rainfall. Annual ground water availability thus varies with rainfall condition during a particular year. The projected ground water draft and stage of ground water development will thus further be modified corresponding to rainfall condition and management activities taken up in the near future. The later part of the graph also


GROUND WATER BALANCE
BALANCE (mcm)
6000
4000
2000
0
-2000
-4000
-6000
1988
1992
1995
1998
2001
2004
2009
YEAR
Balance (mcm)

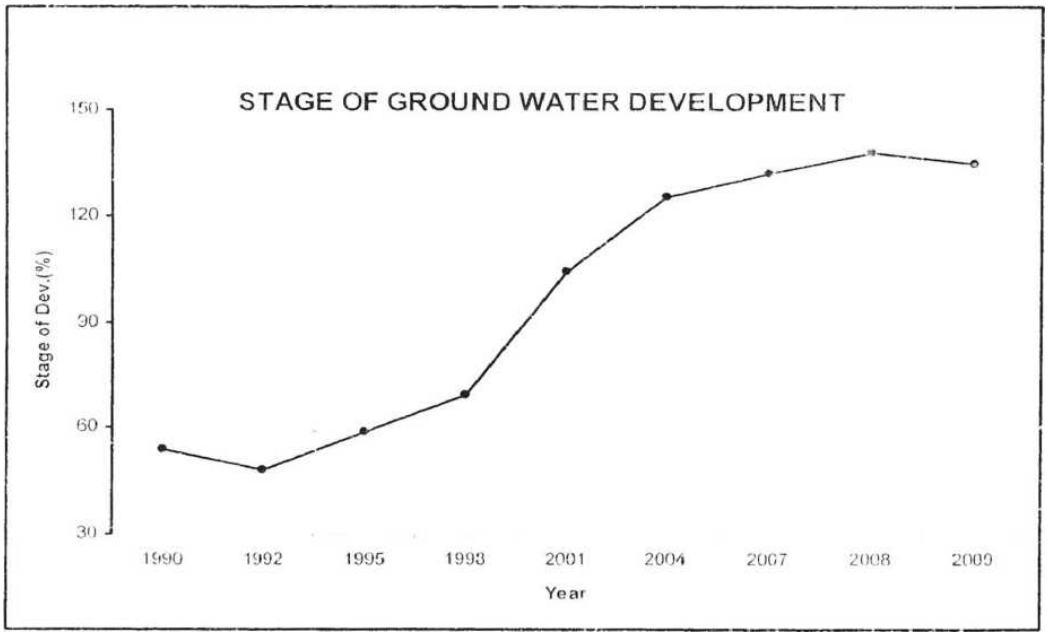
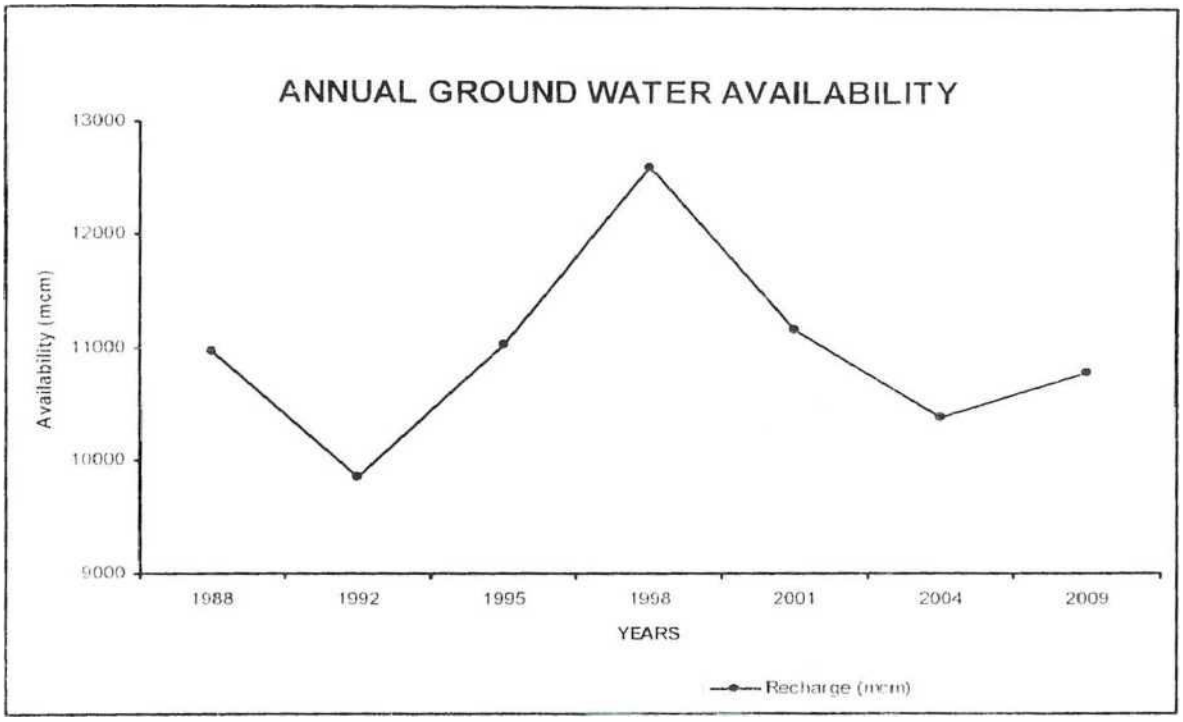
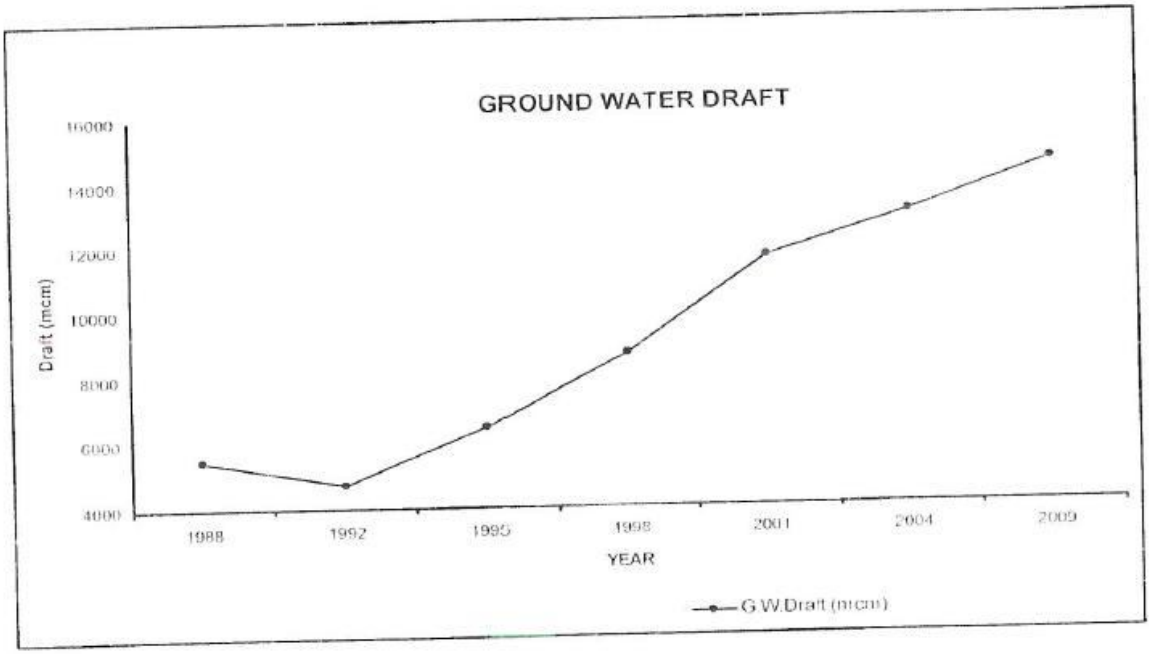

STAGE OF GROUND WATER DEVELOPMENT
Stage of Dev.(%)
150
120
90
60
30
1990
1992
1995
1998
2001
2004
2007
2008
2009
Year

Fig.4: Ground Water Resource position in the State of Rajasthan.





exhibits that stage of development as slowly declining. This is due to reduction in ground water availability in some hard rock areas.

Ground water Management emphasizes that we must not only focus on development of water resources but that we must consciously manage water development in a way that ensures long term sustainable use for future generations. A meeting in the International Conference on Water and Environment, Dublin, in 1992 gave rise to four principles that have been the basis for much of the subsequent water sector reform.

- Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
- Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels.
- Women play a central part in the provision, management and safeguarding of water.
- Water has an economic value in all its competing uses and should be recognized as an economic good.

The Vision Document titled “Ground water resources Vision - 2025 “is being prepared with objective for sustainable management of the ground water resources in the state. The main activities to be taken up are given as below -

1. Integrated Water Resource Management (IWRM)

IWRM means that all the different uses of water resources are considered together. Water allocations and management decisions are able to take account of overall social and economic goals, including the achievement of sustainable development. Different user groups (farmers, communities, environmentalists,) can influence strategies for water resource development and management. Thus IWRM is a systematic process for the sustainable development, allocation and monitoring of water resource use in the context of social, economic and environmental objectives.

Table -1 Groundwater position in the State of Rajasthan

S. No.	Year	Stage of Groundwater Development (%)	Categorization of Blocks				
			Safe	Semi-Critical	Critical	Over-exploited	Total
1	1984	35.73	203	10	11	12	236
2	1990	53.89	148	31	13	44	236
3	1992	47.87	149	19	15	53	236
4	1995	58.88	127	35	14	60	236
5	1998	69.10	135	34	26	41	236
6	2001	104.26	49	21	80	86	236
7	2004	125.13	32	14	50	140	236
8	2007	132.09	31	13	39	153	236
9	2008	137.94	30	8	34	164	236
10	2009	134.54	31	16	25	166	239

An overall plan -

An overall plan is required to envisage how the transformation can be achieved and this is likely to begin with a new water policy to reflect the principles of sustainable management of water resources. To put the policy into practice is likely to require the reform of water law and water institutions. This can be a long process and needs to involve extensive consultations with affected agencies and the public. Bringing some of the principles of IWRM into a water sector policy and achieving political support may be challenging, as hard decisions have to be made. Because of these hard decisions it is not surprising that major legal and institutional reforms are unlikely to take place until serious water management problems have been experienced.

Changing attitudes -

Officials are becoming more aware of the need to manage resources efficiently. Construction of new infrastructure has to take into account environmental and social impacts and the fundamental need for systems to be economically viable for maintenance purposes.

Water legislation converts policy into law and should -

- Clarify the entitlement and responsibilities of users and water providers;
- Clarify the roles of the state in relation to other stakeholders;
- Formalize the transfer of water allocations;
- Provide legal status for water management institutions of government and water user groups;
- Ensure sustainable use of the resource

Role of the government as facilitator and regulator

For many reasons government consider water resources planning and management to be a central part of government responsibility. This view is consistent with the international consensus that promotes the concept of government as a facilitator and regulator, rather than an implementer of projects. To reach mutual agreement about the level at which, in any specific instance, when responsibility for drinking water rests with one agency, for irrigation water with another and for the environment with yet another, lack of cross-sectoral linkages leads to uncoordinated water resource development and management, resulting in conflict, waste and unsustainable systems.

Growth in population, increased economic activity and improved standards of living lead to increased competition for limited freshwater resource. People living in extreme poverty, overexploit soil and forestry resources, with damaging impacts on water resources. Water resources are increasingly under pressure from population growth, economic activity and intensifying competition for the water among users;

Moreover, water management is usually in the hands of top-down institutions, the legitimacy and effectiveness of which have increasingly been questioned. Thus, increased competition for the finite resource is aggravated by inefficient governance. IWRM brings coordination and collaboration among the individual sectors, plus a fostering of stakeholder participation, transparency and cost-effective local management.

The integrated approach to management of water resources necessitates co-ordination of the range of human activities which create the demands for water, determine land uses and generate waterborne waste products. The principle also recognizes the catchment area or river basin as the logical unit for water resources management.

2. Prioritising allocation between sectors —

When there is competition for water resources it brings into open the need to justify the allocation of water to one user rather than to another. This value assessment should take into account both the benefits and the negative impacts. The input from users, politicians and society in general is necessary as the allocation may not be most efficient when valued in economic terms alone or acceptable when made only on political grounds.

- Exploration of deeper aquifers will be undertaken by using latest Geophysical techniques and high capacity drilling rigs.
- The part of canal command areas in the State are facing water logging problems. With the increase in water logged areas, soils become saline and barren. The consumptive use of surface and ground water resources in the canal command areas will be promoted. These will not only increase water availability in the region but also reclaim soil and make it suitable for cultivation.
- The area west of Aravalli occupied by Thar Desert having low and erratic rain fall have meager dynamic ground water resources. Much of the water demand in the region dependent up on exploitation of ground water from static resources. The western parts of the State largely need to be promoted for growing less water consuming crops and industries. Much of the Desert region contains saline ground water as such use of saline ground water in the region is required to be encouraged.

3. Water Pricing -

- Water rates for domestic water supply are much less than actual cost. This under pricing is a major cause of indiscriminate use of water. Economic rates for domestic water will be charged and periodically reviewed to make it rational with actual expenditure.

4. Ground Water Recharge —

- To implement mandatory provision for construction of roof top rain water harvesting structures on all buildings having area 300 sq. m. or more in urban area of the state. The department will provide suitable technical support and conceptual designs to all beneficiaries.
- Sites identified by the local community in rural area technical input and conceptual designs for construction of water harvesting and artificial recharge structures will be provided by the Department to all beneficiaries, government responsibility should cease, or be partnered by autonomous water services management bodies and/or community-based organizations.

River Basin Organisations

The concept of integrated water resources management has been accompanied by promotion of the river basin as the logical geographical unit for its practical realisation. The river basin offers many advantages for strategic planning, particularly at higher levels of government. Groundwater aquifers frequently cross catchment boundaries, river basins rarely conform to existing administrative entities or structures.

5. Strengthening of Database -

- The basic data network will be strengthened and automised in a phased manner. All the existing dug wells/ DCBs being used as key wells will be replaced by piezometers for recording static water levels. New piezometers will be constructed in unrepresented areas.
- All Ground Water data will be digitized and GIS system will be used in the Department. It will help to disseminate data promptly to end users as well as to block level and district level entities.
- Annual resource estimation will be made and water level trends will be analyzed and reported annually. The assessment of ground water resources will be carried out considering watershed as the unit for assessment. It will pave way for basin wise planning of water resources.
- Ground Water Flow Modeling capabilities will be developed in the department for future projections of ground water resources.
- Well developed information system will be initiated in the Department for prompt transfer of ground water data from field (districts) offices to the Head Office. Departmental website will be launched. Study on

aquiferwise ground water model techniques, GIS mapping of ground water aquifer, mapping of all sources of ground water extraction on GIS platform and Bench marking of monitoring stations will be part of ensuing activities.

6. Urban & Sewage Water -

- Most of the municipal areas of the State do not have proper sewage system. As such most of the sewage reaches to natural drainage courses without treatment. The provision of Treatment Plant of adequate capacity in all the municipal areas for treatment require due consideration.
- Efforts will be made to make mandatory provision for installation of Treatment Plant in all water user industries and make use of recycled water in the industries. This will not only reduce water demand for industry but protect water resources from industrial pollution.

7. Management of water logged areas -

- In all water logged areas of the State, consumptive use of surface and ground water resources will be practiced. This will help to check spread of water logged areas and also pave way to make water logged soil fit for agriculture purposes.

8. Control of Water Pollution -

- Most of Urban City of the state do not have proper dumping yards resulting in disposal of waste material in unplanned manner. This often pollutes water resources in the nearby area. Thus in all Urban areas of the State Dumping Areas will be identified in such a way that the litter does not pollute water resources.

- The mining activities in the State often affect water resources. The pumping of water to carry out underground mining activity lowers ground water level and reduces water availability in the region. The waste mining material thrown in the natural drainage courses are also source of water pollution in the surrounding areas. Thus responsibility will be imposed to mine owners to ensure proper use of water pumped out to carry mining activities. The plan for disposal of waste material from mining product will also be taken.

- Possibility of use of storm rain water for artificial recharge of ground water in urban areas of the State will also be explored.

- Subject to technical feasibility, all drinking water wells in rural and urban areas will be provided with ground water recharge structures.
- Permission for use of ground water for industrial purposes will be accorded only when provision of suitable recharge structure has been included in the project plan itself.
- The latest techniques including geophysical surveys and remote sensing will be used for proper siting of structures for artificial recharge of groundwater.
- Community driven ground water management pilot areas will be implemented to start in over-exploited and critical blocks after appropriate strengthening of departmental manpower so that dedicated manpower is available for this activity. Both supply side as well as demand side interventions will be implemented in the pilot areas.
- Non-traditional method for rainwater harvesting, ground water recharge will be explored e.g., development of abandoned mine pits/recharge quarries as rainwater harvesting/recharge structures, reuse of urban sewage and waste water after treatment of ground water recharge.

9. Saline Ground Water-

- Most of the area in the western Rajasthan and some pockets in other parts of the state contain saline ground water. The salinity of ground water varies laterally and vertically. The saline ground water areas in the State will be demarcated and assessed regularly. Possibility of using this water by adopting appropriate desalination techniques in areas suffering from water scarcity will be explored.
- The Community will be facilitated to prepare Integrated Water Resource Management (IWRM) plan for management of ground water resources in their respective regions.
- The Community will be facilitated in preparing and implementing ground water management projects by providing technical inputs on priority basis.
- The Community will be facilitated in rejuvenating traditional water resources in their respective regions.
- Some community driven pilot projects will be taken up to train local community to manage groundwater resources of their region by themselves.

10. IEC Activities -

- GIS based database for village wise groundwater information is being developed through outsourcing. This database will provide groundwater potential, quality of groundwater and other information which are required by the community for groundwater management purposes.

- IEC activities will be taken up throughout the state to build social consensus about depleting groundwater resources and urgent need for their proper management.

- Mass awareness programmes will be taken up to popularize rain water harvesting, artificial ground water recharge techniques, adoption of less water consuming crops, water saving irrigation techniques etc.

11. Strengthening of Ground Water Department -

- The State Ground Water Department was entrusted with ground water exploration and exploitation activity. With the implementation of community driven ground water management programs under Rajasthan Water Sector Restructuring Project, (RWSRP), in the year 2003, management of ground water resources through community participation is being given top most priority. Ground Water Department will be strengthened both in terms of manpower and equipment so that future objectives of sustainable management of ground water resources can be accomplished.

- Appropriate training will be provided to Officers/ Officials of the Department to orient them to take up water management activities.

- The textile industries are major concern of polluting surface and ground water resources in many parts of the State. Some mandatory provisions are to be enacted to protect water pollution from effluent discharges from these industries. Strict provision are to be made not to permit installation of textile industries on areas identified and demarcated as precious ground water potential areas.

- The existing enactments regarding controlling pollution of water resources from urban and industrial effluent discharges should be reviewed and clause modified / inserted to make it abiding clause.

12. Regulation of Ground Water-

- For sustainable management of ground water resources, ground water withdrawal is to be controlled with in the limits of annual replenishment. A legal framework is thus required to be developed for regulation and management of ground water resources. Efforts will be made to enact Ground Water Regulation Act. Till then, present practice of regulation of ground water withdrawal in the Notified Areas of

the State by the Central Ground water Authority will be continued. A State Ground Water Authority will also be constituted to regulate the ground water withdrawal in the State.

13. Public - Private - Peoples Partnership -

- Management of ground water resources through community participation will be given top most priority. Amongst local community Water User Groups will be constituted at village level and federated into higher entities like Gram Panchayat and Panchayat Samiti levels. These groups will be trained to estimate water resources annually and allocate for different uses in their respective regions.

- The Departmental Chemical Laboratories are equipped with analyses of dissolved salts required to decide suitability for agriculture purposes. With the increase in Sewage and Industrial pollution these Chemical Laboratories are to be up graded. Chemical analysis capabilities of the department will be strengthened to enable monitoring bacteriological and industrial pollution of ground water resources.

- Geophysical Equipment and Ground Water monitoring System will be up graded.

- Establishment of Library and arrangement to receive Journals will be made.