DYNAMIC GROUND WATER RESOURCES OF INDIA

(As on 31st March 2011)




Central Ground Water Board
Ministry of Water Resources, River Development& Ganga Rejuvenation
Government of India

Faridabad
July 2014

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उमा भारती
UMA BHARTI

सत्यमेव जयते

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24 JUL 2014

FOREWORD

Ground water is a vital resource meeting the water requirements of irrigation, domestic and industrial sectors of the country. The development of this natural resource is happening in unorganized sector through individual entrepreneurs in an unscientific way resulting in over exploitation in some parts of the country. To ensure sustainability of groundwater resource has to be managed judiciously. It is imperative that pragmatic ground water management decisions should be based on accurate assessment of the resources. Dynamic ground water resources reflect the situation of the extent of ground water utilization.

With this objective, the dynamic ground water resources of India are being assessed at periodical intervals following a well-defined methodology (known as 'Ground Water Estimation Methodology' i.e., GEC-97). The assessments are carried out by the respective State Governments in consultation with Central Ground Water Board under the over-all guidance of the Central Level Expert Group on ground water assessment. The National Report on Dynamic Ground Water Assessment is the compilation of the data based on the State wise Ground Water Assessment. The suggestions of Central Level Expert Group on Ground Water Assessment are taken into consideration for finalizing the dynamic ground water resources as on 2011. The contributions of all these organizations and groups in bringing out this report are commendable.

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I would like to place on record my appreciation of the work done by the Central Ground Water Board in bringing out this publication on the status of the annual replenishable ground water availability in the country and its utilization. I am confident that the planners, administrators and stakeholder of ground water utilization of the country would find this report to be quite useful while taking decisions related to ground water management and regulation. It will also help in prioritization of the areas for National Project on Aquifer Mapping.

(UMA BHARTI)

संतोष कुमार गंगवार
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Message

Ground water is considered to be a dependable source for meeting the requirement of irrigation, drinking water, industrial sector in the country. Over the years, increasing dependence on ground water has created imbalance in the availability vis-à-vis its recharge potential leading to over exploitation of the resources. Major chunk of rural water supply and a significant part of the agricultural needs of the country is met from ground water sector. This makes it imperative that the sustainability of the ground water resources is ensured through proper assessment of the resources supported by strong data base.

The assessment of ground water resources was being done periodically by the State Governments in association with Central Ground Water Board. The assessment of the resources forms the basis for categorization of different administrative units of the country as safe, semi-critical, critical, over-exploited categories. The regulation of withdrawal of ground water resources is dependent on this categorization. Thus, the report on Dynamic Ground Water Resources of the country assumes added significance.

I am sure the report will go a long way in proper management of the resources, and empowering the general public and all the stake holders by providing authentic data on the ground water resources.

(Santosh Kumar Gangwar)

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PREFACE

As a part of National Water Policy, country wide ground water resources assessment is carried out at periodic intervals. The findings of various programmes and schemes implemented by Central and State governments for ground water development and management are incorporated in the ground water resources assessment exercise. Presently, the ground water resource assessment is carried out following the guidelines of Ground Water Resources Estimation Methodology, 1997 and subsequent refinements suggested by R&D Advisory Committee.

In view of the wide ranging implications of resources assessment, the Ministry of Water Resources constituted a Central Level Expert Group for over all supervision of re-assessment of ground water resources of the country for the reference year 2011. The ground water resources assessment as on March, 2011 has been carried out jointly by Central Ground Water Board and respective State Ground Water Departments. The national level compilation of ground water resources is carried out by Central Ground Water Board. The ground water resource assessment and categorization of assessment units is the key criteria for implementation of various management interventions including regulation of ground water.

The National report on "Dynamic Ground Water Resources of India (as on 31st March 2011) is a team work of the officers of CGWB under the guidance of Member (TT & WQ) and overall supervision of Central Level Expert Group. The sincere efforts of Dr. Prahlad Ram, Asstt. Hydrogeologist in compilation of the national report is thankfully acknowledged.

I am sure that this document will be of immense use for the administrators, planners, managers, professionals and academicians working in the field of water management particularly Ground Water Resources Management.

(Sushil Gupta)

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DYNAMIC GROUND WATER RESOURCES OF INDIA
(As on 31st March 2011)

1.	Annual Replenishable Ground Water Resources	433 bcm
2.	Net Annual Ground Water Availability	398 bcm
3.	Annual Ground Water Draft for Irrigation, Domestic & Industrial uses	245 bcm
4.	Stage of Ground Water Development	62%
5.	Categorization of Blocks / Mandals/Firkka Talukas	
	Total Assessed units	6607
	Safe	4530
	Semi-Critical	697
	Critical	217
	Over-Exploited	1071
	Saline	92

DYNAMIC GROUND WATER RESOURCES OF INDIA

(As on 31st March 2011)

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Annexure II: District-wise Ground Water Resources Availability, Utilization and Stage of Development

Annexure IV: District-wise Categorization of Blocks/ Mandals/ Taluks in India

EXECUTIVE SUMMARY

Ground Water Resources Assessment is carried out at periodical intervals jointly by State Ground Water Departments and Central Ground Water Board under the overall supervision of the State Level Committee on Ground Water Assessment. Previous such joint exercises were carried out in 1980, 1995 and 2004 and 2009.

The assessment involves estimation of dynamic ground water resources or annual replenishable ground water resources (recharge), annual ground water draft (utilization) and the percentage of utilization with respect to recharge (stage of development). The assessment units (blocks/ watersheds/mandals/firkas) are categorized based on Stage of Ground Water Development (Utilization) and the long term water level trend. The methodology for assessment is broadly based on Ground Water Resources Assessment Methodology, 1997 with additional inputs from Ground Water Estimation Methodology in Hard Rock Terrain (2004) and R&D Advisory Committee on Ground Water Estimation (2010).

Rainfall is the main source of annual replenishable ground water resource. Most part of India receives rainfall mainly during SW monsoon. Major part of country including Northern, Central and Eastern India receives annual normal rainfall between 75 and 150 cm. Highest rainfall of more than 250 cm is received in the North Eastern States and along West Coast in the Konkan region whereas western Rajasthan receives about 15 cm of rainfall in an year. The average rainfall for the three year period (2009 to 2011) is within the normal range for major parts of the country. Excess rainfalls during this period have been recorded mainly in West Rajasthan, Saurashtra and Kutch whereas NE region and meteorological subdivision of eastern Uttar Pradesh recorded deficient rainfall .

The aquifer properties of rock formations have significant influence in ground water recharge. Porous formations like alluvial formations in the Indo-Ganga-Brahmaputra basin having high specific yield values and are the most important repository of ground water resources. Ground water occurrences in the fissured formations, which occupy almost two-third part of the country including peninsular India, on the other hand are limited to weathered, jointed and fractured portions of the rocks. Ground water level is the basic indicator of the ground water regime of an area.

The annual replenishable ground water resources have been assessed as 433 bcm. Keeping an allocation for natural discharge, the net annual ground water availability is 398 bcm. The annual ground water draft (as on 31st March, 2011) is 245 bcm. The Stage of ground water development works out to be about 62%. The development of ground water in different areas of the country has not been uniform. Out of 6607 assessment units (Blocks/ Mandals/ Talukas/Firkas) in the country, 1071 units in various States have been categorized as 'Over-exploited' i.e. the annual ground water extraction exceeds the net annual ground water availability and significant decline in long term ground water level trend has been observed either in pre-monsoon or post- monsoon or both. In addition 217 units are 'Critical' i.e. the stage of ground water development is above 90 % and within 100% of net annual ground water availability and significant decline is observed in the long term water level trend in both pre-monsoon and post-monsoon periods. There are 697 semi-critical units, where the stage of ground water development is between 70% and 100% and significant decline in long term water level trend has been recorded in either Pre-monsoon or Post-monsoon. 4530 assessment units are Safe where there is no decline in long term ground water level trend. Apart from this, there are 92 blocks/firkas completely underlain by saline ground water.

There is no significant change in the overall Stage of Ground water development from 61% in 2009 to 62% in 2011. As was noticed in the previous estimation, the over-exploited areas are mostly concentrated on three parts

of the country. In north western part in Punjab, Haryana, Delhi, Western Uttar Pradesh where though replenishable resources is abundant but there have been indiscriminate withdrawals of ground water leading to over-exploitation. In western part of the country, particularly in Rajasthan, Gujarat where due to arid climate, ground water recharge itself is less leading to stress on the resource and in peninsular India like Karnataka, Andhra Pradesh and Tamil Nadu where due to poor aquifer properties, ground water availability is less. In some areas of the country, good continuous rainfall and management practices like ground water augmentation and conservation measures through government and private initiatives have resulted in improvement in ground water situation which is also reflected in the change in Category from Over-exploited and Critical (in 2009 assessment) to other categories (in 2011 assessment).

Ground water resources assessment like other fields of science requires continuous refinements. The issue becomes more relevant considering the strong linkage between assessment and ground water management. Some of the suggestions to bring in further refinements in the ground water resources assessment approach are – aquifer characterization and parameter estimation, ground water assessment on a larger scale (smaller assessment unit) for better management of the resources, holistic water balance studies taking into consideration all the hydro-metereological components of the hydrological cycle, case studies on quantitative evaluation of ground water management interventions and consequent changes in ground water assessment.

CHAPTER 1

INTRODUCTION

Sustainable development and efficient management of water is an increasingly complex challenge in India. Increasing population, growing urbanisation and rapid industrialisation combined with the need for raising agricultural production generates competing claims for water. Ground water has an important role in meeting the water requirements of agriculture, industrial and domestic sectors in India. About 85 percent of India's rural domestic water requirements, 50 percent of its urban water requirements and more than 50 percent of its irrigation requirements are being met from ground water resources. Ground water is annually replenishable resource but its availability is non-uniform in space and time. Technically, the dynamic ground water refers to the quantity of ground water available in the zone of water level fluctuation, which is replenished annually. Hence, the sustainable development of ground water resources warrants precise quantitative assessment based on reasonably valid scientific principles. National Water Policy, 2012 has laid emphasis on periodic assessment of ground water resources on scientific basis. The trends in water availability due to various factors including climate change must also be assessed and accounted for during water resources planning. To meet the increasing demands of water, it advocates direct use of rainfall, deslination and avoidance of inadvertent evapo-transpiration for augmenting utilizable water resources. The National Water Policy,2012 also states that safe water for drinking and sanitation should be considered as pre-emptive needs followed by high priority allocation for other domestic needs (including needs of animals), achieving food security, supporting sustenance agriculture and minimum eco-system needs. Available water, after meeting the above needs should be allocated in a manner to promote its conservation and efficient use.

1.1 Previous Assessments:

The assessment of water resources of the country dates back to 1901 when the First Irrigation Commission assessed the Surface Water Resources as 144 million hectare meters (M.ham) (NABARD, 2006). In 1949 Dr. A. N. Khosla based on empirical formula estimated the total average annual runoff of all the river systems of India including both surface and ground water resources as 167 M.ham (Central Ground Water Board, 1995). Since then attempts have been made from time to time by various Working Groups/ Committees/Task Forces constituted by Govt. of India to estimate the ground water resources of the country based on available data and in response to developmental needs. In 1976, the National Commission of Agriculture assessed the total ground water resources of the country as 67 M.ham. and the Utilizable ground water was worked out to be 35 M.ham, out of which 26 M.ham was considered available for irrigation (Central Ground Water Board, 1995).

The first systematic methodology to estimate the ground water resources of the country was evolved by Ground Water Over-Exploitation Committee in 1979. The committee was constituted by Agriculture Refinance and Development Corporation (ARDC) and was headed by Chairman, CGWB with Members from – State Ground Water Organizations and Financial Institutions. Based on the norms suggested by the committee, the country's Gross Ground Water Recharge has been assessed as 47 M.ham. and the Net Recharge as 32 M.ham (Central Ground Water Board, 1995).

In 1982, Government of India constituted 'Ground Water Estimation Committee' (GEC) drawing Members from various States / Central organizations engaged in hydrogeological studies and ground water development. The Committee submitted its recommendations in the year 1984 and suggested a methodology (GEC-1984) for assessment of dynamic ground water resources. As per the recommendations of the GEC-1984 the State Governments were advised to constitute Working Groups for

assessment of ground water potentials. The Working Groups were headed by Irrigation Secretaries-In charge of Ground Water Developments and included Heads of Ground Water Department, State Agriculture Departments, representatives from Agriculture Universities and NABARD. Director, CGWB was the convener of the group. The base year for the computation of the resource mostly varied between 1991 and 1993 and a National report on Ground Water Resources of India was brought out in 1995 by compiling the data of all the States and Union Territories of the country. As per the report, the total Replenishable Ground Water in India was estimated to be about 432 billion cubic meter. The ground water resource available for irrigation purpose was about 361 billion cubic meter. The Net Ground Water Draft from Irrigation uses was around 115 billion cubic meters and the level of development was 32%. The volumetric resource was converted in terms of area and the Utilizable Irrigation Potential from ground water of the country was worked out to be 64 million hectare (Central Ground Water Board, 1995).

Increasing thrust on ground water and changed scenario of data acquisition led the Government of India to form another Committee in 1995 to review the existing methodology for ground water resource assessment and to suggest revisions if necessary. The Committee submitted its report in 1997 wherein a revised and elaborate methodology for resource assessment has been suggested, more commonly called as GEC-1997. While estimating the ground water resources in the hard rock terrains some limitations have been observed. To address these limitations another Committee on Ground Water Estimation Methodology in Hard Rock Terrain was formed in 2001 to review the existing methodology for resource estimation in hard rock terrains. The Committee made certain suggestions on the criteria for categorization of blocks to be adopted for the entire country irrespective of the terrain conditions. Based on GEC-1997, the dynamic ground water resources of India were estimated for the entire country with 2004 and then again with 2009 as base year. In 2004, the Annual Replenishable Ground Water Resources is 433 billion cubic meter (bcm). Keeping an allocation for Natural Discharge, the

net annual ground water availability was 399 bcm and the annual ground water draft for all uses was of the order of 231bcm. The overall stage of ground water development for the entire country was 58%. In 2009, the annual replenishable ground water resources are 431 bcm. The net annual ground water availability of the country has been assessed as 396 bcm after deducting 35 bcm for natural discharge. The annual ground water draft of the country as on March, 2009 was 243 bcm. The largest use is the irrigation sector (about 91%). The stage of ground water development for the entire country has been computed as 61%. The utilization pattern is however uneven across the country resulting in ground water stressed conditions in some parts of the country while in other areas, ground water utilization have been sub-optimal. In 2009, assessments were carried out in 5842 assessment units (blocks/mandals/taluks) in the country, out of which around 14% (802 units) were categorized as Over-exploited. The critical units were 3% (169 units), semi-critical 9% (523 units) and safe were 73% (4277 units). The remaining units 71 (less than 1%) were having totally saline ground water.

1.2 Ground water management initiatives

The findings of the ground water resources assessment guide the planners and stakeholders to take appropriate management measures for optimal utilization and sustainability of the resource. Ground water resources in the country are withdrawn by approximately 20 million wells (World Bank, 2010) mostly through private initiatives. It is a common-pool resource, used by millions of farmers across the country. Management of this resource is hence done both through Govt. and private initiatives. The areas where future scope for ground water development exists, Banks and NABARD provide loans for sinking of wells and installation of pump sets. Various Govt. schemes also exist to sponsor well construction in Safe blocks. On the other hand, measures are being taken to control further deterioration of the resources in Over-exploited and Critical blocks. Ground water management practices like water conservation and water harvesting measures, Farmer's Participatory Action Research Programme (FPARP), efficient water use practices with

community participation, restrictions on institutional funding for ground water irrigation in Over-exploited and Critical blocks are some such examples. Community management of ground water resources has been quite effective in certain places in the country. Success stories on effective community participation on water conservation measures such as community management and water conservation measures in Aravalli hills of Rajasthan, Ralegaon Sidhi, Hiware Bazar and World Bank sponsored Projects in rural Maharashtra, Andhra Pradesh Farmer-Managed Groundwater Systems Project (APFAMGS), Water Conservation measures and efficient water use practices in Gujarat are well known. There are several such efforts across the length and breadth of the country. All these initiatives have helped in improving the ground water situation in localized areas in certain parts of the country.

1.3 Re-assessment of Ground Water Resources (2010-11)

In order to assess prevailing ground water scenario of the country, re-assessment of ground water resources was felt necessary after two year interval. It would also indicate the impact of the on-going ground water management practices on the ground water regime. In 2012, Ministry of Water Resources constituted a Central Level Expert Group (CLEG) for over-all supervision of the re-assessment of ground water resources in the entire country. The terms of reference of the Group include supervision of assessment of annual replenishable ground water resources and the status of utilization for the reference year 2010-11 The copy of the Government Resolution is given as ***Appendix A***. Ministry of Water Resources requested all the State Governments to constitute State Level Committees for overall supervision of assessment of the groundwater resources at the State level (***Appendix B***). The ground water resources assessment for 2010-11 at the States have been carried out jointly by State Ground Water Departments and Central Ground Water Board under the supervision and final approval of the State level Committees (***Appendix C***). Central Level Expert Group provided the technical guidance in this regard. Based on the assessment figures

provided by the State Government, the national report has been compiled under the supervision of the CELG for overall reassessment of the ground water resources of the country. The meetings of the CLEG were held during 2012-13 to finalize the report on dynamic ground water resources of India (as on 31 March 2011) and was approved in the 2nd meeting of CLEG (***Appendix D***). List of the members and special invitees who have attended the meetings of the Central Level Expert Group is given in ***Appendix E***.

CHAPTER 2

GROUND WATER RESOURCES ESTIMATION METHODOLOGY

The ground water resources assessment for 2008-09 were carried out based on the guidelines of Ministry of Water Resources which broadly follows the methodology recommended by Ground Water Resources Estimation Committee, 1997. However, there have been few modifications in the MOWR guidelines namely in the criteria of Categorization of Assessment units and future Allocation for irrigation and domestic & industrial sector. Further MOWR suggested a protocol for assessment of ground water resources. The salient features of the methodology are enumerated in the following paragraphs.

Ground water resources are estimated assessment unit wise. The assessment unit is watershed in the states occupied predominantly with hard rocks. This is because the ground water balance equations recommended in GEC-1997 can be better applied in the assessment units with hydrologic/ hydrogeological boundaries. However, in the states covered predominantly with alluvium and/ or soft rocks, administrative blocks are chosen as assessment unit since in alluvial areas it is difficult to identify watershed considering the possibility of trans-boundary aquifer system. Within the assessment areas, the hilly areas (slope greater than 20%) are to be excluded since these are not likely to contribute to ground water recharge. The assessment units are to be divided into command and non-command areas for the purpose of computation of ground water resources. The ground water resources in the poor quality (saline) areas are to be computed separately (Ministry of Water Resources, 1997).

The ground water recharge is estimated season-wise both for monsoon season and non-monsoon season separately. The following recharge and discharge components are assessed in the resource assessment - recharge from rainfall, recharge from canal, return flow from irrigation, recharge from

tanks & ponds and recharge from water conservations structures and discharge through ground water draft.

2.1 Assessment of ground water draft

Ground water draft is estimated seasonally. The most commonly used method for computation of irrigation draft is – number of abstraction structures multiplied by the unit seasonal draft. Alternative methods like area irrigated by ground water and the associated crop water requirements are also recommended for assessment of ground water draft for irrigation. Ground water draft for Domestic & Industrial needs is computed using unit draft method and based on consumptive use pattern of the population.

2.2 Assessment of ground water recharge from other sources

Ground water recharge due to return flow from irrigation, seepage from canals, recharge from tanks and ponds and recharge from water conservation structures are to be estimated separately for both monsoon and non-monsoon seasons based on the recommended norms as given in ***Table 1***.

Table -1 Recommended norms for the Assessment of Recharges from Other Sources

Parameters	Sources of Recharge	Range of Parameters
Canal seepage factor	Unlined canals	15 to 30 ham/day/million sq.m. of wetted area
	Lined canals & canals in hard rock terrain	20% of above value suggested for unlined canals
Return flow factor	Surface water Irrigation	0.10 – 0.50
	Ground water Irrigation	0.05 – 0.45
Seepage from tanks and ponds	1.4 mm/day over the average water spread area	
Water conservation structures	50% of the Gross Storage. Out of this, 50% is during monsoon season and the remaining 50% during non-monsoon season	

(Source: Ministry of Water Resources, 1997)

2.3 Assessment of ground water recharge from rainfall

Ground water recharge from rainfall is estimated for monsoon and non-monsoon seasons separately.

Rainfall recharge during monsoon season is estimated using two methods – Water level fluctuation Method and Rainfall Infiltration Factor Method.

2.3.1 Water level Fluctuation (WLF) Method

Under this method the change in storage will be computed by multiplying water level fluctuation between pre and post monsoon seasons with the area of assessment and specific yield.

$$\text{Change is Storage} = DS = h * Sy * A \quad \text{.....(i)}$$

Where,

h = rise in water level due to monsoon (fluctuation between pre-monsoon and post-monsoon water level), A = area for computation of recharge, Sy = specific yield.

The Specific yield of a soil or rock is the ratio of the volume of water that, after saturation, can be drained by gravity to its own volume (Todd & Mays, 2005). The Specific yield data were either arrived through field studies, including long-duration pumping tests and dry season groundwater balance (in hard-rock areas) or adopted from the norms recommended by GEC-1997, which were derived from the various water-balance studies carried out by CGWB, SGWDs and academic/research institutions. The range of specific yield considered for different formations are given in the ***Table 2***.

Table - 2 Specific Yields for Different Formations

Formation		Range of Specific Yield
Unconsolidated formations	Alluvium	0.04 to 0.22
Semi-consolidated formations	Sedimentary rocks	0.01 to 0.15
Consolidated formations	Crystalline and other hard rocks	0.002 to 0.04

The change in storage calculated from the above relation is the resultant of the recharge from rainfall and other sources during the monsoon period and the gross ground water draft during monsoon season. In order to segregate the rainfall recharge during monsoon season, the following equation is used –

Rrf = h X Sy X A + DG – Rc – Rsw – Rt – Rgw – Rwc .....(ii)

Where,

DG = Gross ground water draft for all uses during monsoon season

Rc = recharge due to seepage from canals during monsoon season

Rsw = recharge from surface water irrigation during monsoon season

Rt = recharge from tanks and ponds during monsoon season

Rgw = recharge from ground water irrigation during monsoon season

Rwc = recharge from water conservation structures during monsoon season

The rainfall recharge thus calculated is normalized for the normal monsoon season rainfall.

2.3.2 Rainfall Infiltration Factor (RIF) Method

The other method for assessment of rainfall recharge is using Rainfall infiltration factor. The recharge from rainfall is to be estimated as given below

R_{rf} = f * A * normal monsoon rainfall .....(iii)

Where;

f = rainfall infiltration factor

A = area

The same Rainfall Infiltration Factor should be used for computation of recharge due to rainfall during monsoon and non monsoon seasons.

The norms adopted for computation of recharge from rainfall is given in ***Table – 3***.

Table – 3 Rainfall Infiltration Factor for different formations

Formation		Range of Rainfall Infiltration Factor
Unconsolidated formations –	Alluvium	0.08 to 0.25
Semi-consolidated formations	Sedimentary rocks	0.03 to 0.14
Consolidated formations	Crystallines and other hard rocks	0.01 to 0.12

(Source: Ministry of Water Resources, 1997)

The rainfall recharge computed by WLF method is to be compared with recharge computed by RIF method. In case the difference between the two sets of data are more than 20%, then rationalized RIF figure is to be considered, otherwise monsoon recharge using WLF method is to be considered. Whenever the percent difference is less than - 20%, 80 % of the recharge computed by RIF method is to be used and wherever, the percent difference is more than + 20 %, 120 % of recharge computed by RIF method is to be taken.

2.4 Ground water Recharge during Monsoon Season

The total recharge in monsoon season is the sum of the normalized rainfall recharge and the recharge from other sources as expressed in the following equation –

R(normal) = Rrf (normal)+ Rc + Rsw + Rt + Rgw + Rwc .....(iv)

Where,

R (normal) = Total recharge during monsoon season

Rrf (normal) = Rainfall recharge during monsoon season for normal monsoon season rainfall

2.5 Ground water Recharge during non-Monsoon Season

Similar expression as given in equation (iv) above is used for recharge during non-monsoon season wherein all the recharge components including rainfall

recharge and recharge from other sources during non-monsoon season are computed. Only difference is that rainfall recharge during non-monsoon is computed using RIF method only. If the rainfall during non-monsoon period is less than 10% of the annual rainfall, the recharge due to rainfall is taken as zero. The total recharge during non monsoon is the sum of recharge from rainfall and recharge from other sources.

2.6 Annual Replenishable Ground Water Resources

The Annual Replenishable Ground Water Resources of the area is the sum of recharge during monsoon and non monsoon seasons. An allowance is kept for natural discharge during non monsoon season by deducting 5% of Annual Replenishable Ground Water Resource, wherever WLF method is employed to compute rainfall recharge during monsoon season and 10% if RIF method is used.

2.7 Net Annual Ground Water Availability

The Net annual ground water availability is the available resource after deducting the natural discharges from the Annual Replenishable Ground Water Resource and is expressed as:-

Net Annual Ground Water Availability =Annual Replenishable Ground Water Resource – Natural Discharge during non monsoon season ..... (v)

2.8 Future Utilization of Ground Water Resources

The projected demand for domestic and industrial water supply is kept based on projected population for the year 2025 and present dependency on ground water. The ground water available for future irrigation is obtained by deducting the sum of projected demand for Domestic and Industrial use and existing gross irrigation draft from the Net Annual Ground Water Availability. In order to rationalize the projected demand of ground water resources in over-exploited areas, following procedure is adopted:

- Case I, when GWav ≥ Dgi+ Alld

  In such cases projected demand for future domestic and industrial uses = Alld
- Case II, when GWav < Dgi+ Alld

In such cases, projected demand for future domestic and industrial uses = (GWav – Dgi) or Dgd, whichever is more.

Where,

GWav = Net Annual Ground Water Availability
Dgi = Existing Ground Water draft for Irrigation
Dgd = Existing Ground Water draft for Domestic use
Dg = Existing Ground water draft for all uses
Alld = Computed value of allocation for domestic use
(Based on projected population, fractional load on ground water and per capita requirement)

2.9 Stage of Ground Water Development

The stage of Ground water Development is to be computed as given below,

$$Stage\ Of\ \ Development = \frac{Existing\ Gross\ Draft\ For\ \ All\ Uses}{Net\ \ Annual\ GroundwaterAvailability} \times 100 \ldots\ldots\ldots\ldots\ldots (vi)$$

2.10 Categorization of Assessment Units

The assessment units are to be categorized for ground water development based on two criteria – a) stage of ground water development, and b) long-term trend of pre and post monsoon water levels. The long term ground water level trend is to be computed generally for a period of 10 years. The significant rate of water level decline has been taken between 10 and 20 cm per year depending upon the local hydrogeological conditions. There are four categories, namely – 'Safe', 'Semi-critical', 'Critical' and 'Over-exploited' areas. The criteria for categorization are given below.

Table - 4 Criteria for Categorization of Assessment Units

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

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

A sample calculation of one assessment unit is presented as ***Appendix F*** to illustrate the methodology for assessment of replenishable ground water resources.

The State Governments broadly followed the methodology outlined above while carrying out the computation of ground water resources. However, at some places, the detailed steps, norms and criteria for categorization have been modified by the States to match the prevailing ground water conditions in the field.

CHAPTER 3

RAINFALL OF INDIA

Rainfall is the main source of ground water recharge. India receives about 120 cm of rain in a year. However distribution of rainfall has a wide variation both in space and time. Most of rainfall (about 75%) occurs during a short span of four Monsoon months (June to September) resulting into eight relatively dry months. Similarly the meteorological Subdivisions like Coastal Karnataka, Konkan and Goa, North east India receive more than 250 cm of rainfall annually whereas West Rajasthan gets only about 30cm (IMD, 2011).

3.1 Rainfall Pattern

Rain gauge stations are established and maintained by different departments and Undertakings of Central and State governments and also by private parties to cater their particular data need. India Meteorological Department (IMD) has 559 observatories (both departmental and part time) while amongst non-Departmental Rain gauge Stations, 3540 are reporting and 5039 are non-reporting.

Though the period of seasons varies from place to place, for Climatological purposes especially for rainfall, year at all the places is uniformly divided into 4 parts, called seasons. The seasons are: Winter (January and February), Pre monsoon (March to May), South West Monsoon (June to September) and Post Monsoon season (October to December).

For the purpose of compiling the rainfall data and draw the inferences India is divided into 36 meteorological homogeneous regions.

The long term average rainfall indicates that most part of India receives rainfall mainly during SW Monsoon season. However main Rainfall season in Tamil Nadu is Post Monsoon season. Jammu and Kashmir, Himachal Pradesh and Uttarakhand receive significant rainfall in all 4 seasons.

Normal Annual rainfall (1941 to 1990) for each Meteorological Sub Division with Coefficient of Variation (measure of dispersion of a probability distribution) is shown in ***Figure-1***. Maximum variation is observed in NW India while minimum variation is observed in coastal regions and Assam-Meghalaya area. The map of normal annual rainfall (***Figure-2***) shows that highest rainfall of more than 250 cm is received in the North Eastern States and along West Coast in the Konkan region. The major part of country including Northern, Central and Eastern India receives rainfall between 75 and 150 cm. A portion of Peninsular India including parts of Western Maharashtra and Karnataka receives less rainfall up to 75 cm. Western part of the country including Rajasthan and Gujarat receives the lowest rainfall in the country, at places even less than 15 cm in an year i.e. in western part of Rajasthan.

Rainy day is defined as a day when rainfall recorded is at least 2.5 mm. Number of rainy days in different parts is shown in ***Figure-3***. For given amount of rainfall, more number of rainy days is favourable for ground water recharge. Annual number of rainy days is less than 10 in parts of West Rajasthan, Gujarat and Kashmir, gradually increasing towards east and more than 100 days in North East portion of the country.

Perusal of Monsoon rainfall maps of 2009 to 2011 (***Figure-4***) indicate that overall rainfall pattern has been normal during intervening period between two successive ground water assessment viz. 2009 and 2011. In 2008, major part of the country received normal monsoon rainfall, except for Punjab and Orissa, where excess monsoon rainfall was recorded and Western Madhya Pradesh, Vidharbha and Kerala which received deficient monsoon rainfall. In 2009, major part of the country received deficient rainfall where Arunachal Pradesh, Gangetic West Bengal, Madhya Maharashtra Konkan, Goa, Coastal Karnataka Kerala Tamilnadu, Puducherry and Rayalseema received normal rainfall. Ondly some part of country i.e. NI&SI Karnataka, Saurashtra Kutch, Daman &Diu received excess rainfall. In 2010 most part of country has received excessive rainfall like J&K, Uttarachal, Haryana, Chandigarh, West

Rajasthan, Saurashtra, Kutch, diu, Marathwada, Madhya Maharashtra, Vidarbha, Telegana, Rayalseema, Tamilnadu and Puducherry whereas Assam, Meghalaya, Bihar, East Uttar Pradesh, Jharkhand and Gangetic West Bengal has got deficient rainfall. In 2011 West& East Rajasthan,West MP, Saurashtra, Kutch, diu, Konkan, Goa and coastal Karnataka received excessive rainfall whereas Arunachal Pradesh, Assam and NMMT has got deficient rainfall. Remaining part of country received normal rainfall.

Analysis of average monsoon rainfall data for the period 2009 to 2011, shows that in major parts of the country, 31 met-subdivisions out of 36, the average rainfall for the three year period (2009 to 11) is within the normal range (**Table No.5**). However, West Rajasthan and Saurashtra and Kutch recorded excess rainfall. The N.E. regions like NMMT, Assam& Meghalaya and the met-subdivisions East U.P. of North West India recorded deficient rainfall. For the same period the average rainfall for the country as a whole was 6% less than its LPA i.e. the rainfall for the country as a whole was 836.6 mm against its normal value of 890.8 mm. The annual average rainfall pattern for the same period 2009 to 2011, was almost same as that of monsoon rainfall scenario. However, three met-subdivisions Jharkhand, Punjab and Himachal Pradesh, which were normal during the monsoon season recorded less rainfall on annual scale and remained deficient. The annual average rainfall for the country as a whole was recorded 8% less than its LPA i.e. the annual rainfall for the country as a whole was 1094.3 mm against its normal value of 1193.1 mm. It is noticed that met-subdivisions West Rajasthan and Saurashtra & Kutch recorded excess rainfall during SW monsoon as well as annual statistics for the whole period of 2009 to 2011.

3.2 Trends in Rainfall

One of the most significant consequences of global warming due to increase in greenhouse gases would be an increase in magnitude and frequency of extreme precipitation events. National Climate Centre of India meteorological Department has studied Trends in the extreme rainfall indices

for the period 1901-2000 for 100 stations over India and published same in National Climate Centre Research Report No: 2/2006. Report depicts that Rainfall changes expected for 36 Meteorological sub Divisions for 4 seasons and Annual. ***Figure-5*** shows Increase/Decrease in rainfall in mm in 100 year in each of 36 subdivisions for annual.

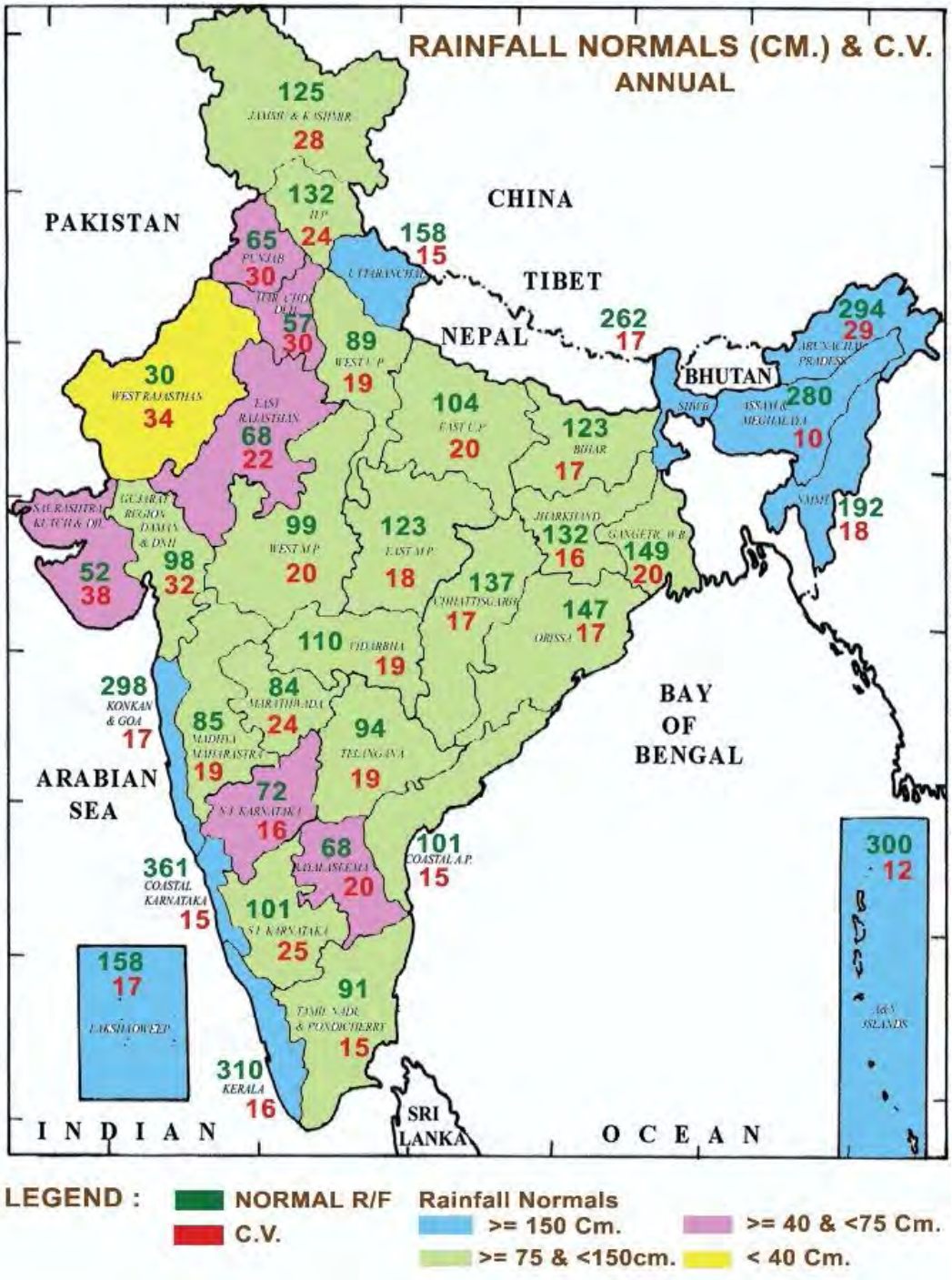
From the Figure, it may be seen that Significant increasing trend is observed in the annual scale for the sub-divisions Konkan & Goa, Madhya Maharashtra, North Interior Karnataka, Rayalaseema, coastal Andhra Pradesh, Gangetic West Bengal, Assam & Meghalaya and Jammu & Kashmir. On the other hand significant decrease in rainfall is observed for the sub-divisions Chhattisgarh, Jharkhand and Kerala.

Table-5 Subdivision-wise Monsoon Averages Rainfall(mm) (2009-2011)(IMD)

S.	METEOROLOGICAL	2009-2011 (JUNE-SEPT.)			
NO.	SUBDIVISIONS	AVERAGE	NORMAL	%DEP.	CAT
1.	A & N Island	1906.2	1710.3	11%	N
2.	Arunachal Pradesh	1488.1	1770.8	-16%	N
3.	Assam & Meghalaya	1365.6	1876.6	-27%	D
4.	N M M T	1107.5	1378.8	-20%	D
5.	Shwb & Sikkim	1863.5	1962.4	-5%	N
6.	Gangetic West Bengal	1050.2	1148.3	-9%	N
7.	Orissa	1089.1	1161.4	-6%	N
8.	Jharkhand	882.6	1089.6	-19%	N
9.	Bihar	868.4	1030.4	-16%	N
10.	East U.P.	696.3	906.9	-23%	D
11.	West U.P.	646.2	771.1	-16%	N
12.	Uttarakhand	1346.2	1220.1	10%	N
13.	Har. Chd & Delhi	417.2	467.9	-11%	N
14.	Punjab	416.5	496.5	-16%	N
15.	Himachal Pradesh	705.1	791.0	-11%	N
16.	Jammu & Kashmir	510.9	524.1	-3%	N
17.	West Rajasthan	331.3	262.8	26%	E
18.	East Rajasthan	639.6	623.2	3%	N
19.	West Madhya Pradesh	822.3	894.6	-8%	N
20.	East Madhya Pradesh	952.5	1078.7	-12%	N
21.	Gujarat Region	842.0	915.0	-8%	N
22.	Saurashtra & Kutch	779.5	482.1	62%	E
23.	Konkan & Goa	3156.7	2838.6	11%	N
24.	Madhya Maharashtra	761.2	710.2	7%	N
25.	Marathwada	689.0	699.4	-1%	N
26.	Vidarbha	924.7	968.6	-5%	N
27.	Chhattisgarh	1017.1	1185.4	-14%	N
28.	Coastal Andhra Pradesh	600.9	577.2	4%	N
29.	Telangana	722.6	763.0	-5%	N
30.	Rayalaseema	429.4	386.7	11%	N
31.	Tamilnadu & Pondicherry.	329.9	315.5	5%	N
32.	Coastal Karnataka	3409.3	3143.9	8%	N
33.	N. I. Karnataka	557.2	496.0	12%	N
34.	S. I. Karnataka	734.4	663.8	11%	N
35.	Kerala	2035.3	2107.4	-3%	N
36.	Lakshadweep	1055.6	989.6	7%	N
Country as a whole		**836.6**	**890.8**	**-6%**	**N**

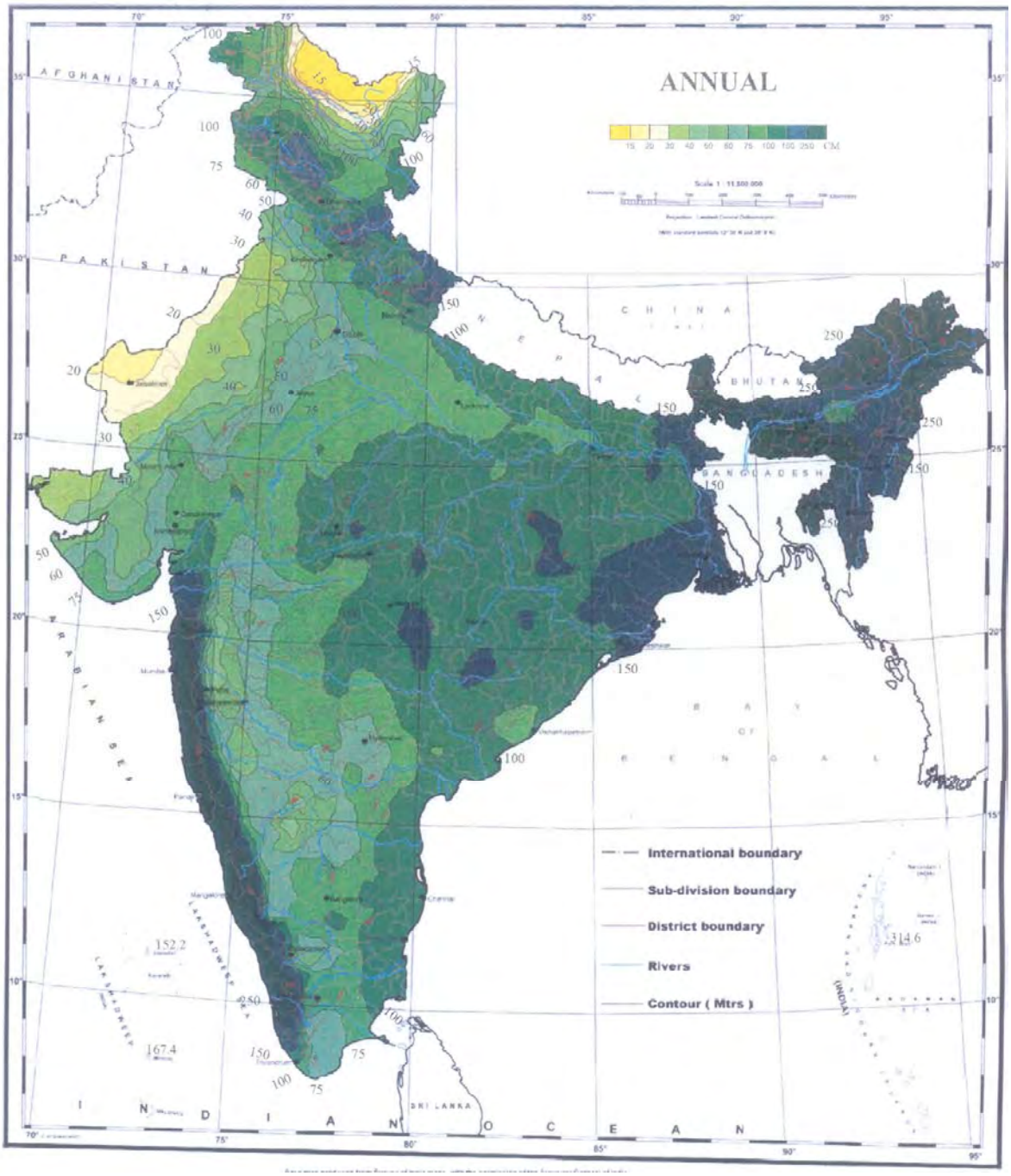
Excess: 2, Normal: 31, Deficient: 3, Scanty: 0, No Rain: 0

Figure-1



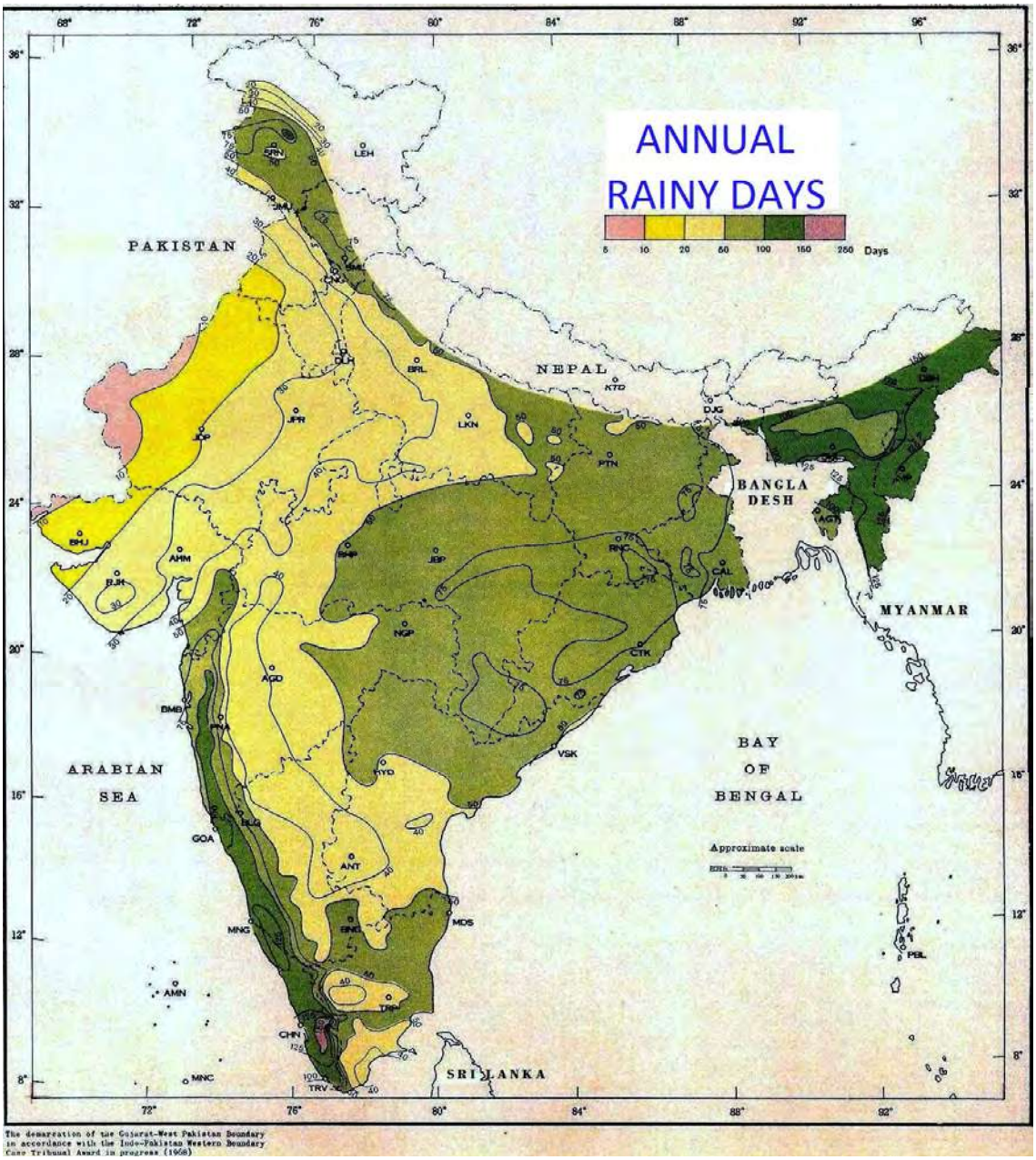
Source: India Meteorological Department

Figure-2 Normal Annual Rainfall



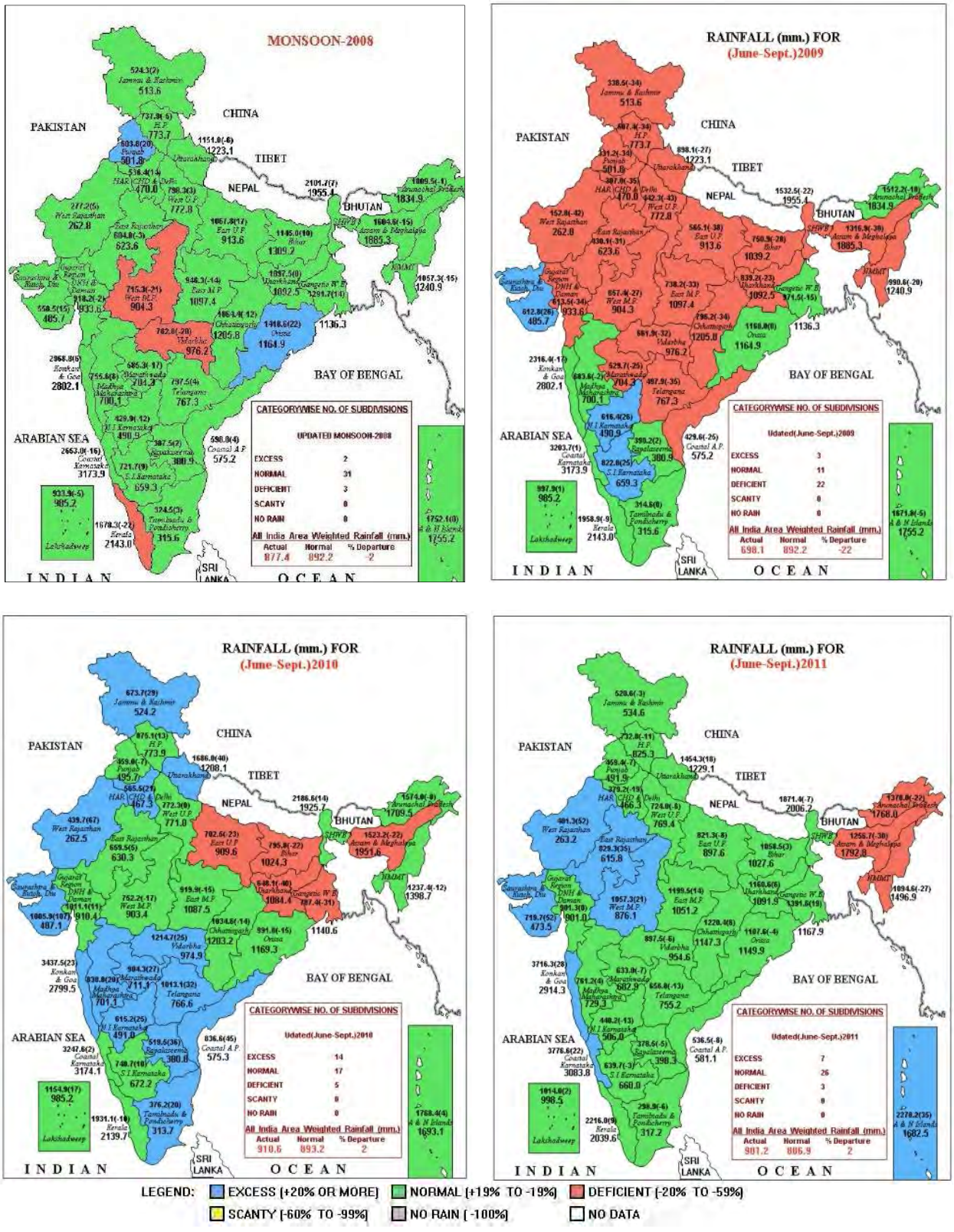
Source: India Meteorological Department

Figure-3 Annual Normal Rainy Days



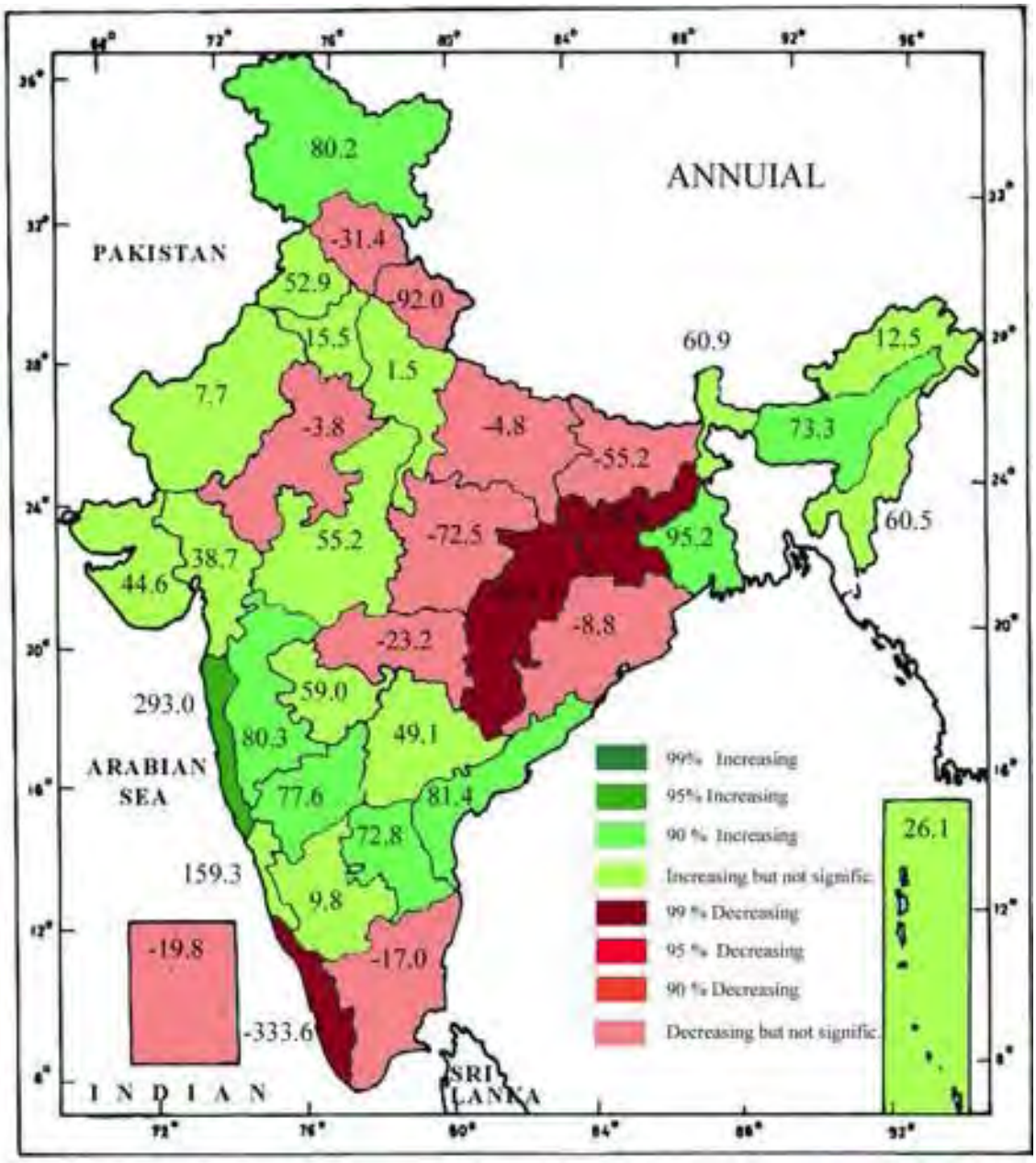
Source: India Meteorological Department

Figure-4 Year-wise monsoon rainfall distribution (2008-2011)



[Source: India Meteorological Department]

Figure-5. Increase/Decrease in annual rainfall (in mm) in 100 years period for each of 36 subdivisions of India



[Source: India Meteorological Department]

3.3 Drought analysis

Drought is a short term extreme climatic events. About 68% of the country is prone to drought in varying degrees.

There are three conditions that are generally referred to as drought:

Meteorological drought-: This type of drought all about the weather and occurs when there is a prolonged period of below average precipitation, which creates a natural shortage of available water. Country as whole has received normal rainfall.

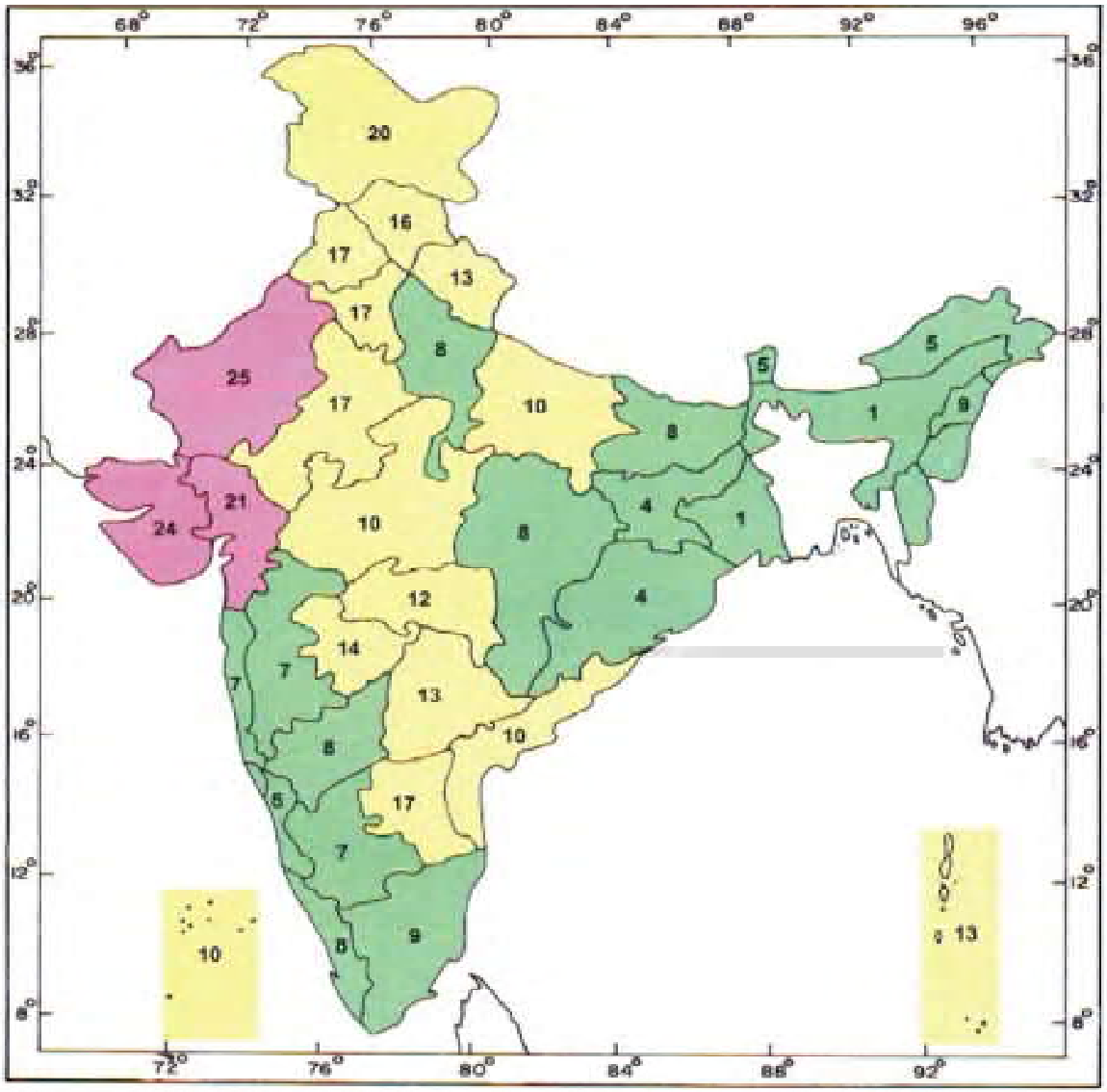
Agricultural drought-: This type of drought occurs when there isn't enough moisture to support average crop production on farms or average grass production on range land. Although agricultural drought often occurs during dry, hot periods of low precipitation, it can also occur during periods of average precipitation when soil conditions or agricultural techniques require extra water.

Hydrological drought-: This type of drought occurs when water reserves in aquifers, lakes and reservoirs fall below an established statistical average. Again, hydrological drought can happen even during times of average or above average precipitation, if human demand for water is high and increased usage has lowered the water reserves.

Drought classification of all India rainfall time series indicates that 11 years viz. 1901, 1904, 1907, 1913, 1920, 1941, 1966, 1968, 1974, 1986 & 2004 were under moderate drought category, 6 years (1905, 1911, 1951, 1965, 1982 & 2002) were under severe drought category and 5 years (1918, 1972, 1979 & 1987, 2009) were under extreme drought category. Based on frequency of drought and probabilities for 36 sub-divisions of 130 years data, highest frequency is observed in West Rajasthan and Saurashtra & Kutch with 31 cases. The adjoining Gujarat Region which mostly belongs to semi-arid also experienced high incidence of drought. Jammu Kashmir regions which mostly received rains from extra-tropical systems in most-monsoon and winter season also faces numerous incidences of drought. Other areas recording significantly large incidence of drought are Haryana, Delhi, Chandigarh, Punjab,

Himachal Pradesh and East Rajasthan in northwest India and Rayalseema in southern Peninsula. The lowest number of droughts have been observed, for obvious reasons, in Arunachal Pradesh, Assam, Meghalaya, Orissa, Gangetic West Bengal and Jharkhand and coastal area of Karnataka also experienced significant less frequency of droughts (**Fig.6**). Konkan and Kerala occasionally experienced more drought.

Fig. 6: Probability of Occurrence of Drought and Drought Prone areas during 1875-2004



[Source: India Meteorological Department]

CHAPTER 4

HYDROGEOLOGICAL SETUP OF THE COUNTRY

Two groups of rock formations have been identified depending on characteristically different hydraulic parameters of these formations viz. Porous Formation and Fissured Formation. Studies carried out over the years have revealed that aquifer groups in alluvial / soft rocks even transcend the surface basin boundaries

India is occupied by a variety of hard and fissured formations, including crystalline, trappean basalt and consolidated sedimentaries (including carbonate rocks), with patches of semi-consolidated sediments in narrow intra-cratonic basins. Apart from this, the central part of the country is occupied by alluvial formation stretching from Rajasthan in the west to Brahmaputra valley in the east. Rugged topography, compact and fissured nature of the rock formations, combine to give rise to discontinuous aquifers, with moderate to poor yield potentials. The near surface weathered mantle forms an important aquifer in case of hard rocks. In hard rock terrains, deep weathered pediments, lowlands, valley fills and abandoned river channels, generally have adequate thickness of porous material, to act as repositories of groundwater.

4.1 Aquifer Systems of India

The various rock formations with different hydrogeological characteristics act as distinct aquifer systems of various dimensions. The aquifer systems of India can be broadly categorized in to 14 Principal Groups .A brief description of the Principal Aquifer Systems is given below. The principal Aquifer systems identified by CGWB are given in **Fig 7.**

Alluvial aquifers

The Quaternary rocks comprising Recent Alluvium, Older Alluvium, Aeolian Alluvium (Silt/ Sand) and Coastal Alluvium of Bay of Bengal are by and large important unconsolidated formations comprising major alluvial aquifers.

These sediments are essentially composed of clays, silts, sands, pebbles, Kankar etc.

. These are by far the most significant ground water reservoirs for large scale and extensive development. The hydrogeological environment and ground water regime conditions in the Indo-Ganga-Brahmaputra basin indicate the existence of potential aquifers having enormous fresh ground water reserves. Bestowed with high incidence of rainfall and covered by a thick pile of porous sediments, these ground water reservoirs get replenished every year and are being used heavily. In these areas, in addition to the Annual Replenishable Ground Water Resources available in the zone of Water Level Fluctuation (Dynamic Ground Water Resource), there exists a huge ground water reserve in the deeper passive recharge zone below the zone of fluctuation as well as in the deeper confined aquifers which is nearly unexplored. The coastal aquifers show wide variation in the water quality, both laterally and vertically, thus imposing quality constraints for groundwater development.

Laterite

Laterites are formed from the leaching (chemical weathering) of parent sedimentary rocks (sandstones, clays, limestones); metamorphic rocks (schists, gneisses, migmatites) and igneous rocks (granites, basalts, gabbros, peridotites). It is rich in iron and aluminium, formed in hot and wet tropical areas. Laterites are the most wide spread and extensively developed aquifer especially in the peninsular states of India. Laterite forms potential aquifers along valleys and topographic lows where the thickness of the saturated zone is more and can sustain large diameter open wells for domestic and irrigation use.

Sand stone, shale aquifers

The sand stone and shale aquifers generally belong to the group of rocks ranging in age from Carboniferous to Mio-Pliocene. These are mainly composed of shale and sandstone. The terrestrial freshwater deposits

belonging to Gondwana System and the Tertiary deposits along the west and east coast of the peninsular region are included under this category. The Gondwana sandstones form highly potential aquifers, locally. Elsewhere, they have moderate potential and in places they yield meagre supplies. The Gondwanas, Lathis, Tipams, Cuddalore sandstones and their equivalents are the most extensive productive aquifers in this category.

Lime stone aquifer

The consolidated sedimentary rocks include carbonate rocks such as limestones, dolomite and marble. Among the carbonate rocks, limestones have the greatest distribution. In the carbonate rocks the principal aquifers are the fractured zone and solution cavities. Consolidated sedimentary rocks of Cuddapah and Vindhyan subgroups and their equivalents consist of limestones/dolomites apart from other major litho-units such as conglomerates, sandstones, shales, slates and quartzites.

Basalt aquifers

Basalt is the basic volcanic rock which forms alternate layers of compact and vesicular beds of lava flows as seen in the Deccan trap area. The groundwater occurrence in the basalts are controlled by nature and extent of weathering, presence of vesicles and lava tubes, thickness, number of flows and the nature of inter-trappean layers . The basalts have usually medium to low permeability. Groundwater occurrence in the Deccan Traps is controlled by the contrasting water bearing properties of different flow units, thus, resulted in multiple aquifer system, at places. The water bearing zones are the weathered and fractured zones.

Crystalline aquifers

The crystalline hard rock aquifers such as granite, gneisses and high grade metamorphic rocks such as charnockites and khondalites constitute good repository of ground water. Most of the results of groundwater exploration projects have proven that hard rocks neither receive nor transmit water, unless they are weathered and/or fractured. The aquifers are the weathered zone or the fracture system. The fracture system includes fractures, joints,

bedding planes, and solution holes. These openings do not have an even distribution, but are rather localised phenomena. The weathered zone is underlain by semi-weathered rock, fractured rock followed by bedrock. The depth of the bed rock varies from 30-100 m.

In hard rock terrains, ground water occurs under phreatic condition in the mantle of weathered rock, overlying the hard rock while within the fissures, fractures, cracks, joints within the hard rock, ground water is mostly under semi-confined or in the confined state Compared to the volume of water stored under semi-confined condition within the body of the hard rock, the storage in the overlying phreatic aquifer is often much greater. In such cases, the network of fissures and fractures serves as a permeable conduit feeding this water to the well. Ground water flow rarely occurs across the topographical water divides and each basin or sub-basin can be treated as a separate hydro geological unit for planning the development of ground water resources.

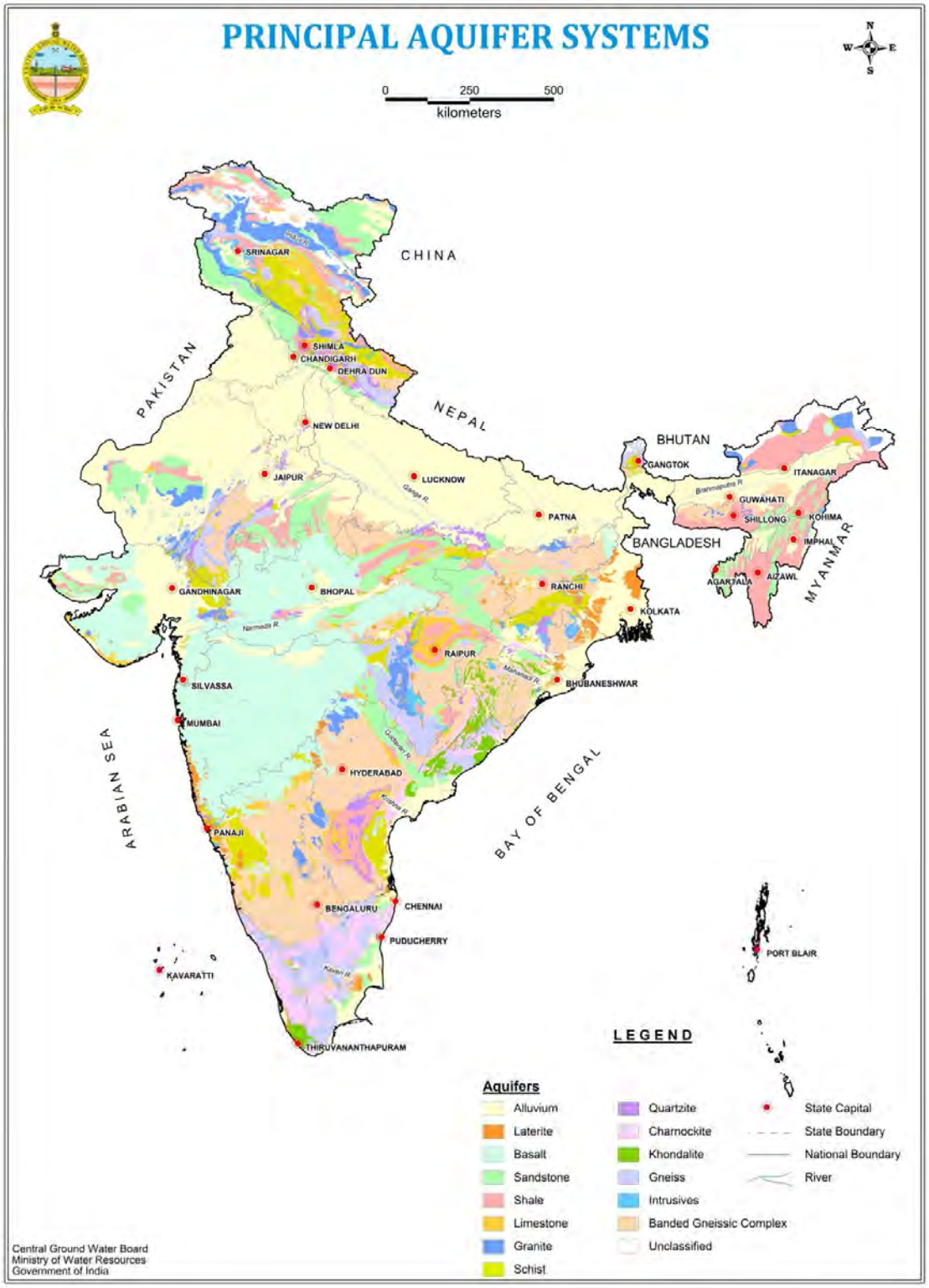


Fig 7 Principal Aquifer Systems of India

4.2 Ground Water Level Scenario in the country

Ground water level is one of the basic data-element which reflects the condition of the ground water regime in an area. Ground water levels are being monitored by Central Ground Water Board and State Ground Water Departments. CGWB monitors ground water level four times a year during January, April/ May, August and November. The periodicity of ground water level monitoring by the State Government varies from State to State. The primary objective of monitoring the ground water level is to record the response of ground regime to the natural and anthropogenic stresses of recharge and discharge parameters with reference to geology, climate, physiography, land use pattern and hydrologic characteristics. The natural conditions affecting the regime involve climatic parameters like rainfall, evapotranspiration etc., whereas anthropogenic influences include pumpage from the aquifer, recharge due to irrigation systems and other practices like waste disposal etc.

CGWB monitors the ground water level and quality in a network of 15640 ground water monitoring wells located all over the country. This data along with State Government monitoring data is used for assessment of ground water resources. The ground water level scenario based on data from CGWB is presented in the following paragraphs.

4.2.1 Ground Water Level Scenario, 2010

The depth to water level map of India for Pre- Monsoon period (May 2010) (***Fig 8***) reveals that that in sub-Himalayan area, north of river Ganges and in the eastern part of the country in the Brahmaputra valley, generally the depth to water level varies from 2-10 meter below ground level (m bgl). In major parts of north-western states (Indus basin), depth to water level generally varies from 10-20 m bgl with pockets of deeper water level of more than 20 m bgl. In the western parts of the country covering the states of Rajasthan and Gujarat deeper water level is recorded in the range of 10-20 m bgl. In western Rajasthan and north Gujarat deeper water level in the

range of 20-40 m bgl and > 40 m bgl have also been also recorded. In the west coast water level is generally less than 10 m and in western parts of Maharashtra State in isolated pockets water level in the range of 2-5 m has also been observed. In the east coast i.e. coastal Andhra Pradesh, Tamil Nadu and Orissa, water level in the range of 2-5 m bgl have been recorded. However South-eastern part of West Bengal recorded water level in the range of 5-10 m bgl. In central India water level generally varies between 5-10 m bgl, with patches where deeper water level more than 10 m bgl has been observed. The peninsular part of country generally recorded a water level in the range 5-10 m bgl. In some patches water level ranges from 10-20 m bgl. Isolated patches of water level of 10-20 m bgl and 20-40 m bgl have been observed. The Post-Monsoon (November 2010) depth to Water level map (***Fig 9***) reveals that in Sub-Himalayan area, north of river Ganges and in the eastern part of the country in the Brahmaputra valley, generally the depth to water level varies from 2-5 meter below ground level (bgl). Isolated pockets of shallow water level less than 2 m bgl have also been observed. In major parts of north-western states depth to water level generally ranges from 10-20 m bgl. In the western parts of the country deeper water level is recorded in the depth range of 20-40 m bgl. In North Gujarat, part of Haryana and western Rajasthan water level more than 40 m bgl is recorded. In the west coast water level is generally less than 5 m and in western parts of Maharashtra State isolated pockets of water level less than 2 m has also been observed. In the east coast i.e. coastal Andhra Pradesh and Orissa, shallow water level of less than 2 m have been recorded. In eastern states, water level in general ranges from 2-5 m bgl. However South-eastern part of West Bengal recorded water level in the range of 5-10 m bgl. In central India water level generally varies between 2-5 m bgl, except in isolated pockets where water level more than 5 m bgl has been observed. Similarly pockets of shallow water level less than 2 m bgl is also observed along the west coast. The peninsular part of country generally recorded water level in the range 2-5 m bgl. In some patches water level ranges from 5-10 m bgl.

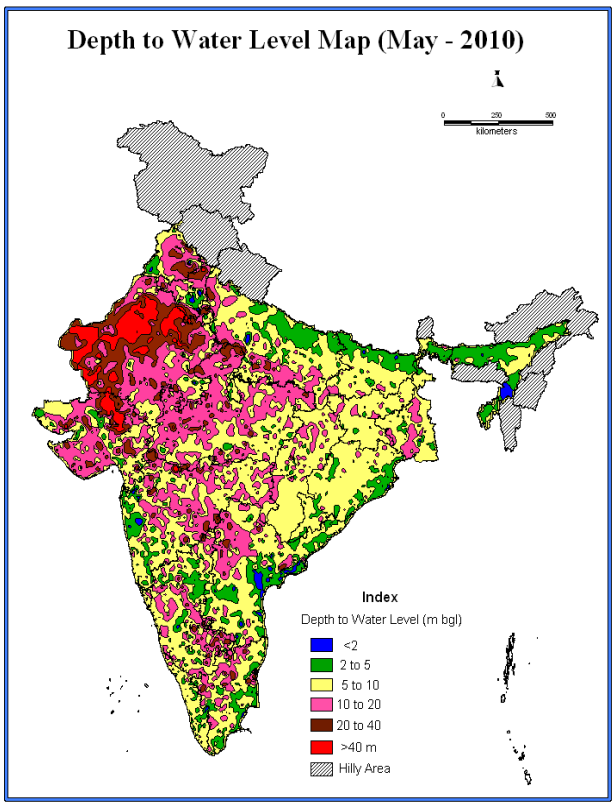


Fig 8 Pre monsoon Depth to Water Level Map-2010

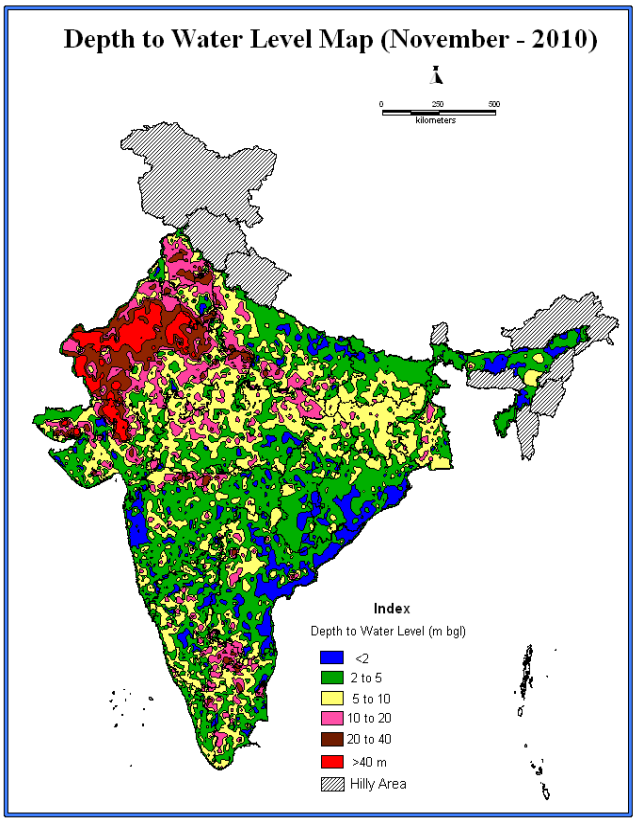


Fig 9 Post- monsoon Depth to Water Level Map-2010

4.2.2 Changes in ground water level regime due to impact of rainfall

Rainfall is the most significant source of ground water recharge and hence changes in the rainfall pattern leaves distinct imprint on the ground water regime of an area. Since post-monsoon water level indicates the impact of rainfall on ground water recharge, comparison was made between post-monsoon water level of last three years from the year of assessment and the decadal mean water level. Comparison of depth to water level of Post Monsoon 2008 with decadal mean Post Monsoon (1998-2007) (***Fig 10***) reveals that in general, there is a decline in the water levels in south western Uttar Pradesh, Punjab, Haryana, central Rajasthan, south eastern Madhya Pradesh, Chhattisgarh, West Bengal, in parts of Andhra Pradesh, Maharashtra and North Eastern states. Decline in water level of more than 2 m have been observed in south western Uttar Pradesh, Punjab, Haryana and eastern Rajasthan states. Rise in water level is observed in parts of peninsular states, Gujarat and south Rajasthan states. Rise in water level of more than 2 m is prominent in the states of Gujarat, southern and western Rajasthan, Tamil Nadu and in parts in Maharashtra and Andhra Pradesh.

Comparison of depth to water level of Post Monsoon 2009 with decadal mean Post Monsoon (1999-2008)(**Fig 11**) reveals that the decline in water levels has spread to more far flung areas as compared to 2008 in western and southern Uttar Pradesh, Punjab ,Haryana, Rajasthan, Chhattisgarh ,Bihar, Jharkhand, Meghalaya, parts of Bengal etc. This is directly related to rainfall as in 2009,major parts of the country received deficient rainfall except Arunachal Pradesh, Madhya Maharashtra, Coastal Karnataka, Kerala, Tamil Nadu, Puducherry, Konkan, Goa, Gangetic West Bengal which received normal rainfall. The post monsoon rise in water level in 2009 as compared to decadel mean are registered in most parts of Gujarat, Maharashtra, Karnataka, Kerala, parts of Orissa etc.

In 2010 most parts of the country received excessive rainfall except Assam, Meghalaya, Bihar, eastern Uttar Pradesh, Jharkhand and Gangetic West

Bengal which received deficient rainfall. This is also reflected in the post monsoon water level fluctuation map of 2010 versus the decadal mean (**Fig 12**).The map shows that most parts of peninsular India, Gujarat, Maharashtra etc have registered a rise in water level whereas the fall in water level in 2010 as compared to decadal mean is conspicuous in Bihar, Jharkhand, West Bengal, Meghalaya, eastern and western parts of Rajasthan etc.

Thus it can be broadly concluded that the changes in ground water level with respect to the mean water level behaves similarly with the changes in rainfall pattern with normal rainfall.

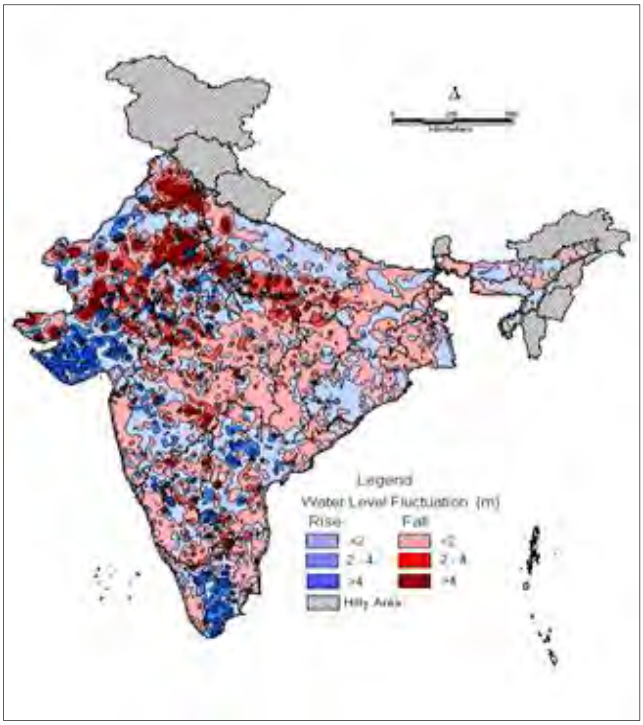


Fig 10 Water level fluctuation Post–monsoon 2008 Vs Decadal Mean (1998-2007)

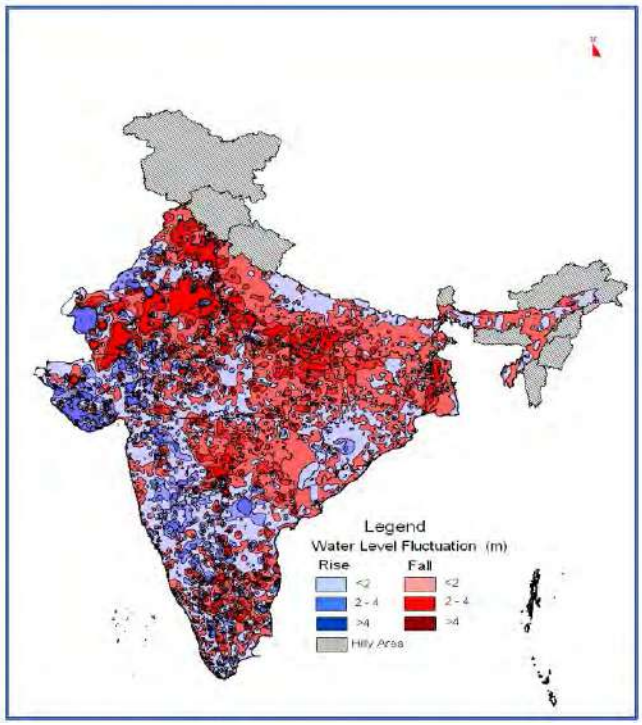


Fig 11 Water level fluctuation Post–monsoon 2009 Vs Decadal Mean (1999-2008)

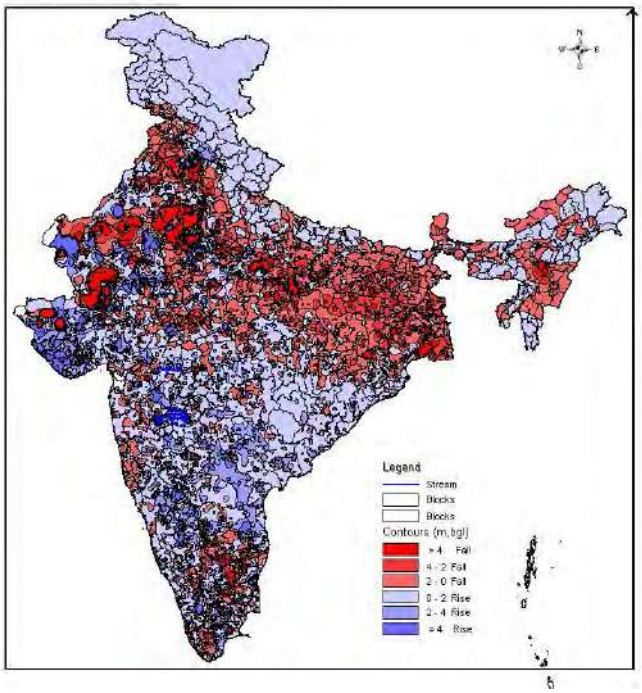


Fig 12 Water level fluctuation Post–monsoon 2010 vs Decadal Mean (2000.-2009)

CHAPTER 5

GROUND WATER RESOURCES OF INDIA

5.1 Dynamic Fresh Ground Water Resources

The dynamic ground water resources of the States and Union Territories have been assessed jointly by the CGWB and State Ground Water Departments under the supervision of the State level Committees. The base year of computation of the resources is 2010-11. The ground water resources in some of the State/Union Territory/Islands viz. Sikkim, Andaman & Nicobar, Dadara& Nagar Havelli, and Lakshadweep have been estimated by CGWB in absence of active participation of State Govt. The ground water assessment figures computed at the State Level are presented in the following compilation.

The dynamic ground water resources are also known as Annual Replenishable Ground Water Resources since it gets replenished/ recharged every year. The Annual Replenishable Ground Water Resource for the entire country has been assessed as 433 billion cubic meter (bcm). The major source of ground water recharge is the monsoon rainfall. About 58% of the annual replenishable resources i.e. 253 bcm are contributed by monsoon rainfall recharge. The overall contribution of rainfall to country's Annual Replenishable Ground Water Resource is 68% and the share of other sources viz. canal seepage, return flow from irrigation, recharge from tanks, ponds, and water conservations structures taken together is 32%. State-wise Ground Water Resources of India as on March, 2011 is given in ***Annexure – I*** and the district-wise figures are given in ***Annexure - II***. ***Figure-13*** presents the over-all scenario of ground water resource utilization and availability of the country. The contribution from other sources such as canal seepage , return flow from irrigation, seepage from water bodies etc in Annual Replenishable Ground Water Resource is more than of 33% in the states of Andhra Pradesh, Delhi, Haryana, Gujarat, Goa, Jammu & Kashmir, Karnataka, Punjab,

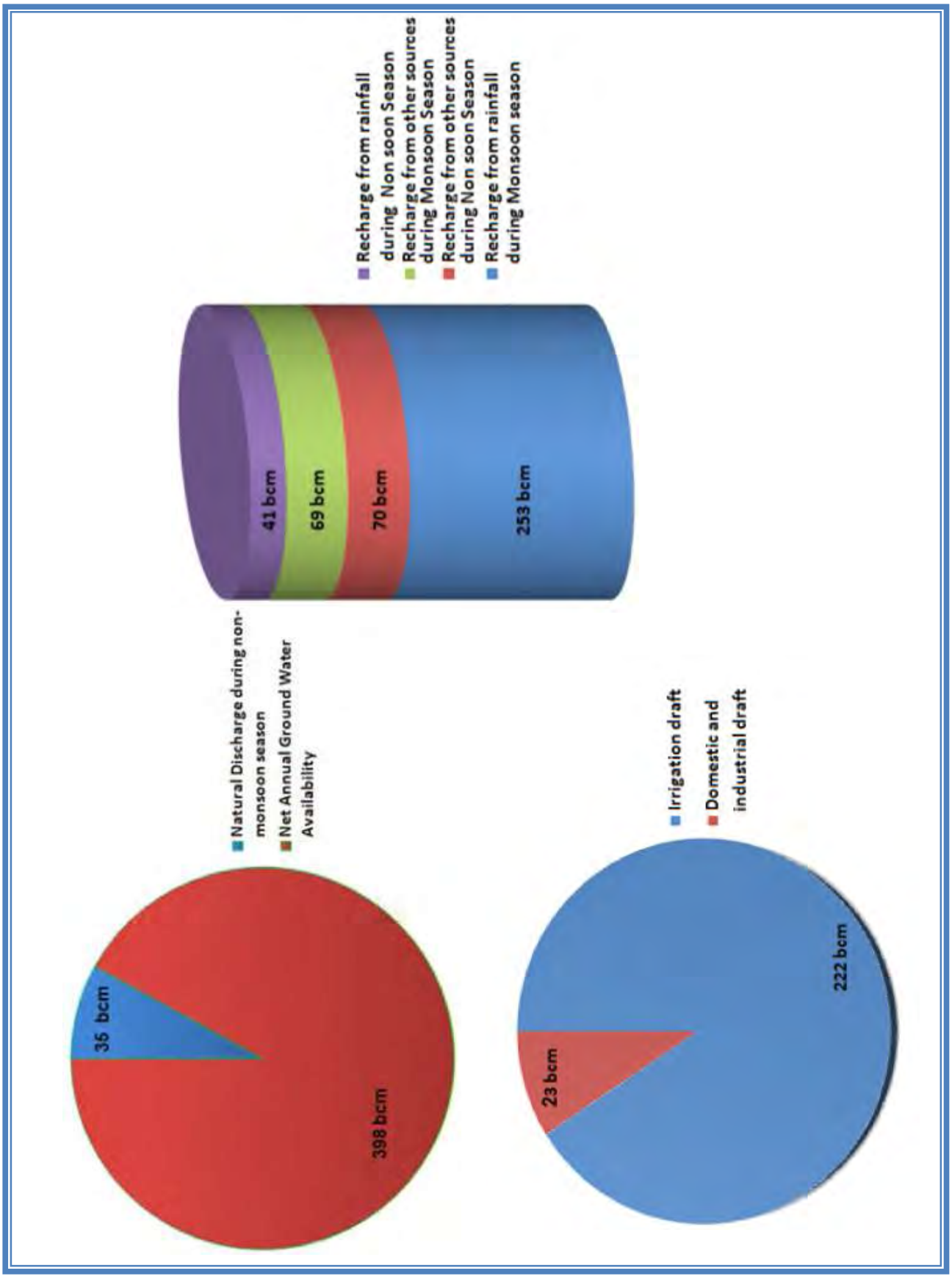
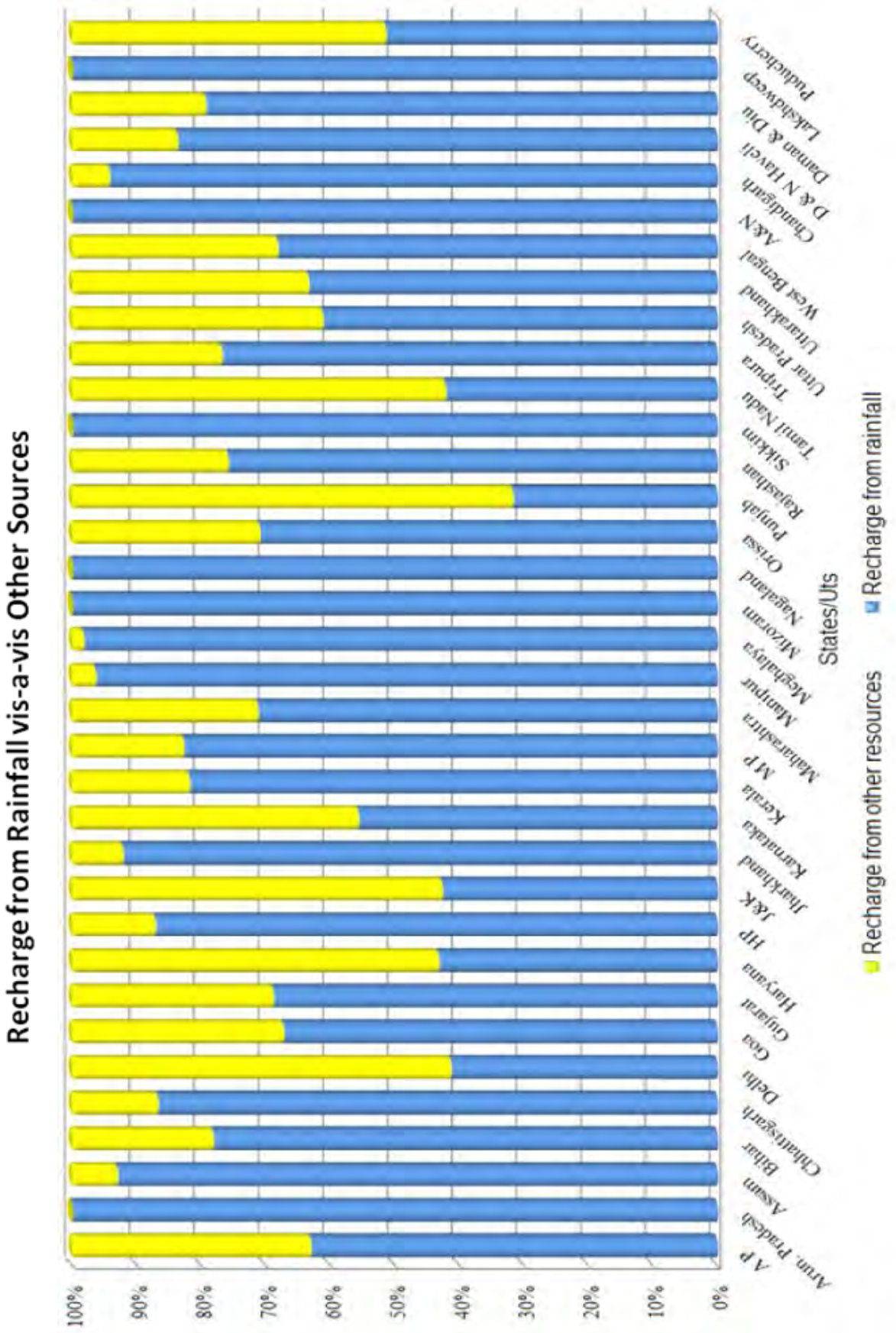


Fig.13 Ground water Resources Availability and Utilization in India

Fig.14

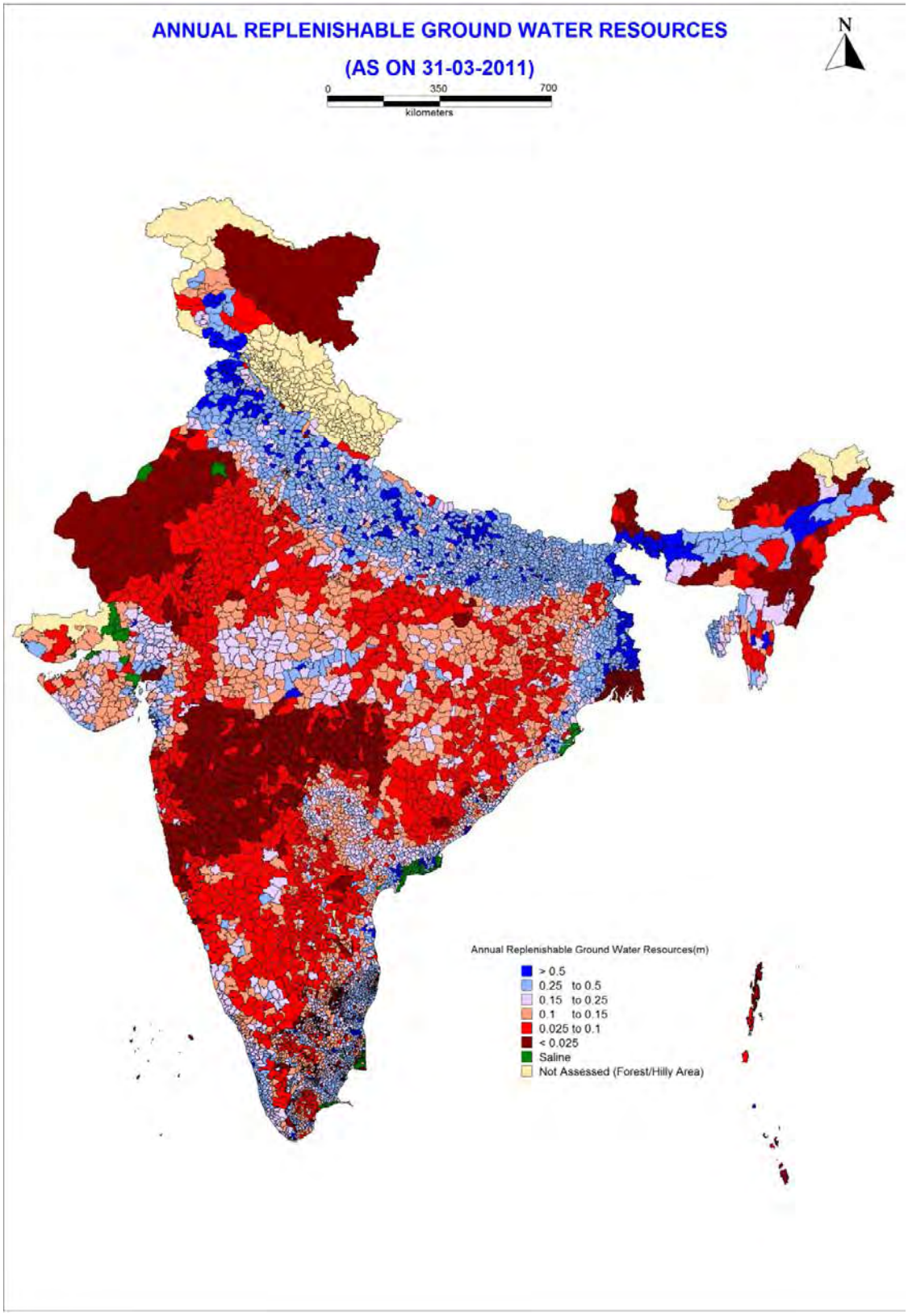

Recharge from Rainfall vis-a-vis Other Sources
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
A P
Arun. Pradesh
Assam
Bihar
Chhattisgarh
Delhi
Goa
Gujarat
Haryana
HP
J&K
Jharkhand
Karnataka
Kerala
M P
Maharashtra
Manipur
Meghalaya
Mizoram
Nagaland
Orissa
Punjab
Rajasthan
Sikkim
Tamil Nadu
Tripura
Uttar Pradesh
Uttarakhand
West Bengal
A&N
Chandigarh
D & N Haveli
Daman & Diu
Lakshdweep
Puducherry
States/Uts
Recharge from other resources
Recharge from rainfall

Tamil Nadu, Uttar Pradesh, and UT of Puducherry (***Figure-14***). South-west monsoon being the most prevalent contributor of rainfall in the country, about 73% of country's Annual Ground Water Recharge takes place during the Kharif period of cultivation. Keeping 35 bcm for natural discharge, the Net Annual Ground Water Availability for the entire country is 398 bcm.

The spatial variation in annual replenishable ground water resources is presented in ***Figure-15***. Volumetric estimates are dependent on the areal extent of the assessment unit. Thus, relative comparison of ground water resource of different assessment units based on volumetric estimates is not possible. Hence volumetric estimates of annual replenishable ground water resources have been divided by the area of the assessment unit to arrive at estimates per unit area (in meter). Replenishable Groundwater resource is significantly high in the Indus–Ganga–Bramhputra alluvial belt in the North, East and North East India covering the states of Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal and valley areas of North Eastern States, where rainfall is plenty and thick piles of unconsolidated alluvial formations are conducive for recharge. Annual Replenishable Ground Water Resource in these regions varies from 0.25 to more than 0.5 m. The coastal alluvial belt particularly Eastern Coast also has relatively high replenishable ground water resources, in the range 0.25 to more than 0.5 m. In western India, particularly Rajasthan and parts of northern Gujarat which have arid climate, the annual replenishable ground water resources are scanty, mostly up to 0.025 m. Similarly, in major parts of the southern peninsular India covered with hard rock terrains, annual replenishable ground water recharge is less, only up to 0.10 m. This is primarily because of comparatively low infiltration and storage capacity of the rock formations prevailing in the region. The remaining part of Central India is mostly characterized by moderate recharge in the range of 0.10–0.25 m.

The overall estimate of annual replenishable ground water resources of the entire country shows a marginal increase in the present estimate as

Figure-15


ANNUAL REPLENISHABLE GROUND WATER RESOURCES
(AS ON 31-03-2011)
0
350
700
kilometers
N
Annual Replenishable Ground Water Resources(m)
> 0.5
0.25 to 0.5
0.15 to 0.25
0.1 to 0.15
0.025 to 0.1
< 0.025
Saline
Not Assessed (Forest/Hilly Area)

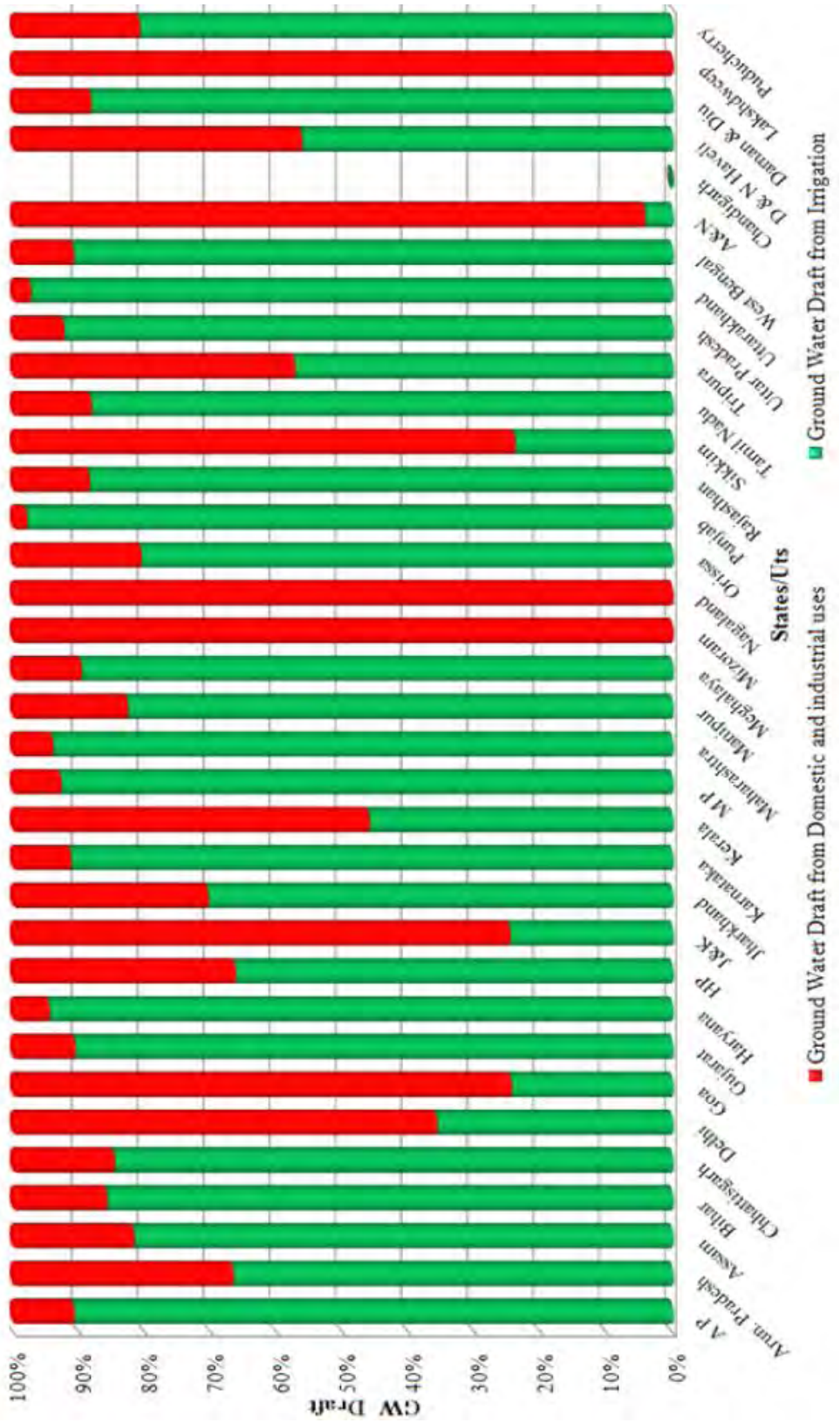
compared to the 2009 by about 2 bcm. However there are significant variations in the recharge estimates of some of the States as indicated in Section 5.5. The main reasons for this can be attributed to – changing ground water regime, widespread implementation of rainwater harvesting and water conservation measures, changes in rainfall pattern, adoption of revised values of parameters like Specific Yield which were estimated based on subsequent field studies and availability of improved database which helped in refinements in assessment.

5.2 Ground Water Utilization

The assessment of ground water draft is carried out based on the Minor Irrigation Census data and sample surveys carried out by the State Ground Water Departments. The Annual Ground Water Draft of the entire country for 2010-11 has been estimated as 245 bcm. Agriculture sector remained the predominant consumer of ground water resources. About 91% of total annual ground water draft i.e. 222 bcm is for irrigation use. Only 23 bcm is for Domestic & Industrial use which is about 9% of the total draft. An analysis of ground water draft figures indicates that in the states of Arunachal Pradesh, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Kerala and Odisha, Sikkim, North Eastern states of Manipur, Mizoram, Nagaland and Tripura, Sikkim, and Union Territories of Andaman & Nicobar Island, Dadra & Nagar Haveli, Lakshadweep and Puducherry, ground water draft for domestic & industrial purposes are more than 15% (***Figure-16***).

There has been marginal (2 bcm) increase in the overall estimate of the annual ground water draft of the country in 2011 as compared to 2009. However, in some States, decrease in ground water draft estimates has also been recorded which have been attributed to lower yield of bore wells in Over-exploited blocks in hard rock terrain, good rainfall and provision for alternate source of water resulting in lesser stress on ground water resources etc. State-wise details are given in Section 5.5.

Figure.16 Irrigation draft vis-à-vis domestic industrial draft



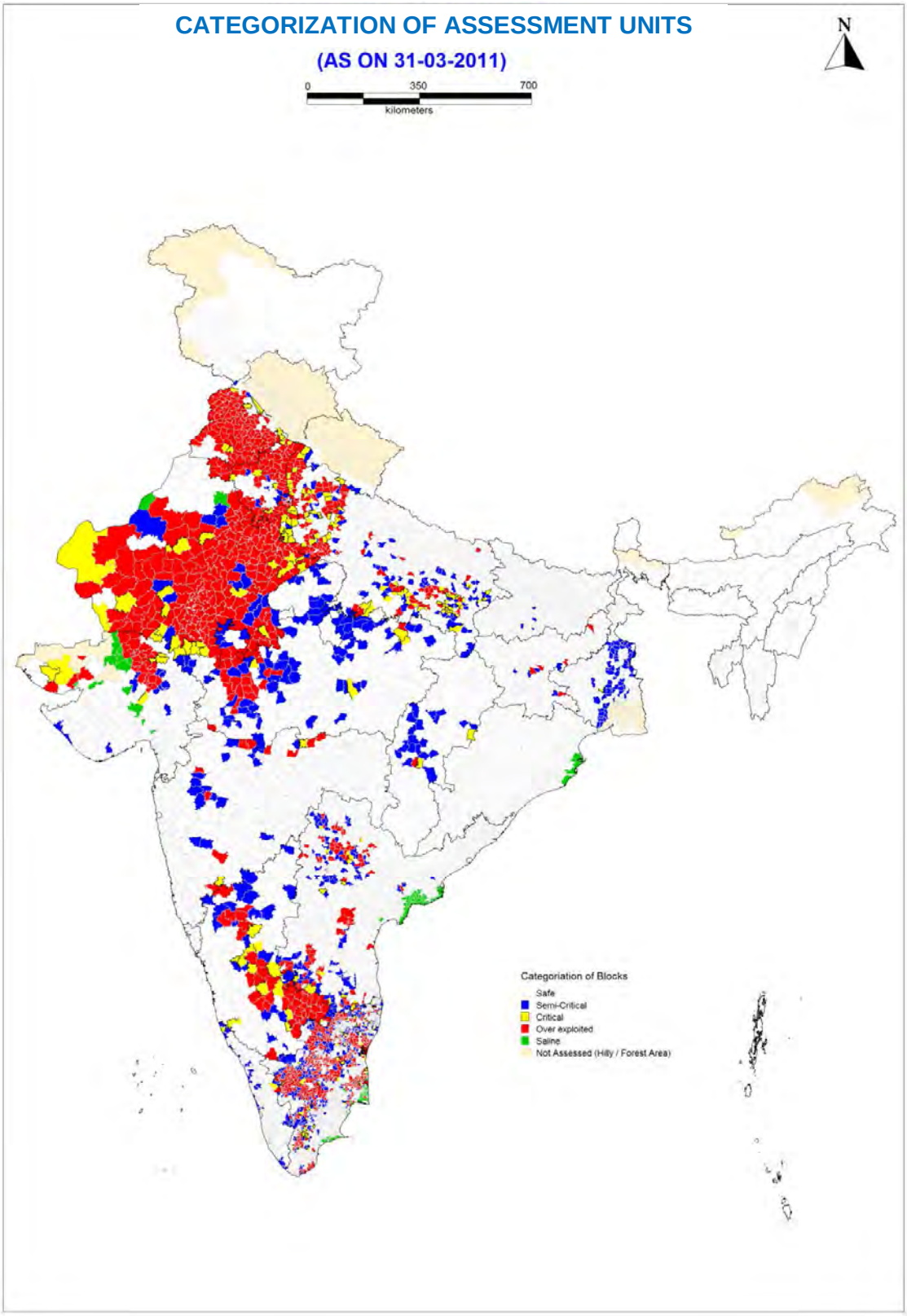
5.3 Stage of Ground Water Development

The overall stage of ground water development in the country is 62%. The status of ground water development is very high in the states of Delhi, Haryana, Punjab and Rajasthan, where the Stage of Ground Water Development is more than 100%, which implies that in the states the annual ground water consumption is more than annual ground water recharge. In the states of Himachal Pradesh, Tamil Nadu and Uttar Pradesh and UTs of Daman & Diu, and Puducherry, the stage of ground water development is 70% and above. In rest of the states / UTs the stage of ground water development is below 70%. The ground water development activities have increased generally in the areas where future scope for ground water development existed. This has resulted in increase in stage of ground water development from 61% (2009) to 62% (2011).

5.4 Categorization of Assessment Units

Out of 6607 numbers of assessed administrative units (Blocks/ Taluks/ Mandals/ Districts), 1071 units are Over-exploited, 217 units are Critical, 697 units are Semi-critical, and 4530 units are Safe. Apart from these, there are 92 assessment units which are completely Saline (Annexure – III). Number of Over-exploited and Critical administrative units are significantly higher (more than 15% of the total assessed units) in Delhi, Haryana, Himachal Pradesh, Karnataka, Punjab, Rajasthan and Tamil Nadu, Uttar Pradesh and also the UTs of Daman & Diu and Puducherry (***Figure-17***).

Figure-17


CATEGORIZATION OF ASSESSMENT UNITS
(AS ON 31-03-2011)
0
350
700
kilometers
N
Categoriation of Blocks
Safe
Semi-Critical
Critical
Over exploited
Saline
Not Assessed (Hilly / Forest Area)

A perusal of the Categorization map indicates that the Over-exploited blocks are concentrated in the North Western, Western and Southern Peninsular part of the country. The reason for over-exploitation in the North Western part i.e. Punjab and Haryana is indiscriminate extraction of ground water mainly for irrigation purpose. In the Western part of the country viz. Rajasthan and Gujarat, over-exploitation is caused by arid climate resulting scanty and irregular rainfall and consequent less recharge. In the southern part of the country i.e. Karnataka, and Tamil Nadu, large number of over-exploited blocks are caused because of hard rock terrain which permits less recharge and thus result in water stressed conditions.

List of categorization of Blocks / Taluks/ Mandals/ Districts is given in ***Annexure – IV***.

5.5 State-wise Ground Water Resources Scenario

The ground water conditions, its availability and utilization scenario in various States are described in the following paragraphs.

ANDHRA PRADESH

Andhra Pradesh state covers an area of 2, 75,068 km^2 with coastal line of 974 km and forest cover of 23%. The state shares its boundaries with Orissa, Tamilnadu, Chattisgarh, Maharashtra and Karnataka and on the eastern side bounded by the Bay of Bengal. The state is divided in to 1229 watersheds as the State is predominantly covered by hard rocks. The ground water resources of these watersheds were estimated separately for Command, Non-command and Poor Quality areas. The total area considered for recharge is 2, 38,001 km^2 and out of this 53,744 km^2 falls in command area and 1, 76,700 km^2 in non-command area and remaining 7,557 km^2 in poor ground water quality area. The state is underlain by diverse rock types of different geological ages from Pre-Cambrian to Recent. As much as 85% of the State is underlain by consolidated formations like Archaeans, Cuddapahs, Dharwars, Kurnools, Deccan Traps etc. Rest of the area is underlain by soft rocks including Gondwanas, Rajahmundry sandstone and

Alluvium. Ground water in phreatic zone is generally through open wells, filter points and cavity wells.

The Ground water resources have been assessed watershed wise and were apportioned to mandals. The Annual Replenishable Ground Water Resource of the State has been estimated as 35.89 bcm and Net Annual Ground Water Availability is 32.57 bcm. The Gross Ground Water Draft for all uses is estimated as 14.51 bcm and Stage of Ground Water Development is 45%. Out of 1110 blocks, 83 blocks have been categorized as 'Over-exploited', 15 as 'Critical', 97 as 'Semi-Critical', 877 as 'Safe' and 38 as saline blocks in the state. Comparatively high development of ground water has been observed in Medak, Anantapur, Chittoor, Rangareddy, Nizamabad, Kaimnagar, Warangal and Prakasam districts. As compared to 2009 estimates, the Net Ground Water Availability and Gross Ground Water Draft as in 2011 were increased from 30.76 bcm to 32.57 bcm (5.88% rise) and 14.15 bcm to 14.51 bcm (2.5% rise) respectively, resulting in the reduction of Stage of Ground Water Development from 46% in 2009 to 45% in 2011. The changes in the recharge and categorization in respect of assessment units are mainly due to good monsoon rainfall in the year 2010, updation of data on water harvesting structures and usage of low unit draft values due to availability of more rain water for the agriculture.

ARUNACHAL PRADESH

The state is underlain by diverse rock types of different geological ages from Pre-Cambrian to Recent and more than 90% of the area is covered by hilly terrain. Major part is covered with consolidated crystalline rocks and meta-sediments of Precambrian and Palaeozoic times, while Tertiary sediments consisting semi-consolidated argillaceous assemblage, represented by the Disang, Barail, Tipam, Siwalik and Dihing groups of rock, occupy periphery areas bordering Assam and behave as run-off, infiltration as also discharge zones. In consolidated formations ground water potentiality appears to be very much limited. Semi-consolidated Tertiary formations are likely to give moderate or poor yield and expected to be controlled by aquifer geometry

and structural features. Ground water in both consolidated and semi-consolidated formations is manifested as springs. Springs in all geological formations are both seasonal and perennial in nature.

Unconsolidated Quaternary sediments comprising the terrace deposits of Pleistocene (Bhabar zone) and also the terrace and alluvial fan deposits of Holocene age prevail in the fringe valley areas and as thin carpet in isolated structural valleys and with considerable thickness in open and wide valleys joining Brahmaputra Alluvial plains. The unconsolidated alluvial sediments in the valley areas act as good repositories for ground water development. Valleys adjoining Assam are most promising where good thickness of granular zones is distributed. Discharge of the deep tube wells, tapping mostly unconsolidated Quaternary sediments & at places Upper Tertiary formations, varies from 1.4 m^3/hr to 54 m^3/hr, while transmissivity ranges from 1.14 to 661 m^2/day. Storativity ranges from 0.35 x 10^{-3} to 6.65 x10^{-3}. Autoflow conditions seen at places are promoted due to high hydraulic head.

Ground water resources have been assessed district-wise and the resources of eleven districts, out of the total 16 district of the State, have been assessed for the assessment year 2010—11 and the ground water resource potential of the remaining five districts, namely, Upper Siang, Anjaw, Dibang Valley, Kurung Kumey and Tawang could not be estimated due to paucity of data. The Annual Replenishable Ground Water Resource of the State has been estimated as 4.51 bcm and Net Annual Ground Water Availability is 4.06 bcm. The Annual Ground Water Draft is 0.003 bcm and Stage of Ground Water Development is 0.08%. All the districts have been categorized as 'Safe' and there is no saline area in the state. As compared to 2009 estimate, there is no significant change in annual ground water recharge and ground water draft.

ASSAM

The State is underlain mainly by unconsolidated Quaternary formation in Brahmaputra valley and potential aquifers lie at shallow as well as deeper zone. The yield potential of deep tube wells in the area ranges from 100 to 300 m3/hr for negligible drawdown within 8 m and transmissivity ranges from

2000 m2/day to more than 4000 m2/day and permeability range varies from 20 m/day to 60 m/day. The semi-consolidated Tertiary formations are found to occur in the southern part of Karbi Anglong, Cachar, Karimganj and Hailakandi districts and in Upper Assam covering southern fringe of Dibrugarh, Tinsukia, Sibsagar, Jorhat, Golaghat districts. The tube wells are feasible with yield potential within 50 to 100 m^3/hour for drawdown within 20 m. The consolidated Precambrian rocks occurs mainly in N.C. Hills, Karbi-Anglong, Kamrup, Goalpara, Dhubri, Nagaon districts and the bore wells may yield <15 lps for considerable drawdown.

Ground water resources have been assessed district-wise due to paucity of block wise data. The Annual Replenishable Ground Water Resource of the State has been estimated as 28.52 bcm and Net Annual Ground Water Availability is 25.79 bcm. The Annual Ground Water Draft is 3.49 bcm and Stage of Ground Water Development is 14%. All the districts have been categorized as 'Safe' and there is no saline area in the state. As compared to 2009 estimate, the Net Ground Water Availability and Gross Ground Water Draft as in 2011 have decreased by 2.02 bcm & 2.54 bcm respectively, resulting in the Stage of Development decreasing by 8% during 2011 than that of 2009. The changes in the recharge and draft parameters in respect of assessment units can be attributed to decrease in recharge components from ground water irrigation and the ground water draft for irrigation use during 2011, which have been calculated considering the fourth census data of 2006-07 and projected 2% per year. As per the fourth census, the number of shallow tube well became half of the figure during 2004 and gross ground water draft for irrigation has markedly decreased by 2.47 BCM in 2011 in comparison to 2009 which was calculated considering the projected figure, based on the figure of 2004.

BIHAR

The state is covered with Gangetic alluvium in more than 89% of its geographical area. The consolidated formations occupy fringes in the southern parts of the state. Dug wells and shallow tube wells tapping the

phreatic zone are the common groundwater abstraction structures. The yield of the wells generally ranges from 3-10 lps.

With 'Block' as the assessment unit, the estimation of dynamic ground water resources has been carried out for 533 blocks in the state. The Annual Replenishable Resource has been worked out as 29.34 bcm with the Net Groundwater Availability as 26.86 bcm. The Gross Ground Water Draft for all uses has been estimated as 11.95 bcm. In comparison to the previous estimation of 2009, the Net Ground Water Availability and Gross Ground Water Draft as on 2011 have increased by 2.52% and 5.19% respectively. The Stage of Ground Water Development of the state is 44.5%, which was earlier at 43% in the 2009 estimate. A perusal of the Stage of Ground Water Development indicates that out of 533 blocks in the state, 522 blocks fall under 'Safe' category where available water level trend of wells do not reveal any significant lowering for any patch with significant aerial extent. The rest 11 blocks has been categorized as 'Semi-Critical'. Out of these, 6 blocks fall in the South Bihar Plains and 3 blocks fall in the North Bihar plains. No block has been categorised as critical or over-exploitated.

CHHATTISGARH

The state is underlain by diverse rock types of different geological ages from Pre-Cambrian to Recent. 87% area of the State is underlain by hard rocks being tapped mostly by dug wells constructed in the weathered zone and bore wells to tap the deeper aquifers. The yield of open (dug) wells varies from 1 to 2 lps and the yield of the bore wells ranges from < 1 to 5 lps. 13% area of the State is occupied by Semi-consolidated sedimentary rocks where Dug wells & tube wells have yield range of 1 to 10 lps.

The Ground water resources have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 12.42 bcm and Net Annual Ground Water Availability is 11.63 bcm. The Annual Ground Water Draft is 4.05 bcm and Stage of Ground Water Development is 35%. Out of 146 blocks, 18 have been categorized as Semi-

critical, 2 as Critical, one as overexploited and remaining 125 as Safe. In Chhattisgarh, the ground water development concentrates in the central part of the state i.e. within Chhattisgarh basin more as compared to the other parts of the state. Therefore, most of the Semi-critical, critical and over exploited blocks are falling in the Central part of the State. As compared to 2009 estimate, there is increase in Annual Replenishable Ground Water Resources in 2011 by about 1.63%, which is mainly due to the increase in recharge from other sources. The Ground Water Draft has been increased by about 11.27% during current assessment as compared to draft during 2009.

DELHI

The state is covered by diverse rock types of different geological ages from Pre-Cambrian to Recent. As much as 89% of the State is occupied by alluvium and ground water is being tapped mostly through tube wells. Yields of tube wells vary from 4 to 10 lps in older alluvial deposits and from 25 to 55 lps in newer alluvium. About 11% of the State is occupied by quartzitic hard rock where bore wells have yields of 0.6 to 5 lps.

The Ground water resources have been assessed tehsil-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 0.31 bcm and Net Annual Ground Water Availability is 0.29 bcm. The Annual Ground Water Draft is 0.39 bcm and Stage of Ground Water Development is 137%. Out of 27 tehsil, 18 tehsils have been categorized as 'Over-exploited', two as 'Critical', 5 as 'Semi-Critical', 2 as 'Safe'. Comparatively high development of ground water has been observed in all districts except Central, New Delhi and districts. As compared to 2009 estimate, the Gross Ground Water Draft as in 2011 have decreased by about 1%, resulting in the Stage of Ground Water Development at about 137%. The changes in the recharge and draft parameters in respect of assessment units are due mainly to the reduction in domestic Ground Water Draft, during the current assessment is because of the actual population as per 2011 Census, whereas in 2009 the projected population based on 2001 Census figure was taken for estimation of draft. The slightly increase in surface water supply by DJB, the

regulation on drilling of new bore wells in whole NCT Delhi also contributed to lesser dependency on Ground Water.

GOA

Major part of the Goa State is covered by consolidated formation of Dharwar Super Group. Ground water occurs under unconfined to semi-confined conditions in beach sands, laterites and weathered and fractured crystalline rocks. The development of ground water from phreatic zone is mostly through dug wells and shallow bore wells.

Ground Water Resource has been assessed taluk-wise. The Annual Replenishable Ground Water Resource has been estimated as 0.24 bcm and Net Annual Ground Water Availability is 0.145 bcm. The Annual Ground Water Draft is 0.041 bcm and Stage of Ground Water Development is 28% and all the taluks in the state have been categorized as Safe.

There is a marginal increase in the estimates of annual replenishable resources and net annual ground water availability as compared to the previous 2009 assessment. The main reason for this is 43 % reduction in number of dugwells even though there is a marginal increase of 10% in number of bore wells.

GUJARAT

The state is underlain by diverse rock types of different geological ages from Pre-Cambrian to Recent. As much as 60 % of the State is underlain by hard rocks and rest by soft rock / alluvium formations. In hard rock areas, the ground water is tapped mostly through dug wells constructed in the weathered zone. Dug cum bore wells and deep bore wells are common for irrigation. In alluvium & soft rock areas, deep tube wells are common for both irrigation and domestic usage. A yield of open (dug) wells varies from 2 to 10 m3/day whereas, that of tube wells ranges from less than 10 to 100 m3/day. Most of the alluvium areas of central and north Gujarat have experienced high groundwater development since last two decades. Majority of the overexploited block are in the alluvial aquifer areas. The State has 1600 km long coast line and many areas along it are facing salinity ingress problem.

The Ground water resources have been assessed on taluka –wise basis. The Annual Replenishable Ground Water Resource of the State has been estimated as 18.57 bcm and Net Annual Ground Water Availability is 17.59 bcm. The Annual Ground Water Draft is 11.86 bcm and Stage of Ground Water Development is 67 %. Out of 223 assessment units (taluka area), 24 talukas have been categorized as 'Over-exploited', 5 as 'Critical', 13 as 'Semi-Critical', 171 as 'Safe' and there are 10 saline talukas in the state. Comparatively high development of ground water has been observed in Banaskantha, Mahesana, Patan, Gandhinagar, Ahmedabad and Kachchh districts. As compared to 2009 estimate, the Net Ground Water Availability have increased by about 1.36 % whereas Gross Ground Water Draft have decreased by 8.73 %in 2011, resulting in lowering of Stage of Ground Water Development from 74.87 % in 2009 to 67 % in 2011. The changes in the recharge and draft parameters in respect of assessment units are due to the increased in recharge activities, more rainfall in last five years and also due to adoption of water conservation methods like drip and sprinkler irrigation in many of over exploited blocks which has decreased the irrigation draft leading to modification of parameter values.

HARYANA

Haryana State is occupied by the alluvial deposits, which covers around 98% of the state while hard rocks cover just around 2%. Alluvial deposits are of Older and Newer types and consist chiefly of clay, silt and fine to medium sand. Other deposits are piedmont deposits, which are confined to a narrow zone, about 2 to 4 kms wide, between Siwalik hills and alluvial plains. Sand-dunes are found in the districts of Bhiwani, Mahendragarh, Hissar and Sirsa. Coarse sand, gravels and boulders are found to occur in piedmont areas and in the adjacent alluvial tracts. The hard rock formations belong to the formation of Delhi systems of Pre-Cambrian age and occupying the southern part of the state, while Shivalik system of Tertiary age are occupying the northern most part of the state. Broadly, three-aquifer groups down to the depth of 450 m. bgl. have been deciphered by Central Ground Water Board

in the depth range of 40 to 167 mbgl., 65 to 294 m bgl. and 197 to 383 mbgl. in Ambala-Karnal-Panipat region. In June 2010, 40% of the area the depth to water in general lies within 10 mtrs below ground level which was 53% during June, 2008.

The Ground water resources have been assessed block-wise for the period 2010-11 (as on March 2011). The Annual Replenishable Ground Water Resource of the State has been estimated as 10.78 bcm and Net Annual Ground Water Availability is 9.79 bcm. The Annual Ground Water Draft is 13.05 bcm and Stage of Ground Water Development is 133%. Out of total 116 assessed blocks taken for study, 71 Blocks (61%) are over-exploited, 15 Blocks (13%) are critical, 07 Blocks (6%) are semi critical and 23 Blocks (20%) are in safe category. The analysis of present ground water resource assessment indicates that there is marginal decrease in net availability of ground water resources as compared to previous assessment carried out for the period 2004-08 (as on March 2009). The ground water draft has increased by about 5 %. It has been observed that 9 blocks have shown change to higher category owing to increased ground water draft for irrigation and other uses. 15 blocks have shown change to lower category due to increased replenishable recharge, reduction in draft of tubewells, rise in water level trends or change in the land use.

HIMACHAL PRADESH

The diverse physiographic, climatic, topographic and geologic conditions have given rise to diversified ground water situation in different parts of the state. The rock formation ranges in age from Archean to Recent occupy the area and control the occurrence and movement of ground water depending upon aquifer composition, structure and deposition. Hilly and mountainous parts with steep slopes mainly constitute the run off areas and have low ground water potential. In valley and low-lying areas, unconsolidated / semi-consolidated formations form good potential aquifers.

In consolidated formations the water availability is restricted to weathered mantle, joints/fractures, weak planes, bedding planes and

limestone caverns. The limestones are associated with phyllites and quartzite forms potential aquifers. In granites, ground water availability is minimum in the weathered zone of 5-10m and potentiality of the aquifer is highly dependable on the fracture intensity. The discharges of these granitic aquifers are in the range of 1-3 lps. Groundwater in hard rock areas is either developed though bore wells or springs. Springs are yielding sometimes more than 40 lps and utilized for both drinking and irrigation purposes. Weathered mantle in low topography areas form poor aquifers. Bowri are also constructed in oozing out spring zones for collecting the water to fulfill the domestic water needs.

In the unconsolidated formations the occurrence and movement of ground water is highly dependent on lithology particularly the percentage of clay. These are confined to valley fill areas, regionally extensive, having prolific yield prospects that can sustain moderate to high capacity deep tube wells. The yield potentials of the tube wells depends on the thickness of the total granular zones available within the aquifers tapped and ranging from 5-40 lps in different valleys.

The Ground water resources have been assessed valley-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 0.56 bcm and Net Annual Ground Water Availability is 0.53 bcm. The Annual Ground Water Draft is 0.38 bcm and Stage of Ground Water Development is 71%. Out of 8 valleys, one valley has been categorized as 'Over-exploited', two as 'Critical', five as 'Safe' and there is no saline valley in the state. Comparatively high development of ground water has been observed in Kala Amb valley, Sirmaur district, Una valley & Hum valley of Una district. As compared to 2009 estimate, the Net Ground Water Availability and Gross Ground Water Draft as on March, 2011 have increased by 15% and 22.6% respectively, resulting in increase in the Stage of Ground Water Development by 6.5%. The changes are mainly attributed to refinements in the recharge and draft parameters.

JAMMU & KASHMIR

The dynamic ground water resources of Jammu & Kashmir have been estimated for valley areas and outer plains of all districts of the State. The total recharge of ground water involves several components and the rainfall being the major one. The other components are seepage from canal and return irrigation flow from surface water and ground water.

The Annual Replenishable Ground Water resource of the State has been estimated as 4.25 bcm and Net Annual Ground Water Availability is 3.83 bcm. The Annual Ground Water Draft is 0.81 bcm and the Stage of Ground Water Development is 21%. The entire assessment unit falls under Safe Category. As compared to the 2009 estimates, the Net Ground Water Availability has increased by 15% and the Gross GW Draft has increased by 10%. The change in the Net Ground Water Availability is due to the refinements in the parameter.

The high ground water development in Srinagar can be attributed to low recharge due to the presence of Karewas, which has low specific yield, less rechargeable valley area and small valley portion of Udhampur district.

Assessment units are categorized for Jammu and Kathua districts based on both stage of ground water development and long term trend of water levels. For rest of the districts, state of ground water development is the sole criteria for categorization.

JHARKHAND

The state is underlain by diverse rock types of different geological ages ranging from, Archaean to Recent. The major rock type is Igneous & Metamorphic Rocks covering nearly 85 percent of the geographical area of the state. The weathered zone ranges generally between 10-25 m, is a good repository of ground water; however the recent exploratory wells drilled by CGWB revealed that the secondary porosities below the weathered zones also form potential aquifers. The yield of the exploratory wells range from negligible up to 151 m^3/hr. The Vindhyan rocks do not form potential aquifer system as such. The yield of the dug wells (depth range 5.5 to 11m) recorded

from 0.5 to 0.75 m^3/hr. The dug wells in volcanic rocks tapping, the weathered mantle have an average yield of 0.5 to 1.2 m^3/hr. In Gondwana Supergroup discharge of borewells is 7-10 m3/hr, was obtained from 2 to 3 fractures within 200m bgl. In Tertiary deposits yield ranges from 18 to 78 m^3/hr. The Younger Alluvium deposits are confined in patches. The depth of dug wells in general ranges between 10 – 15 m bgl while the depth of shallow tube wells varies between 20 – 40 m bgl and discharge may go up to 40 m^3/hr if sediments are available with sufficient thickness.

The Ground water resources have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 6.31 bcm and Net Annual Ground Water Availability is 5.76 bcm. The Annual Ground Water Draft is 1.86 bcm and Stage of Ground Water Development is 32%. Out of 210 blocks, six blocks has been categorized as 'Over-exploited', five as 'Semi-Critical',199 as 'Safe' and there are no saline block in the state. Comparatively high development of ground water has been observed in Dhanbad, Godda, Ranchi and Hazaribagh districts. As compared to 2009 estimate, the Net Ground Water Availability and Gross Ground Water Draft as in 2011 have increased by about 6.5% and 15.53% respectively, resulting in the increase in Stage of Ground Water Development from 30% to 32%. The increase in the recharge and draft parameters in respect of assessment units are due mainly to the increase Domestic & Industrial Water Supply and in the irrigation draft.

KARNATAKA

Karnataka state is located in southwestern part of India and covers an area of 191761 sq km. It is divided into 30 districts and 176 taluks. The state is drained by five river basins namely Godavari, Krishna, Cauvery, Pennar and West Flow rivers. Though the state is blessed with the bounties of nature, 63% of the land falls under dry tracts ranking second only to Rajasthan in having arid tracts. Major part (99%) of the Karnataka is occupied by hard rock aquifers leaving a small part of the coastal terrain, which is occupied by alluvium. The aquifer systems are classified into nine major groups depending

upon their characteristics and distribution namely Banded Gneissic Complex (BGC), Basalt, Schists, Granites, Charnockites, Limestones, laterites, Sandstones and alluvium. The state is dependent on ground water for its all round development. There is a spurt in groundwater development since the 1990 and the same is more pronounced in some of the districts like Bangalore, Belguam, Chickballapura, Chitradurga, Kolar, Ramanagaram and Tumkur. Consequently, there was a steady decline in the water levels resulting in drying up of dug wells and shallow bore wells. The progressive farmers were trying their luck with deeper bore wells. Now it is common to have irrigation bore wells of the depth range of 250-300 m in parts of Kolar and Bangalore districts. The groundwater scarcity, decline in water levels, over- exploitation, deterioration in quality and related problems are encountered in the areas to the east of the Western Ghats covering the plateau region.

The ground water assessment was done on watershed wise. A total of 234 watersheds have been identified. These watersheds have been further classified as Command and Non Command as sub units. 86 of 234 watersheds are having command area and thus, a total of 310 assessment units are there. The Annual Replenishable Ground Water Resources has been assessed as 17.03 bcm and the Net Annual Ground Water Availability is 14.81 bcm. The Annual Ground Water Draft is 9.41 bcm and the Stage of Ground Water Development is 64%.

The resources so assessed have been apportioned on taluk wise for all the 176 taluks of the state. Out of 176 taluks, 95 taluks are having command area in parts. Thus, on a taluk wise basis there are 270 assessment units.

Out of 270 assessment units, 63 are categorized as Over-exploited, 21 as Critical, 34 as Semi-critical, and 152 are Safe. The over-exploited assessment units are concentrated in the eastern part of Belgaum and southers part of Bagalkote district, south eastern part of the State in the districts of Bangalore Rural, Bangalore Urban, Kolar, Chickballapur, Ramanagaram, Tumkur, Chitradurga and Davanagere. There has been marginal increase in the

annual replenishable resource in 2011 as compared to 2009 and there is a considerable decrease in draft. It is attributed to reduction in ground water abstraction structures mainly dug well which showed a decrease of 38%. However, numbers of borewells have been increased marginally about 2%. The reduction in number of dugwells is mainly attributed to drying of phreatic zone due to the over-exploitation in many of the districts, reduced draft in borewells due to mutual interference. This is cumulative effect of various contributory factors viz. reduction in yield due to mutual interference of bore wells in the OE area, reduction in draft due to the restriction in availability of electricity and farmers resorting advanced irrigation practices like micro irrigation as against the traditional flood irrigation especially in OE districts like Kolar.

KERALA

The state is underlain by diverse rock types of different geological ages from Pre-Cambrian to Recent. As much as 88% of the State is underlain by hard rocks and ground water is being tapped mostly through dug wells constructed in the weathered zone. Yields of open (dug) wells varies from 2 to 10 m^3/day whereas that of bore wells ranges from less than 1 to 35 lps. About 12% of the State is underlain by Semi-consolidated and unconsolidated sedimentary formations where dug wells and filter points have yields of 1 to 35 m^3/day, whereas deep tube wells have yields in the range of 1 to 57 lps. Laterites, which cover most of the geological formations in the major part of the state also forms an important aquifer in the state with dug wells having yields in the range of 0.5 to 6 m^3/day.

The Ground water resources have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 6.69 bcm and Net Annual Ground Water Availability is 6.07 bcm. The Annual Ground Water Draft is 2.84 bcm and Stage of Ground Water Development is 47%. Out of 152 blocks, one block has been categorized as 'Over-exploited', two as 'Critical', 23 as 'Semi-Critical', 126 as 'Safe' and there are no saline block in the state. Comparatively high development of ground water has

been observed in Kasargod, Palakkad and Thiruvananthapuram districts. As compared to 2009 estimate, the Net Ground Water Availability and Gross Ground Water Draft as in 2011 have increased by about 0.73% and 0.95% respectively, resulting in the Stage of Ground Water Development remaining at about 47% in both the estimates. The changes in the recharge and draft parameters in respect of assessment units are due mainly to the reduction in the irrigation draft and modification of parameter values in the light of information gathered during subsequent field studies. Reorganization of blocks in 2010 has also resulted in change in category of ground water development in a few assessment units.

MADHYA PRADESH

The State of Madhya Pradesh has varied hydrogeological characteristics due to which ground water potential differs from place to place. The area is underlain by various geological formations ranging in age from the Archaean to the Recent. Hard rock areas cover more than 80% of total land area of the State. These hard-rock areas show wide variations and complexities in nature and composition of rocks, geological structures, geomorphological set up and hydro meteorological conditions. The crystalline rocks of Archaean age like granite, gneiss, granulites, schist, quartzite and granitoids occupy about 14.7% of geographical area of the State. The basaltic rocks of Deccan lava flows are the predominant formations and occupy nearly 44.5% of total geographical area. The consolidated sedimentary rocks of Vindhyan Super Group and Mahakoshal (Cuddapah) Super Group of Proterozoic age occupy about 19.1% of total geographical area and the semi consolidated (Gondwana Formation) occupies about 6.7%. Recent unconsolidated alluvial sediments occupy about 14.4% of total geographical area

Total recharge from rainfall in the State is of the order of 29,00,686 ham, (29.01 bcm) with Hoshangabad district having the highest recharge of 1.43 bcm ham and Alirajpur district has minimum recharge of the order of 0.19 bcm. Component of recharge from other sources is highest in Hoshangabad district

(0.71 bcm) followed by Dhar district (0.23 bcm) and Morena district (0.21 bcm) where maximum canal irrigation facility is available. Lowest value of recharge from other source is recorded in Annupur (355 ham) and Dindori (488 ham) being tribal districts where use of ground water as well surface water for irrigation purpose is very low. Thus, total recharge from rainfall is 29.01 bcm whereas from other sources is 6.03 bcm. The Annual Replenishable Ground Water Resources from all sources in the State is of the order of 35.04 bcm. The natural discharge during non-monsoon season in the State is 1.75 bcm. The net ground water availability in the state is 33.29 bcm.

The Annual Ground Water Draft of ground water for all uses in state is 18.83 bcm. Comparison of ground water draft for various uses reveals that draft for irrigation accounts for more than 93% of total ground water draft, where as draft for domestic & industrial supply accounts for meager 7% of the total ground water draft in the state. The stage of development of the State is 57%. Out of 313 blocks, 24 blocks has been categorized as 'Over Exploited', 4 as 'Critical', 67 as 'Semi-Critical' and 218 blocks as 'safe'.

The ground water resources of the individual block /assessment unit show wide variation in the resource available and stage of ground water development. In Madhya Pradesh, the ground water development concentrates mainly in the western (Malwa Region), Central (Narsinghpur districts), Budelkhand Region and part of Bagkhelkhand Region of the State. Almost all over-exploited blocks are falling in western part of Madhya Pradesh, which is known as "MALWA AREA" where ground water draft has increased many folds during past decades. The entire command areas of different blocks are falling under safe category. District wise analysis of data of ground water availability and annual ground water drafts indicate that two districts namely Indore and Ratlam are falling under "Over-Exploited" category where stage of ground water development is more than 100% as a whole.

The Annual Replenishable Ground Water Resources has increased in the 2011 estimate as compared to 2009. The reason being localized improvement in rainfall pattern, increased activity on rainwater harvesting and water conservation measures etc. In addition, management practices like efficient water use practices with community participation, increased awareness etc. also helped in improving water use efficiency of ground water resources in stressed areas. In majority of the cases, it is the combination of the above mentioned reasons which have brought in the changes in category.

MAHARASHTRA

The State is underlain by diverse rock types of different geological ages from Pre-Cambrian to Recent. Large part of the State is underlain by Basaltic hard rocks where dug wells are predominant. They mostly tap the weathered zone and fractures/joints. The yield of dug wells varies from 3 to 5 lps. However, in few district borewells are becoming more popular and they tap both shallow as well as deeper aquifers. A small part of the State is occupied by Semi-consolidated sedimentary rocks where tubewells have yield of 5 to 45 lps.

The Ground water resources have been assessed watershed wise and subsequently apportioned into block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 33.95 bcm and Net Annual Ground Water Availability is 32.15 bcm. The Annual Ground Water Draft is 17.18 bcm and Stage of Ground Water Development is 53%. Out of 353 blocks, 10 have been categorized as over-exploited, 2 critical, 16 semi-critical and remaining 325 as Safe. In Maharashtra, the ground water development is mainly concentrated in the central part of the state i.e. predominantly in the drought prone areas. The dependency on ground water is more due to non-availability of surface water. Hence, the over-exploited, critical and semi-critical blocks are mostly from the Central part of the State. Similarly, they have a direct correlation with the water guzzling crops.

As compared with 2008-09 estimates, there is decrease in Annual Replenishable Ground Water Resources in 2011 by about 5% which is mainly attributed to decrease in the recharge by water conservation structures. This is due to silting of the water conservation structures. The Ground Water Draft has increased by about 1.3% during the same period. This has resulted in increasing the number of over-exploited blocks from 9 to 10, critical blocks from 1 to 2 compared to 2008-09.

MANIPUR

The State of Manipur is occupied by mostly North South parallel hill ranges made up of consolidated and semi-consolidated rocks ranging in age from pre-Mesozoic to Miocene. The consolidated rocks confined to the eastern part of the state along the Myanmar border. The semi-consolidated formations, which cover almost the entire state, comprise shale, siltstone, sandstone and conglomerate. These formations belong to Disang, Barail, Surma and Tipam group of rocks. In the Western and central part of the state, unconsolidated alluvium of quaternary age occurs in the valleys and topographical lows. Groundwater is restricted to secondary porosity in joints, fissures, fractures and weathered residuum of consolidated and semi-consolidated rocks and inter-granular pore spaces of alluvial deposits. In the valley, ground water is utilized through tube wells, tapping granular zones of thickness ranging from 10 to 20 m, and the yield of the tube well varies from 10 to 30 m^3/hr. The transmissivity and hydraulic conductivity of the aquifer formation range between 4.3 & 89 m^2/day and from 0.67 & 16 m/day respectively.

Ground water resources have been assessed district-wise due to paucity of block wise data. The total area considered for the resources estimation is 2441.40 sq.km, which covers Imphal West, Imphal East, Thoubal, Bishnupur and parts of Churachandpur districts of Manipur valley. Rests of the four districts were excluded for the recharge re-assessment. The Annual Replenishable Ground Water Resource of the State has been estimated as 0.44 bcm and Net Annual Ground Water Availability is 0.40 bcm. The Annual

Ground Water Draft is 0.004 bcm and Stage of Ground Water Development is 1%. All the districts have been categorized as 'Safe' and there is no saline area in the state.

As compared to 2009 estimate, there is negligible change in annual ground water recharge (0.003 bcm) which may be due to low rainfall, especially in Manipur valley, during last three years.

MEGHALAYA

The Meghalaya State is essentially occupied by hard massive rocks belonging to the Archaean gneissic complex with acid and basic intrusives and Precambrian Shillong Group of parametamorphites. Groundwater occurs under unconfined condition in the weathered residuum and fractured rocks and restricted to about 150 m depth. The development of ground water is practiced by dug wells which is restricted to the weathered zone and through bore wells including hand pumps which mainly tap the semi-weathered and fractured zones in the hard rock. The south-western, southern and south-eastern parts of the state is covered by semi-consolidated formations comprising sandstones, shales, conglomerates, limestones etc. belonging to Cretaceous – Tertiary age. The aquifers are formed by rock strata that are granular/porous, fissured/fractured or cavernous. These aquifers are thick and discontinuous in nature. The unconsolidated sediments comprising sand, gravel, silt, clay, etc are found to occur as thin veneer along rivulets and as valley-fills. Significant thickness of this unconsolidated formation is found to occur only along extreme north-western fringe of the state in West Garo Hills district. Productive aquifer of thickness ranging of 10-15 m occurs in the area which is suitable for the development of ground water through shallow tube well.

Ground water resources have been assessed district-wise due to paucity of block wise/ watershed wise data. The Annual Replenishable Ground Water Resource of the State has been estimated as 1.78 bcm and Net Annual Ground Water Availability is 1.60 bcm. The Annual Ground Water Draft is 0.002

bcm and Stage of Ground Water Development is 0.08%. All the districts have been categorized as 'Safe'.

As compared to 2009 estimate, the Annual Replenishable Ground Water Resources as in 2011 has increased by 0.55 bcm. This change may be attributed to the fact that during 2011 estimation, assessment Area has been demarked based on digitized Geological and geomorphlogical maps and the area has increased for West Garo Hills District and East Garo Hills District. The changes in other figures are negligible.

MIZORAM

The state is occupied mainly by the rocks of the Tertiary formation ranging in age from Oligocene to Miocene to Recent. The Barails form the lower most rock units comprising siltstone and bands of soft and hard fine grained sandstone with strings of carbonaceous material and occur in the north eastern part of the state. The Surma is divided into two formations, Bhuban and Bokabil. The Bhuban is made up of grey sandstone and shale and occupies the major part of the state all along the length of the state. The Bokabil, predominantly argillaceous, mostly occurs along the western part of the state. The Tipam sandstone is of semi-consolidated in nature comprising medium to coarse grained sandstone with subordinate shale and occurs in limited extent in the north western part of the state. The alluvial deposits comprising silt, clay and sands occur in the valley fill area with very limited thickness. Ground water is confined only to valley filled areas and secondary porosities of semi-consolidated rocks. These aquifers are the main source for springs. Ground water stored in the hill slopes emanates in the form of springs, which are being used as a source for water supply. In the valley area, the yield potential of tube wells within the depth range of 200 m tapping Tertiary sandstone ranges from 120 to 330 liters per minute for drawdown of 13 to 20 m. The transmissivity, specific capacity and storativity are to the tune of 11 - 46 m^2/day, 25.61 lpm/mdd and $4.28x10^{-4}$ respectively.

The major part of the State is covered with similar formations and hilly terrain with more than 20 % slope. However, ground water resources have been

assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 0.03 bcm and Net Annual Ground Water Availability is 0.027 bcm. The Annual Ground Water Draft is 0.001 bcm and Stage of Ground Water Development is 4%. All the blocks have been categorized as 'Safe' and there is no saline block in the state. As compared to 2009 estimate, there is no significant change in annual ground water recharge and ground water draft.

NAGALAND

The state is covered by rocks ranging in age from Pre-Cretaceous to Recent. The rock sequences comprise the geosynclinal facies, represented by Disang Group, Barail Group, Surma Group, Tipam Group, Namsang formation and Dihing Group. While the Disang and Surma Group of rocks are mainly argillaceous, the Barail and Tipam groups are arrenacious. The Girujan clay formation overlying the Tipam sandstones is characterized by typical blue, mottled clay and argillaceous sand stone beds. Older rocks occupy southern parts of the State whereas younger rocks are exposed in the northern parts. The unconsolidated alluvial plains, comprising clay, sand pebble, cobble and boulder assemblages, occupy the narrow, intermountain and open valleys in the northern part of the state bordering upper reaches of Brahmaputra flood plains of Assam. The consolidated formations are confined to the south eastern part of the State along the Burma (Myanmar) border.

Ground water development potentiality in valley fill and alluvial deposits are restricted to construction of open wells having depth of 15 to 20 metres and deep tube well down to 100 m depth which yield to the tune of 10 m^3/day to 45 m^3/day with more than 5 m drawdown. Water bearing formations pertaining to Tertiary deposits are found to have moderate potentials which can sustain deep tube wells having yield prospects varying from 10 to 20 m^3/hr. The valleys underlain by Tipam sandstones form good aquifers with yield prospects varying from 30 to 80 m^3/hr. In the consolidated formations, ground water abstraction structures can be constructed in structurally weak zones. Autoflow zones have also been identified in some parts of the state.

Ground water emerges as perennial springs which are the main source of water supply for domestic needs in the state.

The ground water resource estimation of the state is done on district-wise assessment unit due to paucity of block-wise data. The Annual Replenishable Ground Water Resource of the State has been estimated as 0.62 bcm and Net Annual Ground Water Availability is 0.55 bcm. The Annual Ground Water Draft is 0.03 bcm and Stage of Ground Water Development is 6.13%. All the districts have been categorized as 'Safe'. As compared to 2009 estimate there is an increase in annual ground water recharge by about 0.20 BCM in the 2011 estimate, which can be attributed to the non-monsoon recharge. The changes in other figures are negligible.

ODISHA

The state is underlain by diverse rock types, which ranges in age from Precambrian to Cenozoic era. The Precambrians occupy nearly 80% of the total geographical area of the State. The Tertiary and the Quaternary Alluvial formations are restricted mainly to the narrow coastal tracts. The Gondwana group of rocks belonging to Paleozoic and Mesozoic era occurs in isolated patches in different parts of the State. These formations occur in Talcher area of Angul district and Ib river valley area of Sambalpur and Sundargarh districts. Groundwater abstraction in the state is mostly done by dug wells constructed in the weathered zone in hard rock areas and in shallow phreatic aquifers in alluvial areas. The yield of open (dug) wells varies from 1 to 5 lps. However, at present, bore wells, shallow to medium deep tube wells, filter point tube wells are also in use for ground water abstraction both for domestic and irrigational purpose. The yield of bore wells varies from 2 to 5 lps in general depending on the occurrence of saturated fractures at depths. The yield from shallow and medium deep tube wells may vary from 6 to 10 lps in general depending on the aquifer disposition.

The Ground water resources in the state have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 17.78 bcm and Net Annual Ground Water Availability is

16.69 bcm. The Annual Ground Water Draft is 4.73 bcm and Stage of Ground Water Development is 28%. Among the total of 314 Blocks spanning across 30 districts of the state, 308 blocks have been assessed as safe, rest 6 blocks are completely saline/ poor ground water quality area. In Odisha, the ground water development is mostly concentrates in the eastern part of the state where agricultural usage is dominant.

As compared to the last assessment carried out during 2009, there is no significant change in the overall State level figures of dynamic ground water resources. However, significant changes have been observed in some of the blocks of the state. Based on extensive field studies, more reliable specific yield values were used. This has led to more realistic resource estimation in the current assessment than the Rainfall Infiltration Method which was adopted for majority of the assessment units in the previous estimation exercises.

PUNJAB

The Punjab State is a flat alluvial plain having a thin belt of mountains along north eastern border and stable sand dunes are seen dotting the landscape in the south western parts. The slope of the plain is 0.4 m/km towards south & southwest direction. The alluvial deposits in the State are comprised of sand, silt and clays often mixed with kankar. Sandy zones of varying grade constitute abundant ground water resources & act as a reservoir. The alluvial plain towards the hills is bordered by the piedmont deposits comprising Kandi and Sirowal. Immediately south-west of the hills, Kandi belt is 10 to 15 km wide followed by Sirowal which imperceptibly merges with the alluvial plain. Kandi deposit explored up to 450 m depth show gradation from boulders to clays and at places an admixture of various grades in different proportions. The Sirowal deposit is essentially composed of finer sediments but occasional gravel beds are also encountered in them.

Ground water levels in Punjab State vary from almost near surface to about 40 m bgl. The deep water levels are recorded in Kandi belt. Water logging conditions exist in some parts of south-western districts. In the remaining part of Punjab the water table varies from 3 to 34 m bgl. The

master ground water slope is towards southwest. Most of the shallow tubewells have ground water draft per year varying from 0.962 to 4.09 Ham (electric) and 0.712 to 2.11 Ham (diesel) and command area is 1 to 3 Hact. of land per tube-well in the State.

There is significant variation in quality of ground water with depth, especially in the south western parts of the State. As per recent estimates, the area underlain by ground water of unfit quality is around 3022 sq. km. (6 % of the total area of Punjab State).

The Dynamic Ground Water Resource of Punjab State has been assessed as per GEC-1997 Methodology by taking Block as a Unit of Assessment. At present, there are total 145 Blocks of Punjab State. The last estimation of Ground water Resources was carried out in 2009 for 138 Blocks. The Minor Irrigation Census for Tube wells for the year 2006-07 has been carried out by the Agriculture Department for 136 Blocks only. As such, 138 Blocks have been considered by incorporating the data of 2 Blocks on pro-rata basis, for making assessment of Dynamic Ground Water Resource.

The Ground water resources have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 22.53 bcm and Net Annual Ground Water Availability is 20.32 bcm. The Annual Ground Water Draft is 34.88 bcm and Stage of Ground Water Development is 172%. Out of 138 blocks, 110 block has been categorized as 'Over-exploited', 4 as 'Critical', 2 as 'Semi-Critical', 22 as 'Safe' and there are no saline block in the state. The block-wise stage of ground water development varies from 21% in DharKalan Block of Gurdaspur district to maximum of 416% in Ahmadgarh block of Sangrur district respectively. The district wise stage of ground water development varies from 69% in Muktsar district to 283 % in Sangrur district.

Shallow water level area having depth to water table less than 5 m bgl in the State is about 4584 km2, which is lying mainly in the south-western districts of the Punjab State. Blockwise Annual Additional Potential Ground Water Recharge, has been worked out to be 1,204 Ham for water logged and

shallow water table areas of the State. The maximum potential has been observed in Muktsar District. In comparison with 2009, ground water resources assessment shows that one block has shown the change in the stage of development to higher category i.e. safe to critical.

As compared to 2009 estimate, the Net Ground Water Availability and Gross Ground Water Draft as in 2011 is almost same respectively, resulting in the Stage of Ground Water Development remaining at almost same in both the estimates. In general, the variation in stage of development has been observed which seems to be mainly due to increase in number of electric tubewells there unit draft and conversion of centrifugal pumps to submersible pumps.

RAJASTHAN

The State of Rajasthan has diversified geology, ranging from Archean metamorphics to recent alluvial sediments. Based upon geological diversities, geomorphological setup and ground water potentialities, the state of Rajasthan can be divided into three broad hydrogeological units.

(i) Unconsolidated formation (ii) Semi-consolidated formation (iii) Consolidated (Fissured formation). Large part of the State is underlain by Quaternary sediments (Thar Desert) consisting of clay, silt, sand and gravel of various grades. The fine sand and clay with or without kankar layers have formed multi layered aquifer system. The thickness may go up to 200-250 m below ground level, either resting directly over the basement rocks or over the Tertiary formation. Drilling data of CGWB indicates presence of aquifer of poor quality down to a depth of 200 mbgl. Exploratory drilling data reveals that the yield vary from meagre to 10 m^3/day, transmissivity ranges between 80 and 300 m^2/day and storage co-efficient vary from 1.1x 10-5 to $3.9x10^{-6}$ in the state . In compact sedimentary rocks i.e. sandstone belonging to the Vindhyan formation is compact in nature and has low primary porosity. Ground Water occurs within the weathered residue and in the secondary porosity underneath. In general, the thickness varies from 5 to 10m. Yield potential is limited due to compact nature of the formation. The limestone is

also having low ground water potential. The yields of dug wells vary from 0.25 to 0.75 m^3/day with water levels ranging from 10 to 120 meters. The yield of the wells drilled in Vindhayan formation has been observed to be 15m^3/day, tapping fractures between 50-75 mbgl. In consolidated formation (Fissured) the thicknesses of the weathered zone vary from 5 to 50 m. Ground Water occurs under unconfined condition within the weathered zone. The results of the exploratory drilling carried out by CGWB in hard rock areas indicate presence of productive fractures down to a depth 40m and yield vary from 3 to15 m^3/day., whereas transmissivity vary from 3 to 30 m^2/day.

The Ground water resources have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 11.94 BCM and Net Annual Ground Water Availability is 10.83 BCM. The total Ground Water Draft due to all sources is 14.84 bcm. Projected for 2025 is 1.89 bcm while the net groundwater availability for future irrigation development is only 0.91 bcm and the stage of ground water development in the state is 137 %. Out of 243 blocks, 172 blocks has been categorized as 'Over Exploited', 24 as 'Critical', 20 as 'Semi-Critical' and 25 blocks as 'safe'. 2 blocks has been categorized as 'Saline'.

SIKKIM

Sikkim is a small mountainous state characterized by rugged topography with series of ridges and valleys. The various rock types prevalent in the state are Pelitic, Carbonate rocks and Gondwanas over a gneissic basement. and occasional alluvial terrains along streams and river courses. Ground water occurs largely in disconnected localized pockets and in deeper fractures zones, springs are the main sources of water. The total discharge of the springs is about 0.044 bcm and its annual utilization for domestic purpose is about 0.0113 bcm. The stage of development is 26%. There is marginal decrease net annual ground water availability in the state in 2011 as compared to 2009.

TAMIL NADU

Tamil Nadu State is underlain by diverse hydrogeological formations, nearly 73% of the state is occupied by hard rocks, the semi-consolidated and consolidated formations are mainly confined in the eastern part including the coastal tract. In the hard rock area, groundwater is mainly developed through dug wells and dugcum bore wells tapping the weathered zone, the yield of open wells vary from 1 to 3 lps, whereas in dugwells tapping soft rocks including sedimentary formations, the yield is upto 10 lps.

The dynamic groundwater resources have been assessed firka wise. The Annual Replenishable Groundwater resource of the State has been estimated as 21.53 bcm and Net Annual Ground Water Availability is 19.38 bcm. The Annual Ground Water Draft is 14.93 bcm and Stage of Groundwater Development is 77 %. Out of 1129 firkas, 374 firkas has been categorised as 'Over Exploited', 48 as 'Critical', 235 as 'Semi-Critical' and 437 firkas as 'safe'. 35 firkas has been categorised as 'Saline'. Greater groundwater development is noticed in the central and western part of the state. The groundwater water draft is 14.93 bcm which is 10 % lesser than 2009 estimate. The overall stage of groundwater development of the state is 77 %. This is attributed to reduction in irrigation draft due to urbanisation is some regions of the state and marginal reduction in usage of dugwells for domestic use.

TRIPURA

The State is occupied by the rocks ranging in age from Upper Tertiary to Quaternary. Mobile trough geosynclinal deposition of Barail group followed by flysch type of Surma & Tipam sediments, overlain by Dupitila formation, is noticed in the state. Most of the longitudinal synclinal valleys of the state are the basins of deposition of recent formation. Recent alluvium occurs along the streams and the flood plains of major rivers.

Ground water occurs under unconfined condition in Dupitila formation, Recent formation & in Tipam formation. Besides it also occur under confined to semi-confined conditions in Tipam formation at considerable depth. Recharge areas for the deeper aquifer lies in the adjacent anticlinal hills.

Wherever a good thickness of impermeable clay beds underlie & overlie the saturated granular zones, autoflow artesian conditions have been found in the valleys, which are the discharge area. The artesian flowing conditions occur in patches both at shallow depth and at deeper depth. The auto discharge of the flowing wells in the State ranges from 100 to 6000 lph, the maximum auto discharge from deep tube well to the extent of 54000 lph has been found in Khowai valley near Khowai town, where the piezometric head rose up to 7m above ground level.

Ground water resources have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 2.59 bcm and Net Annual Ground Water Availability is 2.36 bcm. The Annual Ground Water Draft is 0.16 bcm and Stage of Ground Water Development is 7%. All the blocks have been categorized as 'Safe'. As compared to 2009 estimate, there is no significant change in annual replenishable ground water resources and annual ground water draft.

UTTAR PRADESH

The state of Uttar Pradesh is categorized with five distinct hydrogeological units – Bhabar, Terai, Central Ganga Plains, Marginal Alluvial Plain, Southern Peninsular area. Bhabar is mainly the recharge zone having deeper water levels. The ground water development in phreatic aquifer is through hand pumps, dug wells, dug cum bore wells and shallow tube wells. The yield from these wells has been generally found to be in the range of 40 to 60 lps. Terai zone lies between Bhabar in the North and Central Ganga Plain in the South. It is characterized by fine grained sediments with occasional pebbles and boulders. The average yield of tube wells constructed in this zone varies from 30 to 60 lps at moderate drawdowns. Central Ganga Plain constitutes the most promising ground water repository characterized by multi-layered aquifer systems. The yield of the open wells and hand pumps constructed in the phreatic aquifer vary from 5 to 10 lps. The tube wells in the phreatic aquifer yield between 20 and 28 lps at 6 to 8 m drawdowns. Marginal alluvial plain consists of kankar mixed clay-silt beds intercalated with sand and gravel

lenses. The aquifer in this area is capable of yielding 15 to 40 lps at moderate drawdowns. Southern Peninsular Region is characterized by sedimentary formations (sandstone, quartzite, limestone, shale). The wells tapping these formations generally recorded yield between 2 and 8 lps.

The assessment unit for ground water resources assessment in the state of Uttar Pradesh is block. The Annual Replenishable Ground Water Resource of the state has been estimated as 77.19 bcm and Net Annual Ground Water Availability is 71.66 bcm. The Annual Ground Water Draft is 52.78 bcm and Stage of Ground Water Development is 74%. Out of 820 assessment units (blocks), 111 have been categorized as Over-exploited, 68 as Critical, 82 as Semi-critical and 559 as Safe.

The estimates of Replenishable ground water resources have increased by about 2.58% as compared to the previous estimate of 2009. On the other hand, there has been a 6.66% increase in the ground water draft in the present estimate as compared to 2009.

UTTARAKHAND

Uttarakhand State has a distinct geological attributes with wide variety of rock units ranging in age from Archaean to Quaternary. About 85% of the geographical area of the state is mountainous and underlain by hard rocks. Ground water is the hard rock area is developed through the springs and hand pumps constructed in weathered zone. Discharge of springs in the Lesser Himalaya and Central Himalaya is variable and ranges from 60 to 600 LPM. About 15% of the geographical area is underlain by semi-consolidated and unconsolidated formations known as Tarai and Bhabhar. Ground water in this area is developed by open wells, shallow and deep tube wells. Unit draft of state owned deep tube wells varies from 15.08 to 25.80 ha m while that of shallow tube wells ranges from 1.91 to 2.20 ha m.

The ground water resources of Uttarakhand State have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 2.04 bcm and Net Annual Ground Water Availability is

2.00 bcm. The Annual Ground Water Draft is 1.13 bcm and Stage of Ground Water Development is 57%. Out of 18 blocks, no block has been categorized as 'Over-exploited'. Two blocks have been categorized as 'Critical', five blocks as 'Semi-Critical', eleven blocks as 'Safe' and there are no saline block in the State. Comparatively high development of ground water has been observed in Udham Singh Nagar and Haridwar districts. As compared to 2009 estimate, the Net Annual Ground Water Availability in 2011 has been decreased by 5.97 % while the Gross Ground Water Draft in 2011 has increased by about 8.09% respectively. This has resulted in increased Stage of Ground Water Development of 6% in 2011 compared to 2009 estimations. The changes in the recharge and draft parameters in respect of assessment units are due mainly to use of revised irrigation census, increased agricultural and industrial development in parts of the State. This has resulted in modification of parameter values in the light of information gathered during subsequent field studies.

WEST BENGAL

Nearly two third area of the state is occupied by unconsolidated sediments, the western part of the state is partly occupied by the hard rocks. The phreatic aquifer is generally developed through dug well, dug cum bore well and shallow tubewell. The yield of these wells varies from 1-5 lps.

Ground water resources have been assessed block-wise. The Annual Replenishable Ground Water Resource of the State has been estimated as 29.25 bcm and Net Annual Ground Water Availability is 26.58 bcm. The Annual Gross Ground Water Draft is 10.69 bcm and Stage of Ground Water Development is 40%. Out of 271 assessed units (blocks and Municipal areas), provisionally 53 have been categorized as Semi-critical and 01 as Critical and remaining 217 as Safe. There have been marginal changes in the estimation of ground water resources figures.

ANDAMAN AND NICOBAR ISLANDS

Nearly seventy five percent of the total geographical area of A&N islands is underlain by unproductive sedimentary group of rocks which is

developed only through dug wells having meager yield of 0.1-0.5 lps.10% of the island area is occupied by igneous Ophiolite suite of rocks. Although restricted in occurrence, these formations are observed to yield moderate to high both in shallow and deeper locales and they are developed by dugwells and bore wells with yield ranging from 1-10 lps. The rest 15% of the island area is covered by Coralline Limestones associated Acrchipelago Group. This formation contains appreciable quantity of groundwater with yield varies from 5-25 lps. Ground water in the formations occurs under unconfined to confined condition.

Ground water resources have been assessed island-wise. The Annual Replenishable Ground Water Resources of the A&N Islands have been estimated as 0.308 bcm and Net Annual Ground Water Availability is 0.286 bcm. The Annual Gross Ground Water Draft is 0.013 bcm and Stage of Ground Water Development is 4.44%. Out of 36 assessed units (islands) all are categorized as Safe.

CHANDIGARH

Chandigarh is underlain by the alluvial deposits belong to Quaternary age and comprise layers of fine sand and clay. Coarser sediments occur along the Sukhna Choe and Patiali ki Rao whereas relatively finer sediments, thus restricting the aquifer disposition laterally, underlie the area between these two streams. Fair to good aquifer horizons occur in most part of Chandigarh comprising medium to coarse sand, to a depth of 180 mbgl below which they become finer. The yield of the deeper aquifers is also lesser as compared to the shallower ones. Ground water in the area occurs under water table, confined as well as semi-confined conditions. Ground water occurs under unconfined conditions down to about 80 m in Manimajra area. In other areas the semi-confined conditions prevail up to 20-30 m below land surface. The depth of the shallow aquifer system is less than 30 m below ground level whereas the depth of the deeper aquifer system ranges from 40 to 450 mbgl of explored depth. The transmissivity values for the deeper aquifer system ranged between 74 m^2/day to 590 m^2/day. The storativity

values ranged between $1.5x10^{-4}$ to $7.5x10^{-4}$ indicating confined nature of aquifer systems. The transmissivity values of shallow aquifers up to 100 m depth range obtained during these tests ranged between 70 and 466 m2/day. Ground water is found to be fresh and suitable for drinking as well as irrigation purposes. Normally, the ground water drawn from the deeper aquifers is less mineralized as compared to water drawn from shallow aquifers.

UT Chandigarh has very small area and whole UT has been taken as an assessment unit. Groundwater level data of the period 2006-10 has been used for estimation whereas water level trends of 2000-2010 have been used for long term trends for categorization. The Annual Replenishable Ground Water Resource of the UT has been estimated as 0.022 bcm and Net Annual Ground Water Availability is 0.019 bcm. The groundwater draft from unconfined aquifer is nil, since all the tube wells are deep and are drawing water from deeper aquifers. Since, there is no draft from shallow aquifers, the Chandigarh UT falls under SAFE Category. As compared to 2009 estimate, the net ground water availability as in 2011 is almost same.

DADRA & NAGAR HAVELI

Basaltic lava flows from the predominant aquifer system in the area. The ground water occurs under water table conditions in weathered basalts and vesicular basalts. The thickness of vesicular units ranges from 2 to 8 m. Ground water is developed by means of dug wells and dug cum bore wells. The sustainable yield of dug wells for 3 to 4 hours of pumping is 30 m^3/day. The specific capacity of dug wells ranges from 3 to 300 lpm/m of drawdown in basalts. The transmissivity of shallow aquifer ranged between 5.5 to 305 m2/day. During 2010, the pre-monsoon depth to water levels in these wells ranged from 2.90 to 10.45 m.bgl, while the post-monsoon depth to water levels varied from 1.90 to 8.35 m.bgl. The depth to water levels during pre-monsoon interval during May 2011 varied from 2.35 to 12.70 m.bgl

In general the ground water resources assessment unit is Watershed, particularly in hard rock areas. In case of alluvial areas, administrative block

can also be the assessment unit. However, in this case considering the small area i.e., of 491 sq. km., entire UT of DNH is considered as a single unit for groundwater assessment purpose. The Annual Replenishable Ground Water Resource of the UT of DNH has been estimated as 0.062 bcm and Net Annual Ground Water Availability is 0.059 bcm. The Annual Ground Water Draft is 0.013 bcm and Stage of Ground Water Development is 22%. Since UT of DNH was considered as single unit (block/district), it has been categorized as 'Safe' and there is no saline block in the UT.

As compared to 2009 estimate, in 2011, the Net Ground Water Availability and Gross Ground Water Draft has increased by about 4.69% and 49.52% respectively, resulting in the increase in Stage of Ground Water Development from 15% in 2009 to 22% in 2011. The changes in the recharge and draft parameters is mainly due to increase in recharge from other sources and increase in irrigation and domestic drafts.

DAMAN & DIU

The Union Territory of Daman & Diu is underlain by alluvium and soft rock formation of Quaternary age and hard rock Basalt rock of Eocene – Late Cretaceous age. The entire island area of Diu is about 40 sq.km is underlain by alluvium & Milliolite soft rock formation. The Daman has about 72 sq km area out of which 30 % is covered by alluvium and the rest is underlain by Basalt rocks. In UT of Daman & Diu, dug well as well as dug cum bore wells are common for irrigation and domestic use. The yields of open (dug) wells varies from less than 1 to 5 m^3/day whereas that of DCB wells ranges from less than 2 to 10 m^3/day. The deeper aquifer zones have brackish to saline groundwater causing groundwater quality constraint for the development in UT of Daman & Diu. Due to limited thickness of good quality aquifers and relatively high development, the Diu district (Island) is assessed Over Exploited. Similarly, the Daman district also has high development but its water resources are augmented by Surface water (canal water) for irrigation and also for domestic usage.

The Ground water resources have been assessed on district wise basis. The Annual Replenishable Ground Water Resource of the UT of Daman & Diu has been estimated as 0.018 bcm and Net Annual Ground Water Availability is 0.0169 bcm. The Annual Ground Water Draft is 0.016 bcm and Stage of Ground Water Development is 97 %. Out of 2 assessment units (District area), the Diu is categorized as 'Over-exploited' and the Daman as 'Semi-Critical'. As compared to 2009 estimate, the Net Ground Water Availability have increased by about 43%whereas Gross Ground Water Draft have also increased by 49%as on 2011 and therefore, resulting in the decrease in Stage of Ground Water Development from 99% in 2009 to 97% in 2011. The changes in the recharge and draft parameters in respect of assessment units are due to mainly increase in recharge activities and increase in rainfall during the last five years leading to modification of parameter values.

LAKSHADWEEP ISLANDS

Lakshadweep islands are composed of calcareous sand and materials derived from coral atolls. Alternate layers of loose sand, moderately cemented calc-arenites and well cemented, hard and compact limestone underlie the islands. In these islands fresh groundwater occurs under phreatic conditions as a lens floating over the saline water and is in hydraulic continuity with sea water. Water levels in wells are strongly influenced by tides. Dug wells are the common ground water abstraction structures in the islands.

Dynamic ground water resources have been assessed for individual islands by computing various components of recharge and draft. Rainfall is the only source of recharge in the islands, whereas domestic draft, evapotranspiration losses and water loss due to outflow into the sea are the major components of draft. A part (20%) of the annual water surplus is kept as reserve to accommodate delayed or deficit monsoon years.

As per the assessment, the total annual ground water surplus in the islands amounts to 1054 Ha.m (0.011bcm). The annual ground water draft, for all the islands grouped together, amounts to 234 ha.m (0.0025 bcm). The stage of

ground water development for the group of islands is of the order of 67%. Based on the stage of ground water development, Agatti, Amini and Kavaratti islands have been categorized as 'Semi-critical' and the remaining islands as 'Safe'. A comparison with the earlier estimate of 2009 indicates a reduction in the draft component in all the islands as the actual population during 2011 was found to be less than the projected population considered for the 2009 estimation based on the decennial growth rate (1991-2001). As a consequence, the domestic draft has decreased by about 10% for the group of islands as a whole. This has resulted in improved ground water balance and consequently, lower stage of ground water development in all the islands.

PUDUCHERRY

The UT of Puducherry is underlain by the semi-consolidated and unconsolidated sedimentary formations which mainly sustains dug wells and shallow and deep tube wells. The yield of the wells generally varies between 3 to 15 lps. High yielding wells i the range of 10 to 40 lps exists in the Tertiary sandstones. The Dynamic groundwater resources for UT of Puducherry have been assessed Region wise.

The Annual Replenishable Groundwater resource of the UT of Puducherry has been estimated as 0.189 bcm and Net Annual Ground Water Availability is 0.170 bcm. Out of 4 regions, 1 region has been categorised as 'Over Exploited' and 2 regions as 'safe'. 1 region has been categorised as 'Saline'. The groundwater water draft is 0.15 bcm and the overall stage of groundwater development of UT of Puducherry is 90 %. The re-assessment of Dynamic Groundwater resources of UT of Puducherry in 2011 has shown marginal increase in the annual replenishable ground water resource as compared to 2009 estimate. Puducherry region has the highest stage of development (139%).

5.6 COMPARISON BETWEEN 2009 ASSESSMENT AND 2011 ASSESSMENT

The overall country figures of ground water resources assessment carried out in 2011 do not show any significant change as compared to 2009 estimate

except for the fact that the number of assessment units have increased by 765 no. (about 13%) from the previous assessment. The main reason for changes in the number of assessment unit is that previously (till 2009), assessment in Tamil Nadu was carried out block-wise basis. In 2011, the assessment unit is Firka which is a smaller administrative unit than block. Hence number of assessment units in Tamil Nadu has increased considerably. At the state level, however, noticeable changes in the assessment figures have been observed due to various reasons.

Rationalization of ground water recharge and draft norms and strengthening of database is the reason behind changes in resources estimation in case of most of the states like Assam, Goa, Himachal Pradesh, Karnataka, Maharashtra, Uttarakhand, West Bengal, Daman & Diu etc. States like Andhra Pradesh, Gujarat show increase in recharge and decrease in draft in some parts due to above average rainfall in recent years. Increase in recharge estimates in some of the assessment units in the states of Gujarat and Karnataka are also attributed to effective implementation of water conservation measures. The increase in ground water draft and consequent rise is Stage of Ground Water Development and Category is attributed to the growth of ground water structures to meet food security and domestic water needs of the rising population. The detailed reasons for significant changes in resources assessment figures between 2009 and 2011 estimates are given in ***Appendix G***.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

The annual replenishable ground water resources of the country have been reassessed as 433 bcm as on March, 2011. The ground water resources get replenished through rainfall and other sources like return flow from irrigation, canal seepage, recharge from water bodies, water conservation structures etc. The main source of replenishable ground water resources is recharge through rainfall which contributes to nearly 68% of the total annual replenishable resources. The net annual ground water availability of the country has been assessed as 398 bcm after keeping a provision for natural discharge. The annual ground water draft of the country as on March, 2011 is 245 bcm, the largest user being irrigation sector (about 91%). The stage of ground water development for the entire country, which is the percentage of ground water draft with respect to net annual ground water availability, has been computed as 62%. The utilization pattern of ground water is however uneven across the country resulting in ground water stressed conditions in some parts of the country while in other areas, ground water utilization have been sub-optimal. In 2011, assessments were carried out in 6607assessment units (blocks/mandals/taluks) which is a significant increase from the number of units assessed in 2009 (5842 units). This shows a gradual refinement in the dynamic ground water resource assessment (as on March, 2011) as compared to previous assessments. Out of the total assessment units, around 16% are categorized as Over-exploited. The critical units are 3% of the total assessment units, semi-critical around 11% and safe are 68%. The remaining units (around 1%) are having saline ground water. The over-exploitation of ground water resources are caused by various region-specific reasons which are broadly spread over three different parts of the country. The assessment units located in the north-western part of the country in the states of Punjab, Haryana, Delhi and western Uttar Pradesh have plenty of replenishable ground water resources but because of unregulated extraction beyond the ground water recharge limits, most of these units are Over-exploited. Over-

exploited units are also common in western part of the country particularly in Rajasthan and Northern Gujarat adjacent to Rajasthan because of arid climate resulting in less recharge of ground water and hence stress on the resource. In peninsular India, over-exploited units are widespread in the states of Karnataka, Tamil Nadu and parts of Andhra Pradesh which is mainly because of lesser availability due to the poor aquifer properties of the hard rock terrains prevalent in the region.

The annual replenishable ground water resources of the country as a whole do not indicate any appreciable change from previous assessment as on March, 2009. However there have been significant variations at the scale of assessment units (blocks / watershed) at several places mainly because of – localized changes in rainfall pattern during last few years, ground water management interventions and improved database resulting in refinements in assessments.

Recommendation:

The Ground Water Resources Assessment of the country is being carried out at regular interval with the objective to identify and prioritize the areas for ground water management interventions. Considering the significance of this exercise in identification of areas for ground water management, continuous endeavor is required to bring in refinements in assessment. Some important issues which require immediate attention and deliberation are enumerated below.

a. *Aquifer Characterization and parameter estimation*: One of the key elements in ground water resources assessment is the estimation of the recharge and discharge parameters. It is recommended that experimental studies to be taken up in National Project on Aquifer Management (NAQUIM) on Rainfall Infiltration Test (for refining the norms of RIF and return flow from irrigation based on soil types and agro-climatic zones), Aquifer Performance Test (for determination of specific yield), real time monitoring of water level along rivers and canals (for studying the inflow-outflow pattern and consequent recharge-discharge rate from streams/canals), unit draft study

and random sampling of wells (for refining the norms and well census figures related to ground water draft assessment).

b. *Scale of assessment*: In the recent assessments, States like Andhra Pradesh and Tamil Nadu have adopted smaller administrative units viz. Mandal (Andhra Pradesh) and Firka (Tamil Nadu) as ground water assessment units. Even Karnataka is also carrying out ground water assessment on a larger scale. The reason for assessment at a larger scale by these States is mainly to introduce more pragmatic ground water management interventions. It is recommended that other states should also gradually attempt for micro-level assessment.

c. *Water Balance Studies*: Ground water is one of the several components of the Hydrologic Cycle, other important components being rainfall, surface water, soil moisture and evapotranspiration. Holistic water resources management interventions require proper understanding of the interaction between the different components of the hydrosphere. Therefore purpose driven studies on Water Balance of various watersheds need to be taken up – a. For judicious management of the water resources, b. To study the climate change effects on the Water Resources.

d. *Case studies linking assessment with management*: As mentioned earlier in the chapter, the ground water assessment is being carried out to facilitate ground water management programmes. It is recommended that few case studies in various assessment units may be undertaken wherein quantitative evaluation of the ground water management interventions and consequent changes in the assessment results would be analyzed. Such studies would help in bringing out the efficacy of various management programmes and also the confidence level of the estimation.

e. The frequency of assessment at present is biannual .However it is felt that the frequency should be reduced to once in 5 years since there are not much significant short term changes also this is a very large scale exercised. The bench marking committee of international experts set up for technical upgradation of CGWB has also recommended for the assessment to be done once in 5years.

ANNEXURE – I

STATE-WISE GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT, INDIA (AS ON 31st MARCH 2011)

STATE-WISE GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
INDIA

(in bcm)

Sl. No.	States / Union Territories	Annual Replenishable Ground Water Resource					Natural Discharge during non-monsoon season	Net Annual Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Ground Water Availability for future irrigation	Stage of Ground Water Development (%)
		Monsoon Season		Non-monsoon Season		Total			Irrigation	Domestic and industrial uses	Total			
		Recharge from rainfall	Recharge from other sources	Recharge from rainfall	Recharge from other sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	States													
1	Andhra Pradesh	17.25	6.29	5.38	6.97	35.89	3.32	32.57	13.18	1.33	14.51	2.81	16.97	45
2	Arunachal Pradesh	3.36	0.00	1.15	0.00	4.51	0.45	4.06	0.002	0.001	0.003	0.01	4.05	0.08
3	Assam	17.90	1.64	8.64	0.34	28.52	2.73	25.79	2.86	0.64	3.49	0.78	22.14	14
4	Bihar	19.54	3.95	3.40	2.44	29.34	2.47	26.86	10.25	1.70	11.95	2.51	14.10	44
5	Chhattisgarh	9.90	0.70	0.87	0.94	12.42	0.79	11.63	3.43	0.62	4.05	0.76	7.44	35
6	Delhi	0.11	0.10	0.02	0.08	0.31	0.02	0.29	0.14	0.25	0.39	0.26	0.01	137
7	Goa	0.16	0.008	0.01	0.07	0.24	0.10	0.145	0.01	0.03	0.04	0.04	0.10	28
8	Gujarat	12.79	2.55	0.00	3.23	18.57	0.98	17.59	10.75	1.11	11.86	1.48	5.87	67
9	Haryana	3.65	2.77	1.01	3.35	10.78	0.99	9.79	12.35	0.71	13.05	0.76	-3.31	133
10	Himachal Pradesh	0.39	0.02	0.10	0.05	0.56	0.03	0.53	0.25	0.13	0.38	0.13	0.15	71
11	Jammu & Kashmir	1.45	2.06	0.36	0.37	4.25	0.43	3.83	0.20	0.61	0.81	0.76	2.87	21
12	Jharkhand	4.75	0.13	1.06	0.36	6.31	0.55	5.76	1.31	0.55	1.86	0.76	3.69	32
13	Karnataka	6.81	4.17	2.67	3.38	17.03	2.22	14.81	8.59	0.82	9.41	1.06	6.53	64
14	Kerala	4.85	0.06	0.63	1.15	6.69	0.61	6.07	1.30	1.53	2.84	1.71	3.07	47
15	Madhya Pradesh	28.22	1.17	0.79	4.87	35.04	1.75	33.29	17.48	1.35	18.83	1.91	13.90	57
16	Maharashtra	22.36	1.68	1.84	8.07	33.95	1.80	32.15	16.15	1.03	17.18	1.97	14.48	53
17	Manipur	0.23	0.01	0.19	0.01	0.44	0.04	0.40	0.0033	0.0007	0.004	0.05	0.35	1.02
18	Meghalaya	1.68	0.03	0.07	0.005	1.78	0.18	1.60	0.0015	0.0002	0.0017	0.232	1.37	0.08
19	Mizoram	0.0257	Negligible	0.005	Negligible	0.030	0.003	0.027	0.00	0.001	0.001	0.002	0.025	3.52
20	Nagaland	0.40	Negligible	0.21	Negligible	0.62	0.062	0.55	0.00	0.03	0.03	0.04	0.51	6.13
21	Odisha	11.29	2.53	1.33	2.63	17.78	1.09	16.69	3.81	0.92	4.73	1.24	11.64	28
22	Punjab	5.82	10.64	1.33	4.74	22.53	2.21	20.32	34.17	0.71	34.88	0.98	-14.83	172
23	Rajasthan	8.78	0.68	0.28	2.20	11.94	1.11	10.83	13.13	1.71	14.84	1.89	0.91	137
24	Sikkim		-	-	-	-	-	0.044	0.003	0.009	0.011	0.01	0.031	26
25	Tamil Nadu	7.38	10.28	1.69	2.18	21.53	2.15	19.38	13.17	1.76	14.93	1.82	4.39	77
26	Tripura	1.248	0.000	0.740	0.598	2.587	0.229	2.358	0.093	0.069	0.163	0.200	2.065	7
27	Uttar Pradesh	42.13	11.57	5.15	18.34	77.19	5.53	71.66	48.74	4.04	52.78	6.55	19.64	74
28	Uttarakhand	1.09	0.26	0.20	0.49	2.04	0.04	2.00	1.10	0.03	1.13	0.09	0.80	57
29	West Bengal	18.53	5.72	1.42	3.58	29.25	2.67	26.58	9.72	0.97	10.69	1.48	15.38	40
	Total States	**252.11**	**68.99**	**40.56**	**70.44**	**432.11**	**34.55**	**397.60**	**222.21**	**22.66**	**244.85**	**32.28**	**154.34**	**62**
	Union Territories													
1	Andaman & Nicobar	0.262	Nil	0.046	Nil	0.308	0.022	0.286	0.001	0.012	0.013	0.014	0.272	4.44
2	Chandigarh	0.015	0.001	0.005	0.001	0.022	0.002	0.019	0.000	0.000	0.000	0.000	0.000	0
3	Dadara & Nagar Haveli	0.043	0.003	0.009	0.007	0.062	0.003	0.059	0.007	0.006	0.013	0.010	0.042	22
4	Daman & Diu	0.014	0.002	0.000	0.002	0.018	0.001	0.017	0.014	0.002	0.016	0.003	0.000	97
5	Lakshdweep	0.000	0.000	0.000	0.000	0.011	0.007	0.0035	0.000	0.0023	0.0023	0.000	0.000	67
6	Puducherry	0.089	0.060	0.008	0.032	0.189	0.019	0.170	0.124	0.029	0.153	0.032	0.057	90
	Total Uts	**0.42**	**0.07**	**0.07**	**0.04**	**0.61**	**0.05**	**0.56**	**0.15**	**0.05**	**0.20**	**0.06**	**0.37**	**36**
	Grand Total	**252.53**	**69.06**	**40.63**	**70.48**	**432.72**	**34.60**	**398.16**	**222.36**	**22.71**	**245.05**	**32.34**	**154.71**	**62**

ANNEXURE – II

DISTRICT-WISE GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT (AS ON 31st MARCH 2011)

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMET
ANDHRA PRADESH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Guntur	109985	18487	22881	19825	171178	15819	155359	46677	8552	55229	10461	98221	36
2	Vizianagaram	69126	18403	43050	28717	159296	15140	144156	104597	9585	114182	13376	38123	79
3	Visakhapatnam	138586	13441	10345	24058	186430	18064	168366	103764	16033	119797	18852	47361	71
4	East Godavari	60450	38551	36600	25814	161415	14536	146879	32646	4451	37097	13177	101056	25
5	Srikakulam	48619	103483	31345	16859	200306	19729	180577	28288	6642	34930	14624	137823	19
6	Nellore	50584	16543	40086	16432	123645	8284	115361	62328	6105	68433	8804	44229	59
7	Kurnool	95298	27618	19069	53391	195376	18097	177279	108666	4620	113286	11415	60269	64
8	Prakasam	143369	12893	38140	26725	221127	18738	202389	51976	6206	58182	10983	139986	29
9	Khammam	48537	44546	22447	66356	181886	16917	164969	49627	9530	59157	11884	105226	36
10	Adilabad	58378	30103	29158	32876	150515	12790	137725	35086	4144	39230	13067	89853	28
11	Krishna	72443	15561	18917	24741	131662	12994	118668	95973	3066	99039	7603	24967	83
12	West Godavari	95154	29351	25467	31327	181299	17958	163341	69040	4502	73542	12666	81635	45
13	Mehaboobnagar	90352	47433	28710	44651	211146	20217	190929	103380	10197	113577	11549	76000	59
14	Kadapa	150029	48098	734	73610	272471	25583	246888	62575	5080	67655	44026	140287	27
15	Nalgonda	64576	22336	15913	30200	133025	12658	120367	81284	1934	83218	6679	34153	69
16	Warangal	60835	20303	26994	70492	178624	17210	161414	43804	2124	45928	7795	112453	28
17	Karimnagar	43753	5789	12695	8870	71107	6761	64346	33303	11954	45257	16234	18452	70
18	Nizamabad	44230	28943	26204	10774	110151	9938	100213	20871	4404	25275	9475	69867	25
19	Rangareddy	68026	5484	13207	5739	92456	7972	84484	14310	4287	18597	11421	58753	22
20	Chittoor	42054	22125	27903	7372	99454	9407	90047	16184	838	17022	6650	67213	19
21	Anantapur	116570	17391	26082	33863	193906	18138	175768	100739	8159	108898	14703	62290	62
22	Medak	53946	42053	22462	43810	162271	15071	147200	52859	565	53424	6003	88338	36
State total (ham)		**1724900**	**628935**	**538409**	**696502**	**3588746**	**332021**	**3256725**	**1317977**	**132978**	**1450955**	**281447**	**1696555**	**45**
StateTotal (bcm)		**17.25**	**6.29**	**5.38**	**6.97**	**35.89**	**3.32**	**32.57**	**13.18**	**1.33**	**14.51**	**2.81**	**16.97**	**45**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
ARUNACHAL PRADESH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Tirap	8718	0	2283	0	11000	1100	9900	3	0	3	43	9855	0.02828
2	Changlang	20988	18	6996	27	28029	2803	25226	26		26	59	25142	0.10109
3	Lohit	143000	0	52360	0	195360	19536	175824	5		5	101	175717	0.00301
4	Anjaw	0	0	0	0	0	0	0	0	0	0	0	0	0.00000
5	Dibang valley	0	0	0	0	0	0	0	0	0	0	0	0	0.00000
6	Lower Dibang Valley	70488	0	30624	0	101112	10111	91001	34		34	104	90864	0.03681
7	East Siang	60078	8	14049	12	74147	7415	66732	84	44	128	45	66603	0.19196
8	West Siang	4878	1	1220	1	6099	610	5489	0	0	0	18	5471	0.00000
9	Upper Siang	0	0	0	0	0	0	0	0	0	0	0		0.00000
10	East Kameng	13338	0	3025	0	16363	1636	14726	15		15	71	14640	0.10186
11	West Kameng	1820	0	530	0	2351	235	2116	0	0	0	19	2097	0.00000
12	Lower Subansiri	1761	0	803	0	2564	256	2307	5		5	91	2211	0.21669
13	Upper Subansiri	228	0	105	0	333	33	299	0	0	0	0	299	0.00000
14	Papum Pare	10781	0	2587	0	13368	1337	12031	58	56	114	73	11900	0.94339
15	Tawang	0	0	0	0	0	0	0	0	0	0	0		0.00000
16	Kurung Kumey	0	0	0	0	0	0	0	0	0	0	0	0	0.00000
	State total (ham)	**336077**	**27**	**114581**	**40**	**450724**	**45072**	**405652**	**229**	**100**	**329**	**624**	**404798**	**0.08**
	StateTotal (bcm)	**3.36**	**0.0002675**	**1.15**	**0.0004**	**4.51**	**0.45**	**4.06**	**0.002**	**0.001**	**0.003**	**0.01**	**4.05**	**0.08**

Note: 1.Assessment carried out by CGWB in absence of active participation of State Govt

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

ASSAM

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Barpeta	59201	20542	7068	4417	91228	9123	82105	36041	3410	39451	4509	41555	48
2	Bongaigaon	59709	4790	24706	1206	90411	9041	81370	13280	1494	14774	1903	66187	18
3	Cachar	52071	9	35195	7	87282	8728	78554	11	3578	3589	4547	73996	5
4	Darrang	59693	7170	22503	1875	91241	9124	82117	19721	1817	21538	2357	60039	26
5	Dibrugarh	92018	5670	57274	1367	156329	15633	140696	14029	2737	16766	3108	123559	12
6	Dhemaji	113890	1507	69337	390	185124	18512	166612	4142	1380	5522	1805	160665	3
7	Dhubri	79158	17269	25660	4327	126414	12641	113773	47935	3940	51875	5407	60431	46
8	Golaghat	94386	1885	43985	478	140734	14073	126661	5214	2135	7349	2473	118974	6
9	Goalpara	80767	5240	27798	1323	115128	11513	103615	14512	2057	16569	2737	86366	16
10	Hailakandi	15423	3	10860	3	26289	2629	23660	0	1323	1323	1757	21903	6
11	Jorhat	95588	2325	49493	592	147998	14800	133198	6425	2259	8684	2457	124316	7
12	Kamrup	87173	8952	33386	2297	131808	13181	118627	24720	3060	27780	3735	90172	23
13	Karbi Anglong	23477	2398	11595	359	37829	3783	34046	104	1959	2063	2477	31465	6
14	Kokrajhar	109550	3980	45329	726	159585	15959	143626	4008	1775	5783	1888	137730	4
15	Karimganj	28446	66	18727	30	47269	4727	42542	138	2453	2591	3212	39192	6
16	Lakhimpur	80114	1360	48773	350	130597	13060	117537	3749	2096	5845	2611	111177	5
17	Morigaon	47311	5260	19046	1320	72937	7294	65643	14593	1924	16517	2621	48429	25
18	Nagaon	109601	33029	44122	5942	192694	19269	173425	33755	5751	39506	7598	132072	23
19	N.C. Hills	2602	1	1192	1	3796	380	3416	0	451	451	510	2906	13
20	Nalbari	20983	4449	11953	1122	38507	3851	34656	12327	1558	13885	1795	20534	40
21	Sibsagar	98417	2590	41461	657	143125	14313	128812	7163	2321	9484	2595	119054	7
22	Sonitpur	113469	10385	71710	1799	197363	19736	177627	6585	3880	10465	4741	166301	6
23	Tinsukia	100609	2788	63520	711	167628	8381	159247	7700	2725	10425	3190	148357	7
24	Baksa	41724	8256	23769	1060	74809	7481	67328	1396	1886	3282	2206	63726	5
25	Kamrup Metro	17171	674	6576	168	24589	2459	22130	1872	2999	4871	3246	17012	22
26	Udalguri	38990	12264	20355	1670	73279	3664	69615	4117	1660	5777	1889	63609	8
27	Chirang	68344	831	28279	208	97662	9766	87896	2308	967	3275	1116	84472	4
	State Total (ham)	**1789885**	**163693**	**863672**	**34405**	**2851655**	**273121**	**2578534**	**285845**	**63595**	**349440**	**78490**	**2214199**	**14**
	State Total (bcm)	**17.90**	**1.64**	**8.64**	**0.34**	**28.52**	**2.73**	**25.79**	**2.86**	**0.64**	**3.49**	**0.78**	**22.14**	**14**

BIHAR

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Araria	61913	8639	16078	2880	89510	8691	80819	22432	4786	27218	6707	51681	34
2	Arwal	11679	6866	1978	2560	23083	1846	21237	9491	1096	10587	1639	10107	50
3	Aurangabad	75591	13610	9315	4634	103150	8779	94371	18082	4264	22346	6464	69825	24
4	Banka	29344	9514	6732	1717	47307	3908	43399	12988	3167	16155	4333	26078	37
5	Begusarai	49227	4520	7198	6415	67360	6736	60624	33069	4745	37813	7611	19944	62
6	Bhabhua	56812	12944	11757	5303	86816	7380	79436	23281	2496	25777	4005	52150	32
7	Bhagalpur	59009	3935	11795	2465	77204	6605	70599	18397	5443	23840	7665	44537	34
8	Bhojpur	47943	18596	7308	12049	85896	6601	79295	30706	4587	35293	6308	42281	45
9	Buxar	33156	18053	4869	9031	65109	5643	59466	18463	2655	21118	4100	36904	36
10	Darbhanga	48712	4959	7548	3234	64452	4047	60405	23710	7631	31342	12327	24367	52
11	E.Champaran	80152	27743	14626	19072	141593	12381	129212	46748	7304	54053	11754	70709	42
12	Gaya	85811	14749	12210	3848	116618	11285	105333	43910	8183	52093	12350	49073	49
13	Gopalganj	37083	13954	6885	10732	68654	3985	64669	33480	4326	37806	5993	25196	58
14	Jamui	26832	7781	6709	2292	43614	3303	40311	12689	2913	15602	4452	23170	39
15	Jehanabad	22059	6767	2897	1487	33210	3123	30087	17481	1931	19412	2801	9805	65
16	Katihar	68092	9394	15793	5868	99148	9915	89233	44202	4685	48886	7361	37670	55
17	Khagaria	47326	1505	6138	4739	59709	5547	54162	22164	2566	24730	3959	28039	46
18	Kishanganj	60420	2474	14676	3059	80628	8063	72566	17714	2699	20413	4015	50837	28
19	Lakhisarai	21513	4726	3119	1792	31150	2805	28345	10436	1648	12084	2100	15809	43
20	Madhepura	34865	9648	8510	5379	58401	5692	52709	26921	3205	30125	4801	20988	57
21	Madhubani	82885	9372	15264	5096	112617	7433	105184	28833	6823	35655	10006	66345	34
22	Munger	25062	4198	4019	1083	34362	3184	31178	7020	2130	9150	2888	21271	29
23	Muzaffarpur	74039	18193	11172	15502	118906	9559	109347	53475	7511	60986	10732	45140	56
24	Nalanda	51356	11721	7002	3355	73434	6735	66699	39149	4592	43741	5509	22041	66
25	Nawada	45277	5336	6829	1976	59417	5456	53961	19550	3842	23392	5807	28604	43
26	Patna	74832	16661	10352	7614	109459	10406	99053	45795	9121	54916	12836	40421	55
27	Purnea	72301	1055	18860	4825	97041	5788	91253	36408	6167	42575	8528	46317	47
28	Rohtas	85392	19758	10500	8058	123709	10503	113206	35158	4908	40066	7370	70678	35
29	Saharsa	39548	7745	8139	5221	60653	4214	56439	18405	2963	21368	4895	33140	38
30	Samastipur	69865	7631	10749	5620	93865	6348	87518	39257	6940	46197	10833	37428	53
31	Saran	55052	12356	8105	10725	86237	5366	80871	39032	6310	45342	8923	32917	56
32	Sheikhpura	12376	2898	2080	713	18067	1463	16604	7809	1126	8935	1390	7405	54
33	Sheohar	13335	2286	1892	1041	18553	1228	17325	9237	1132	10369	1910	6178	60
34	Sitamarhi	60962	7244	9711	5288	83206	5553	77653	29968	5521	35489	8662	39023	46
35	Siwan	41092	19519	7263	15475	83349	8335	75014	38888	5118	44006	7402	28724	59

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

BIHAR

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
36	Supaul	49221	12616	11809	8386	82032	7838	74195	23197	3456	26653	5391	45608	36
37	Vaishali	49081	11578	7330	10038	78027	5867	72160	36052	5324	41375	7421	28687	57
38	West Champaran	95151	24647	12402	25754	157955	15437	142518	31903	6285	38188	9275	101339	27
State Total (ham)		**1954363**	**395192**	**339621**	**244326**	**2933502**	**247048**	**2686454**	**1025497**	**169597**	**1195094**	**250522**	**1410435**	**44**
State Total (bcm)		**19.54**	**3.95**	**3.40**	**2.44**	**29.34**	**2.47**	**26.86**	**10.25**	**1.70**	**11.95**	**2.51**	**14.10**	**44**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
CHHATTISGARH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Baster	84820	846	11132	2299	99098	5960	93139	8510	3357	11867	4121	80508	13
2	Bijapur	71408	95	10259	143	81905	4104	77801	775	560	1335	750	76276	2
3	Bilaspur	53467	5666	0	5043	64175	3227	60948	24371	4526	28896	6048	30530	47
4	Dantewara	52642	206	0	944	53793	3674	50119	1976	1167	3143	1468	46674	6
5	Dhamtari	32926	7141	0	9874	49942	3779	46163	33230	2915	36145	3679	9254	78
6	Durg	58283	8057	7609	15758	89707	7694	82013	48856	7752	56608	8890	24472	69
7	Janjgir Champa	24043	6680	3126	5395	39244	2474	36770	11940	3350	15291	4371	20459	42
8	Jashpur	41188	559	5062	3474	50283	2865	47418	14607	1890	16497	2263	30548	35
9	Kanker	78425	972	8588	2525	90510	5028	85481	16399	1641	18040	2104	66978	21
10	Kawardha	24264	2195	3048	7083	36589	2308	34281	20872	1848	22720	2184	11224	66
11	Korba	41581	832	4090	2604	49107	2822	46285	9664	4962	14626	5676	30945	32
12	Koriya	47349	1271	3397	2247	54264	3310	50954	9994	1530	11524	1960	39000	23
13	Mahasamund	53837	3199	1096	5282	63413	3600	59813	24228	4008	28237	5066	30518	47
14	Narayanpur	25444	219	4255	375	30292	1533	28759	381	461	841	640	27738	3
15	Raigarh	32212	2233	3764	4955	43164	2886	40278	17574	3698	21272	4616	18087	53
16	Raipur	86803	21332	5614	12185	125934	10166	115768	40069	10033	50102	11065	64634	43
17	Rajnandgaon	30000	5999	5007	5586	46592	3500	43092	21529	3384	24913	3478	18084	58
18	Surguja	151224	2615	11115	8560	173514	9812	163702	38144	5235	43379	7509	118049	27
	State Total (ham)	**989914**	**70118**	**87162**	**94332**	**1241526**	**78742**	**1162784**	**343119**	**62316**	**405436**	**75891**	**743979**	**35**
	State Total (bcm)	**9.90**	**0.70**	**0.87**	**0.94**	**12.42**	**0.79**	**11.63**	**3.43**	**0.62**	**4.05**	**0.76**	**7.44**	**35**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
NCT DELHI

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Darya Ganj	161	8	27	64	260	26	234	41	98	139	159	34	59
2	Karol Bagh	31	2	5	6	45	4	40	10	45	55	63	0	137
3	Pahar Ganj	59	3	10	8	80	8	72	0	98	98	124	0	137
4	Gandhi Nagar	147	121	21	108	396	40	357	96	188	284	258	3	80
5	Preet Vihar	175	147	25	289	635	32	604	691	775	1466	833	0	243
6	Vivek Vihar	175	6	25	47	252	25	227	57	316	374	330	0	164
7	Chanakay Puri	188	55	31	118	393	39	353	300	40	340	67	0	96
8	Connaught Place	120	22	20	48	210	21	189	125	24	149	40	24	79
9	Parliament Street	110	24	18	43	195	19	175	128	31	160	53	0	91
10	Civil Lines	632	125	105	497	1359	136	1223	86	679	764	737	401	62
11	Kotwali	65	54	11	12	143	14	128	53	98	151	109	0	118
12	Sadar Bazar	44	1	7	2	54	5	49	0	53	53	60	0	110
13	Seelam Pur	309	314	43	304	970	97	873	329	415	743	583	0	85
14	Seema Puri	99	2	14	12	127	6	120	0	269	269	267	0	223
15	Shahdra	42	12	6	98	158	16	143	0	287	287	285	0	201
16	Model Town	203	66	25	234	529	53	476	70	777	848	767	0	178
17	Narela	1967	1433	286	1429	5115	256	4859	1973	1749	3722	2014	872	77
18	Saraswati Vihar	988	908	127	965	2987	299	2689	1239	3207	4446	3173	0	165
19	Defence Colony	498	323	88	241	1150	115	1035	299	1046	1346	1092	0	130
20	Hauz Khas	825	652	112	103	1692	169	1523	467	3099	3565	3235	0	234
21	Kalkaji	800	649	105	184	1739	174	1565	1127	2001	3128	2072	0	200
22	Delhi Cantonment	583	112	79	118	892	89	803	369	1475	1844	1439	0	230
23	Najafgarh	1016	4258	156	1582	7012	351	6661	5787	2601	8388	2510	0	126
24	Vasant Vihar	1311	216	178	143	1848	185	1663	304	2241	2545	2160	0	153
25	Patel Nagar	264	86	43	674	1067	53	1014	74	1871	1945	1924	0	192
26	Panjabi Bagh	295	117	25	939	1376	69	1307	381	833	1214	941	0	93
27	Rajouri Garden	120	26	19	203	368	37	331	18	874	892	897	0	269
State Total (ham)		**11224**	**9743**	**1612**	**8472**	**31050**	**2338**	**28712**	**14025**	**25191**	**39215**	**26193**	**1333**	**137**
State Total (bcm)		**0.11**	**0.10**	**0.02**	**0.08**	**0.31**	**0.02**	**0.29**	**0.14**	**0.25**	**0.39**	**0.26**	**0.01**	**137**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
GOA

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	North Goa	9758	51	0	4448	14257	5703	8554	778	1750	2527	2166	5610	30
2	South Goa	5913	786	644	2638	9982	3993	5989	228	1359	1586	1682	4079	26
	State Total (ham)	**15671**	**837**	**644**	**7086**	**24239**	**9696**	**14543**	**1005**	**3108**	**4114**	**3849**	**9689**	**28**
	State Total (bcm)	**0.16**	**0.008**	**0.01**	**0.07**	**0.24**	**0.10**	**0.145**	**0.01**	**0.03**	**0.04**	**0.04**	**0.10**	**28**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
GUJARAT

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Ahmedabad	44095	9521	0	8070	61686	3377	58309	38491	7203	45694	9597	12740	78
2	Amreli	61736	9585	0	9514	80836	4042	76794	46774	2637	49411	3532	26488	64
3	Anand	34561	21623	0	22695	78879	4539	74340	33888	5128	39016	6875	33576	52
4	Banaskantha	82040	13061	0	20424	115525	7739	107787	109620	5696	115316	7638	5917	107
5	Bharuch	30556	2450	0	7909	40916	2046	38870	16182	2228	18410	2978	19710	47
6	Bhavnagar	64370	16749	0	13160	94280	4714	89566	51733	5638	57371	7561	30271	64
7	Dang	6883	1891	0	329	9103	455	8648	902	566	1468	758	6988	17
8	Dohad	21542	6890	0	8822	37254	1863	35392	13256	4395	17651	5547	16588	50
9	Gandhinagar	38140	5013	0	5685	48838	3538	45300	51272	3112	54384	4257	0	120
10	Jamnagar	71335	11279	0	7400	90014	4501	85513	50412	4500	54912	6033	29068	64
11	Junagadh	109853	12852	0	14523	137228	6861	130366	73356	6869	80225	9203	47807	62
12	Kachchh	55414	12927	0	15470	83811	4191	79621	58927	4243	63170	5694	15855	79
13	Kheda	47791	14753	0	15493	78037	4026	74011	41345	5866	47210	7862	24805	64
14	Mahesana	69114	7639	0	11271	88025	4401	83624	91506	5562	97068	7455	423	116
15	Narmada	16400	1778	0	4447	22625	1131	21494	4826	1554	6380	2085	14583	30
16	Navsari	17965	8968	0	13613	40546	2027	38518	16249	2344	18593	3117	19153	48
17	Panchmahals	36651	13917	0	23371	73939	3697	70242	23568	5569	29137	7007	39666	41
18	Patan	19710	3082	0	5272	28064	2806	25258	28978	1921	30899	2495	0	122
19	Porbandar	17266	2124	0	1352	20743	1037	19705	13278	835	14113	1618	4809	72
20	Rajkot	109364	19838	0	23622	152825	7641	145183	87049	7816	94865	10344	47790	65
21	Sabarkantha	92046	15694	0	17140	124881	6244	118637	80640	5614	86254	7738	30259	73
22	Surat	32201	19485	0	33947	85633	4282	81352	30197	6315	36512	8339	42816	45
23	Surendranagar	57259	3097	0	5947	66303	3315	62987	34561	2937	37498	3936	24490	60
24	Tapi	25007	3178	0	7289	35474	1774	33701	9633	1397	11030	1824	22243	33
25	Vadodara	95165	11319	0	19497	125982	6299	119682	56601	8129	64730	10566	52515	54
26	Valsad	22402	5822	0	7186	35410	1771	33640	11521	2669	14190	3578	18541	42
State Total (ham)		**1278867**	**254537**	**0**	**323451**	**1856855**	**98317**	**1758539**	**1074766**	**110743**	**1185508**	**147637**	**587102**	**67**
State Total (bcm)		**12.79**	**2.55**	**0.00**	**3.23**	**18.57**	**0.98**	**17.59**	**10.75**	**1.11**	**11.86**	**1.48**	**5.87**	**67**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

HARYANA

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Ambala	30834	10923	9196	7148	58101	4849	53252	38323	7710	46033	8954	5975	86
2	Panchkula	8164	2373	2569	1792	14898	980	13918	8464	2790	11254	4319	1135	81
3	Fatehabad	17482	20511	3300	17586	58879	5887	52992	90660	1400	92060	1809	-39477	174
4	Bhiwani	33642	12844	6122	15476	68084	6227	61857	70596	758	71354	832	-9571	115
5	Hissar	22210	16117	4389	26202	68918	6598	62320	57841	452	58293	565	3914	94
6	Gurgaon	12560	3023	4440	6697	26720	2672	24048	36266	18152	54418	18152	-30370	226
7	Mewat	10254	4243	4280	5531	24308	1944	22364	17586	1190	18776	1755	3023	84
8	Faridabad	9059	3975	3256	5448	21738	2174	19564	12691	2232	14923	2733	4140	76
9	Palwal	12683	13076	2497	17948	46204	3297	42907	40597	999	41596	1310	1000	97
10	Jhajjar	12543	13043	2822	16899	45307	4069	41238	40768	291	41059	339	131	100
11	Jind	18941	28732	9601	36267	93541	8749	84792	91079	3717	94796	3812	-10099	112
12	Kaithal	16997	21240	5193	15272	58702	5193	53509	108316	6241	114557	6241	-61048	214
13	Karnal	26958	26173	5315	31797	90243	8012	82231	120647	1244	121891	1244	-39660	148
14	Kurukshetra	17963	9082	4946	6380	38371	3038	35333	71099	6737	77836	6737	-42503	220
15	Mahendragarh	13402	1924	3335	5819	24480	2000	22480	22506	421	22927	470	-496	102
16	Panipat	12814	8687	2597	10441	34539	3452	31087	50148	496	50644	496	-19557	163
17	Rewari	13018	3609	3075	11844	31546	3154	28392	31999	116	32115	126	-3733	113
18	Rohtak	10823	15309	4179	17653	47964	4193	43771	30488	100	30588	117	13166	70
19	Sirsa	14540	27928	4903	38575	85946	8594	77352	135443	776	136219	776	-58867	176
20	Sonepat	22272	25405	5955	31921	85553	8555	76998	102617	4630	107247	4639	-30258	139
21	Yamunanagar	27599	9097	9165	7960	53821	5380	48441	56434	10215	66649	10499	-18492	138
STATE TOTAL (ham)		**364758**	**277314**	**101135**	**334656**	**1077863**	**99017**	**978846**	**1234568**	**70667**	**1305235**	**75925**	**-331647**	**133**
STATE TOTAL (bcm)		**3.65**	**2.77**	**1.01**	**3.35**	**10.78**	**0.99**	**9.79**	**12.35**	**0.71**	**13.05**	**0.76**	**(-)3.31**	**133**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
HIMACHAL PRADESH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Indaura Valley	7533.47	314.28	2090.68	628.56	10566.99	528.35	10038.64	3771.37	1492.35	5263.72	1492.35	4774.92	52
2	Nurpur Valley	5155.6	125.85	1872.52	251.7	7405.67	370.28	7035.39	1510.2	1511.33	3021.53	1511.33	4013.86	43
3	Balh Valley	2118.76	21.15	792.11	42.29	2974.31	148.72	2825.59	253.73	659.04	912.77	659.04	1912.82	32
4	Paonta Valley	6658.61	109.67	1120.77	219.34	8108.39	405.42	7702.97	1316.02	858.44	2174.46	858.44	5528.51	28
5	Kala Amb Valley	71.02	4.24	17.93	8.47	101.66	5.08	96.58	50.81	494.51	545.32	494.51	-448.74	565
6	Nalagarh Valley	6283.55	184.91	1521.57	369.82	8359.85	417.99	7941.86	2218.92	2113.39	4332.31	2113.39	3609.55	55
7	Una Valley	10464.22	1681.81	2537.96	3108.76	17792.75	889.64	16903.11	15480.4	5485.88	20966.28	5485.88	-4063.17	124
8	Hum Valley	389.14	41.57	113.26	49.14	593.11	29.66	563.45	454.14	106.9	561.04	125.36	-16.05	100
	State total (ham)	**38674.37**	**2483.48**	**10066.8**	**4678.08**	**55902.73**	**2795.14**	**53107.59**	**25055.59**	**12721.84**	**37777.43**	**12740.3**	**15311.7**	**71**
	StateTotal (bcm)	**0.39**	**0.02**	**0.10**	**0.05**	**0.56**	**0.03**	**0.53**	**0.25**	**0.13**	**0.38**	**0.13**	**0.15**	**71**

Note: Assessment carried out in the valley areas of 5 districts out of total 12 districts in the State since rest of the areas are predominantly hilly

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
JAMMU & KASHMIR

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Jammu	39840	55640	10000	24622	130102	13010	117092	12993	8503	21496	9162	94937	18
2	Kathua	18613	21474	4637	8946	53671	5367	48304	5469	3127	8596	3793	39043	18
3	Srinagar	5908	8742	1474	488	16612	1661	14951	500	9328	9827	12304	2147	66
4	Anantnag	13245	34367	3300	98	51009	5101	45908	69	5014	5083	6447	39392	11
5	Baramulla	23040	22138	5760	832	51770	5177	46593	401	4071	4472	4959	41233	10
6	Badgam	9131	18127	2278	96	29632	2963	26669	62	7088	7150	8519	18088	27
7	Pulwama	9349	19182	2337	24	30893	3089	27803	90	7922	8012	10318	17395	29
8	Kupwara	8342	10607	2086	20	21055	2106	18950	24	4858	4882	6607	12318	26
9	Udhampur	2384	2892	597	611	6483	648	5835	15	2785	2800	3045	2775	48
10	Rajouri	6440	2967	1610	782	11800	1180	10620	231	3102	3333	4063	6326	31
11	Poonch	3920	4960	980	574	10434	1043	9391	5	3762	3767	4910	4476	40
12	Doda	2153	2919	492	407	5972	597	5374	6	1043	1049	1715	3654	20
13	Kargil	240	1283	60	0	1583	158	1425	0	132	132	167	1259	9
14	Leh	2640	804	660	0	4104	410	3694	12	40	52	55	3627	1
State Total (ham)		**145246**	**206103**	**36271**	**37500**	**425120**	**42512**	**382608**	**19875**	**60775**	**80650**	**76065**	**286668**	**21**
State Total (bcm)		**1.45**	**2.06**	**0.36**	**0.37**	**4.25**	**0.43**	**3.83**	**0.20**	**0.61**	**0.81**	**0.76**	**2.87**	**21**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
JHARKHAND

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Bokaro	20333	158	2546	1849	24886	1805	23081	5488	2474	7962	3575	14018	34
2	Chatra	24927	216	3427	2389	30959	2187	28772	8886	1374	10260	2262	17623	36
3	Deoghar	17805	53	6304	1506	25668	1935	23733	5527	2754	8282	4783	13423	35
4	Dhanbad	12716	66	2587	1010	16378	1435	14943	3715	4623	8338	5780	5449	56
5	Dumka	20061	2314	6125	1713	30212	3021	27191	5635	1948	7582	2509	19047	28
6	E-Singhbhum	26081	146	4982	891	32101	3001	29100	3138	3467	6605	3837	22125	23
7	Garhwa	25680	1555	4041	2493	33768	2783	30986	9221	2027	11248	2925	18839	36
8	Giridih	37470	81	6363	3141	47055	3360	43695	12308	3913	16221	5245	26142	37
9	Godda	10583	1151	2648	1105	15487	1216	14271	4369	2052	6421	2414	7488	45
10	Gumla	31233	905	8154	2462	42754	4275	38478	9094	1622	10716	2176	27208	28
11	Hazaribagh	27712	703	5999	2991	37404	3154	34250	11022	3378	14399	4556	18673	42
12	Jamtara	13568	14	3429	876	17888	1480	16407	3268	1401	4669	1888	11251	28
13	Khunti	10438	658	4660	1031	16786	1679	15107	3728	724	4452	1166	10213	29
14	Koderma	6335	3	1371	474	8182	610	7572	1818	885	2703	1286	4468	36
15	Latehar	21629	147	3362	1566	26703	2086	24617	5772	1006	6778	1520	17325	28
16	Lohardaga	7550	356	2313	956	11176	1118	10058	3498	627	4125	948	5612	41
17	Pakur	11340	279	3314	256	15188	1405	13783	785	1255	2041	1897	11101	15
18	Palamu	29279	1616	5715	2631	39242	3566	35676	9633	2654	12287	3855	22188	34
19	Ramgarh	11423	44	1513	873	13854	1219	12635	3237	1806	5043	1867	7531	40
20	Ranchi	28405	996	7795	3016	40212	3625	36587	11404	5982	17386	8718	16465	48
21	Sahebganj	12190	196	1770	379	14535	1307	13228	957	2113	3070	3159	9112	23
22	Saraikela	16180	617	4329	317	21443	1977	19465	690	2640	3330	3308	15467	17
23	Simdega	23463	276	5298	1655	30693	2865	27828	7021	1086	8107	1630	19178	29
24	W-Singhbhum	28470	887	8387	393	38136	3394	34742	1064	3064	4128	4563	29114	12
State Total (ham)		**474870**	**13436**	**106432**	**35972**	**630710**	**54503**	**576206**	**131277**	**54875**	**186152**	**75869**	**369060**	**32**
State Total (bcm)		**4.75**	**0.13**	**1.06**	**0.36**	**6.31**	**0.55**	**5.76**	**1.31**	**0.55**	**1.86**	**0.76**	**3.69**	**32**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

KARNATAKA

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Bagalkote	12284	15081	5950	9893	43208	3634	39574	32904	3028	35932	3838	10795	91
2	Bangalore Rural	9511	3419	4999	3463	21391	1206	20184	22376	3239	25616	3240	107	127
3	Bangalore Urban	7031	1205	3624	1557	13417	670	12746	12229	5749	17978	5749	0	141
4	Belgaum	32940	47292	10926	22967	114125	10689	103436	73925	6337	80261	8000	31892	78
5	Bellary	21260	23230	13408	15048	72946	6980	65966	24363	3072	27436	4871	37877	42
6	Bidar	22699	2201	3874	3948	32722	2042	30680	15732	1766	17498	2348	13719	57
7	Bijapur	27163	7944	9209	7130	51446	4036	47410	30634	5006	35640	6070	16071	75
8	Chamrajnagara	13119	11074	6062	7529	37785	3463	34322	26170	1446	27616	1910	10017	80
9	Chikballapur	11987	8362	7901	4453	32703	2820	29883	40612	2705	43318	2735	1591	145
10	Chikmagalur	36800	12513	12862	6455	68630	12228	56402	22015	2235	24250	2604	32580	43
11	Chitradurga	22475	8789	15463	8125	54852	5174	49677	47941	2941	50882	3557	5998	102
12	Dakshin Kannada	39267	1691	7174	3447	51579	19175	32404	19414	2958	22373	3471	10614	69
13	Davangere	21977	10555	13697	14986	61215	5263	55952	46814	2800	49613	4236	11840	89
14	Dharwad	14556	3810	6236	2549	27151	5406	21745	11850	917	12767	1524	8549	59
15	Gadag	10826	5740	6012	4549	27127	2170	24957	20613	1577	22190	2011	5581	89
16	Gulbarga	29185	5181	9049	25880	69295	5996	63299	16699	3374	20073	4609	42025	32
17	Hassan	21739	28695	13069	18516	82020	8428	73593	37804	2347	40151	3486	38414	55
18	Haveri	18802	23494	9235	6657	58188	5034	53154	31214	2680	33894	3734	18465	64
19	Kodagu	20382	1570	9156	1220	32328	4887	27441	5451	433	5884	617	21373	21
20	Kolar	12847	6287	7515	7241	33889	2062	31828	57766	1757	59523	1757	0	187
21	Koppal	13610	19868	7018	19596	60093	5740	54352	21625	1590	23215	2533	31181	43
22	Mandya	12658	45481	7482	38774	104395	10292	94103	42432	2043	44476	3470	52536	47
23	Mysore	18838	19228	12551	12774	63391	5588	57803	23075	2043	25118	3634	32178	43
24	Raichur	19668	30039	9152	33257	92116	8907	83209	23232	2207	25439	3483	57628	31
25	Ramanagara	8720	4378	7004	3986	24087	1789	22298	19527	4527	24054	4779	749	108
26	Shimoga	41067	35836	11424	19888	108216	15667	92549	23330	1962	25292	2856	66378	27
27	Tumkur	27235	22330	20112	15752	85428	7005	78424	73846	4488	78334	6596	15495	100
28	Udupi	45144	958	5995	1736	53834	21058	32775	9646	2393	12039	2888	20241	37
29	Uttar kannada	70874	3637	5611	3299	83421	30516	52905	16869	2752	19621	3256	32780	37
30	Yadgir	16438	6632	5425	13171	41666	3616	38050	9051	1607	10657	2499	26500	28
State total (ham)		**681101**	**416520**	**267196**	**337846**	**1702663**	**221541**	**1481122**	**859160**	**81981**	**941141**	**106365**	**653174**	**64**
StateTotal (bcm)		**6.81**	**4.17**	**2.67**	**3.38**	**17.03**	**2.22**	**14.81**	**8.59**	**0.82**	**9.41**	**1.06**	**6.53**	**64**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

KERALA

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Alappuzha	30407	70	7300	10869	48646	3356	45290	2992	10040	13032	10372	31927	29
2	Ernakulam	42496	483	7942	13578	64499	6173	58327	10308	13931	24240	15296	32722	42
3	Idukki	16233	110	3119	2376	21838	2184	19655	2874	5496	8370	5985	10796	43
4	Kannur	45296	679	0	7256	53232	5219	48013	10943	10939	21882	11932	25137	46
5	Kasargod	31039	815	0	4690	36544	3654	32889	16705	6775	23480	7798	8387	71
6	Kollam	31965	166	10452	4172	46756	4535	42221	4015	11933	15948	13016	25190	38
7	Kottayam	34780	133	7331	6939	49182	4612	44570	3491	9214	12705	10704	30375	29
8	Kozhikode	36227	229	0	1447	37904	3442	34462	5200	14024	19224	15793	13469	56
9	Malappuram	40081	360	5590	8500	54531	4976	49555	8166	20235	28401	24392	16996	57
10	Palakkad	45501	1742	7769	30802	85814	7432	78383	35494	13151	48646	14197	28894	62
11	Pathanamthitta	18208	123	6126	3461	27918	2616	25302	3463	6004	9467	6304	15534	37
12	Thiruvananthapuram	24892	285	7439	2981	35596	2724	32871	3985	13316	17301	14699	14187	53
13	Thrissur	57151	1072	0	17282	75505	7352	68153	22167	13720	35888	15216	30769	53
14	Waynad	30407	21	0	246	30675	3067	27607	652	4319	4971	4816	22139	18
State Total (ham)		**484682**	**6289**	**63067**	**114600**	**668639**	**61341**	**607297**	**130456**	**153098**	**283554**	**170520**	**306524**	**47**
State Total (bcm)		**4.85**	**0.06**	**0.63**	**1.15**	**6.69**	**0.61**	**6.07**	**1.30**	**1.53**	**2.84**	**1.71**	**3.07**	**47**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
MADYHA PRADESH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Alirajpur	19494	801	0	1352	21648	1082	20565	3802	2162	5964	2951	13813	29
2	Annupur	34230	99	5578	257	40163	2008	38155	1017	1162	2180	1399	35738	6
3	Ashoknagar	36962	1650	0	5556	44168	2208	41959	18738	1588	20326	2414	20806	48
4	Balaghat	81283	3872	8091	2579	95825	4791	91034	9620	3107	12728	4114	77299	14
5	Barwani	36947	1444	0	5083	43475	2174	41301	26800	3019	29819	5004	9496	72
6	Betul	94384	3022	12410	10141	119956	5998	113959	55565	3594	59159	4813	53580	52
7	Bhind	51997	749	2061	11165	65972	3299	62673	22632	2764	25396	3718	36323	41
8	Bhopal	31933	1863	0	5431	39227	1961	37266	25719	2356	28075	3211	8336	75
9	Burhanpur	29082	877	0	4118	34077	1704	32373	23504	1147	24651	1422	7446	76
10	Chhatarpur	64451	3049	0	11278	78778	3939	74839	47508	2761	50270	4012	23318	67
11	Chhindwara	109835	4133	11905	13734	139607	6980	132627	64955	5274	70230	7194	60477	53
12	Damoh	32722	1403	0	8091	42217	2111	40106	22861	2113	24974	3761	13484	62
13	Datia	28596	684	0	5475	34756	1738	33018	14598	1248	15847	1928	16492	48
14	Dewas	71825	2759	0	13063	87646	4382	83264	65523	2623	68146	3582	14159	82
15	Dhar	80003	4483	0	18531	103017	5151	97867	75257	5005	80262	6769	15840	82
16	Dindori	39722	106	4683	343	44853	2243	42611	1857	1384	3241	1714	39040	8
17	Guna	64703	3348	0	10897	78949	3947	75002	38689	2665	41354	3389	32923	55
18	Gwalior	35580	3726	1318	12204	52828	2641	50187	19710	1979	21689	3815	26662	43
19	Harda	35662	2764	0	15286	53712	2686	51026	13730	976	14706	1330	35966	29
20	Hoshangabad	142757	10334	0	60746	213837	10692	203145	35051	2933	37984	4348	163745	19
21	Indore	44272	3624	0	12193	60089	3004	57084	65109	3369	68478	4183	-12207	120
22	Jabalpur	51942	2675	980	6640	62238	3112	59126	25989	3141	29130	5083	28054	49
23	Jhabua	20706	722	0	1785	23214	1161	22053	7657	2366	10023	3142	11254	45
24	Katni	34444	1838	0	4786	41068	2053	39015	13404	2549	15953	3893	21717	41
25	Khandwa	72460	1825	0	9533	83818	4191	79627	46898	2862	49760	4793	27936	62
26	Khargone	65142	2821	0	11677	79640	3982	75658	53171	3467	56638	5062	17425	75
27	Mandla	48261	732	6601	3007	58603	2930	55672	6218	2248	8465	3200	46255	15
28	Mandsaur	46733	2385	0	11115	60232	3012	57221	51972	3229	55201	3219	2029	96
29	Morena	41592	959	1079	20459	64089	3204	60885	20623	4289	24912	7209	33053	41
30	Narsinghpur	105594	2890	0	14196	122679	6134	116545	85929	2168	88097	2708	27907	76
31	Neemuch	31755	3695	0	7345	42795	2140	40656	32094	1749	33843	1973	6588	83
32	Panna	50500	838	0	3292	54629	2731	51897	11531	2101	13633	2925	37441	26
33	Raisen	83521	3012	0	8479	95013	4751	90262	37095	3168	40263	4393	48775	45
34	Rajgarh	77303	3317	0	10528	91148	4557	86590	68296	3457	71753	4291	14004	83
35	Ratlam	56957	4350	0	16258	77565	3878	73687	90218	2382	92601	2781	-19312	126
36	Rewa	42292	915	2610	3596	49413	2471	46942	20570	4609	25179	5970	20402	54
37	Sagar	110939	3425	0	14738	129102	6455	122647	69993	2418	72411	4642	48012	59

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
MADYHA PRADESH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
38	Satna	43518	2147	4309	7038	57012	2851	54162	35041	5167	40208	5867	13254	74
39	Sehore	62638	3436	0	12873	78947	3947	74999	55106	2585	57692	5787	14106	77
40	Seoni	68249	1396	551	4509	74706	3735	70970	17504	3029	20532	4412	49055	29
41	Shahdol	59636	216	7502	508	67862	3393	64469	2305	1928	4233	2679	59485	7
42	Shajapur	83175	4187	0	16745	104108	5205	98902	93239	3583	96822	3972	1691	98
43	Sheopur	30388	587	0	13631	44606	2230	42376	14218	1274	15492	1690	26467	37
44	Shivpuri	63109	2995	0	12517	78621	3931	74690	47917	3226	51143	4152	22621	68
45	Sidhi	29807	727	3277	2184	35995	1800	34195	10705	2433	13138	3576	19914	38
46	Singrauli	34818	683	0	2057	37558	1878	35680	8555	2257	10812	3608	23517	30
47	Tikamgarh	43531	2819	0	12252	58602	2930	55672	37827	2348	40175	3813	14032	72
48	Ujjain	74887	4064	0	16932	95883	4794	91088	83560	3141	86701	3935	3594	95
49	Umaria	39318	340	5917	811	46386	2319	44067	3661	1277	4937	1873	38534	11
50	Vidisha	82160	2058	0	9513	93731	4687	89045	44543	3585	48128	5004	39498	54
State total (ham)		**2821816**	**116846**	**78871**	**486530**	**3504063**	**175203**	**3328860**	**1748087**	**135265**	**1883352**	**190723**	**1390050**	**57**
State total (BCM)		**28.22**	**1.17**	**0.79**	**4.87**	**35.04**	**1.75**	**33.29**	**17.48**	**1.35**	**18.83**	**1.91**	**13.90**	**57**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
MAHARASHTRA

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Ahmednagar	101333	13668	26970	54485	196457	10325	186132	148892	3403	152295	6057	40936	82
2	Akola	31274	1223	1699	8106	42302	2323	39979	16785	1197	17983	2394	20800	45
3	Amravati	59485	3791	7173	24537	94987	5037	89950	57902	2865	60767	5055	30342	68
4	Aurangabad	69459	6423	2807	40991	119680	6034	113647	78500	3257	81756	6392	29074	72
5	Beed	84288	11841	15593	30325	142047	7244	134803	64172	4761	68932	9521	61110	51
6	Bhandara	32384	6044	3904	12287	54620	3211	51409	14675	2316	16992	4628	32106	33
7	Buldhana	69345	5007	5656	19830	99839	5676	94162	62735	2798	65533	5392	27268	70
8	Chandrapur	100526	4654	0	4236	109415	5646	103770	9663	7172	16834	14344	79764	16
9	Dhule	49795	5467	0	19276	74538	4334	70205	34596	1784	36380	3517	32093	52
10	Gadchiroli	85046	1086	0	10250	96381	4819	91562	20225	2674	22899	5343	65994	25
11	Gondia	39877	6687	3209	14684	64457	3846	60611	8788	3397	12185	6793	45030	20
12	Hingoli	52136	1821	7211	46610	107779	5389	102390	36370	1804	38174	3607	62412	37
13	Jalgaon	86016	5049	4433	47955	143453	7260	136193	104164	6226	110390	9798	29948	81
14	Jalna	60031	2941	693	32095	95760	5253	90506	46874	1295	48169	2571	41081	53
15	Kolhapur	60002	8059	3712	52339	124112	6206	117907	46927	1326	48253	2653	68327	41
16	Latur	52861	5138	0	17869	75868	3854	72014	52215	2065	54280	3801	18144	75
17	Nagpur	70403	5306	11334	26248	113290	6252	107038	51179	4801	55981	9430	46429	52
18	Nanded	103980	858	16635	20105	141577	7116	134461	43379	3046	46425	6092	84990	35
19	Nandurbar	40734	2285	0	8417	51437	2823	48614	22122	2373	24494	4745	21747	50
20	Nashik	147580	10415	285	44143	202424	10892	191532	107175	3519	110693	6545	82051	58
21	Osmanabad	67600	7587	8022	23463	106673	5396	101277	71082	1872	72954	3628	26931	72
22	Parbhani	61459	719	3863	30859	96900	5022	91878	39446	1847	41293	3673	48758	45
23	Pune	100919	13090	3692	65225	182927	9623	173304	119523	7067	126590	12837	45714	73
24	Raigad	56364	410	0	5826	62600	3176	59425	5795	2094	7889	4188	49442	13
25	Ratnagiri	46573	164	0	1347	48084	2413	45670	3986	1231	5217	2462	39222	11
26	Sangli	56144	9587	2481	27193	95405	5925	89480	71147	2803	73950	5000	15871	83
27	Satara	63874	8934	10508	25553	108869	5518	103351	70465	4946	75411	9564	23668	73
28	Sindhudurg	24825	161	348	2286	27619	1381	26238	7771	1963	9734	3927	14541	37
29	Solapur	99358	12852	13437	42104	167751	8535	159216	117997	4952	122949	9116	39527	77
30	Thane	53005	525	0	8129	61659	3527	58132	6341	1255	7596	2510	49281	13
31	Wardha	61676	469	9366	15668	87179	4707	82472	34445	3504	37949	7008	41019	46
32	Washim	43903	2776	1604	11052	59336	3367	55969	19884	1575	21459	3149	32936	38
33	Yeotmal	104154	2715	19403	13042	139315	7424	131890	19385	5746	25131	11492	101013	19
	State Total (ham)	**2236409**	**167753**	**184041**	**806537**	**3394740**	**179552**	**3215188**	**1614604**	**102933**	**1717538**	**197232**	**1447570**	**53**
	State Total (bcm)	**22.36**	**1.68**	**1.84**	**8.07**	**33.95**	**1.80**	**32.15**	**16.15**	**1.03**	**17.18**	**1.97**	**14.48**	**53**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

MANIPUR

Sl. No.	District	Annual Replenishable Ground Water Resource					Provision for Natural Discharges	Net Annual Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from rainfall	Recharge from other sources	Recharge from rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Imphal West-I Block	2613.23	88.14	2144.71	176.38	5022.46	502.25	4520.21	93	26	119.26	857.16	3570.05	2.64
2	Imphal West-II Block	1775.89	111.73	1457.5	223.47	3568.6	356.86	3211.74	12	4	16.03	417.82	2781.92	0.5
3	Imphal East-I Block	2223.68	141.01	1825	282.03	4471.72	447.17	4024.54	6	2	8.02	621.05	3397.49	0.2
4	Imphal East-II Block	4545.71	7.9	3730.72	15.83	8300.16	830.02	7470.14	27	7	34.08	542.69	6900.45	0.46
5	Thoubal Block	2860.52	85.17	2347.67	170.37	5463.73	546.37	4917.36	33	6	39.1	700.75	4183.61	0.8
6	Kakching Block	3027.61	72.09	2484.8	144.24	5728.74	572.87	5155.87	57	5	62.18	413.2	4685.67	1.21
7	Bishnupur District *	4353.8	2.923	3573.216	5.87	7935.81	793.58	7142.23	30	10	40.08	606.936	6505.29	0.56
8	Churachandpur District*	1909.56	14.429	1567.2	28.93	3520.12	352.01	3168.11	75	10	85.23	449	2644.11	2.69
	State total (ham)	**23310**	**523**	**19131**	**1047**	**44011**	**4401**	**39610**	**333**	**70**	**404**	**4609**	**34669**	**1.02**
	StateTotal (bcm)	**0.23**	**0.01**	**0.19**	**0.01**	**0.44**	**0.04**	**0.40**	**0.0033**	**0.0007**	**0.004**	**0.05**	**0.35**	**1.02**

Note: 1.Assessment carried out by CGWB in absence of active participation of State Govt

2. * In Bishnupur and Churachandpur district details of relevant block level data of the various parameters from the State Govt. are not available

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
MEGHALAYA

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	East Khasi Hills	35359	99.6	1782	23	37263	3726	33537	0	6	6	3576	29961	0.018
2	West Garo Hills	51195	629.7	2333	185.7	54343	5434	48909	150	3.55	153.6	5799	42959	0.314
3	East Garo Hills	37933	779.7	1167	52.3	39932	3993	35939	0	1.76	1.8	2845	33094	0.005
4	Jaintia Hills	30774	353.1	1519	136	32783	3278	29505	0	1.98	2.0	3672	25832	0.007
5	West Khasi Hills	5687	211.5	317	48	6264	626	5637	0	2.03	2.0	3575	2063	0.036
6	Ri-Bhoi	5015	401.4	300	0	5716	572	5144	0	1.25	1.3	2465	2680	0.024
7	South Garo Hills	1634	69	35	10	1748	175	1573	0	0.67	0.7	1312	261	0.043
	State Total (ham)	**167597**	**2544**	**7453**	**455**	**178049**	**17805**	**160244**	**150**	**17.24**	**167.24**	**23244**	**136850**	**0.104**
	State Total (bcm)	**1.68**	**0.03**	**0.07**	**0.005**	**1.78**	**0.18**	**1.60**	**0.0015**	**0.0002**	**0.0017**	**0.232**	**1.37**	**0.080**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMET

MIZORAM

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Aizawl	242	Negligible	69	Negligible	311	31	280	0	21	21	83	198	7.46
2	Champhai	473	Negligible	223	Negligible	696	70	626	0	16	16	23	603	2.54
3	Kolasib	384	Negligible	40	Negligible	424	42	382	0	8	8	17	364	2.07
4	Lawngtalai	537	Negligible	42	Negligible	579	58	521	0	9	9	28	493	1.64
5	Lunglei	196	Negligible	22	Negligible	218	22	196	0	23	23	27	169	11.93
6	Mamit	289	Negligible	36	Negligible	325	33	293	0	7	7	21	272	2.41
7	Saiha	255	Negligible	18	Negligible	273	27	246	0	3	3	11	235	1.06
8	Serchipp	194	Negligible	17	Negligible	210	21	189	0	10	10	12	177	5.29
State Total (ham)		**2571**	**Negligible**	**465**	**Negligible**	**3037**	**304**	**2733**	**0**	**96**	**96**	**222**	**2511**	**3.52**
State Total (bcm)		**0.0257**	**Negligible**	**0.005**	**Negligible**	**0.030**	**0.003**	**0.027**	**0.000**	**0.0010**	**0.0010**	**0.002**	**0.025**	**3.52**

Note: Assessment carried out by CGWB in absence of active participation of State Govt

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
NAGALAND

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Kohima	3198	Negligible	1668	Negligible	4866	487	4379	0	566	566	779	3601	12.9
2	Dimapur	16347	Negligible	8529	Negligible	24876	2488	22388	0	851	851	1180	21209	3.8
3	Phek	2297	Negligible	1198	Negligible	3495	350	3146	0	239	239	277	2868	7.6
4	Mokokchung*	4134	Negligible	2157	Negligible	6291	629	5662	0	286	286	287	5375	5.1
5	Zunheboto*	1638	Negligible	854	Negligible	2492	249	2243	0	206	206	207	2036	9.2
6	Wokha	3418	Negligible	1783	Negligible	5201	520	4681	0	243	243	255	4426	5.2
7	Tuensang	7594	Negligible	3962	Negligible	11556	1156	10400	0	642	642	699	9701	6.2
8	Mon*	1849	Negligible	965	Negligible	2814	281	2533	0	366	366	368	2165	14.5
	State Total (ham)	**40475**	**Negligible**	**21116**	**Negligible**	**61591**	**6159**	**55432**	**0**	**3399**	**3399**	**4052**	**51380**	**6.13**
	State Total (bcm)	**0.40**	**Negligible**	**0.21**	**Negligible**	**0.62**	**0.06**	**0.55**	**0.00**	**0.034**	**0.034**	**0.04**	**0.51**	**6.13**

negative figure. The population of 2025 has been calculated considering the decadal growth rate of 2001-2011, except for these three districts where the projected population of 2025 has been taken same as the population of the year 2011.

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
ORISSA

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Angul	37078	4312	1645	5795	48830	2753	46077	12388	3493	15881	4509	29180	34
2	Balasore	78853	13281	4808	19543	116485	6422	110063	52195	5742	57937	8401	49467	53
3	Bargarh	38893	4556	1127	4261	48837	2783	46054	8607	3293	11900	3797	33650	26
4	Bhadrak	26200	8525	1862	11629	48216	2807	45409	23995	2663	26658	3418	17996	59
5	Bolangir	45972	5958	3265	5599	60794	3138	57656	10045	3091	13136	3421	44191	23
6	Boudh	14105	7742	1930	6123	29900	2061	27839	4698	910	5608	1265	21876	20
7	Cuttack	38608	12326	2430	22353	75717	5001	70716	20774	6089	26863	7620	42322	38
8	Deogarh	13351	4256	0	4566	22173	1544	20629	2657	664	3321	949	17023	16
9	Dhenkanal	36582	3574	2820	3896	46872	2608	44264	8724	2797	11521	3340	32200	26
10	Gajapati	10985	3549	5802	3673	24009	1339	22670	5081	1140	6221	1302	16286	27
11	Ganjam	52792	33115	21513	15650	123070	8529	114541	27508	7334	34842	9475	77558	30
12	Jagatsinghpur	20734	9595	2328	16026	48683	3654	45029	21234	1970	23204	2463	21332	52
13	Jajpur	39472	4761	7385	8786	60404	3471	56933	25515	2190	27705	2999	28419	49
14	Jharsuguda	14605	1572	0	1600	17777	986	16791	3590	1563	5153	1757	11444	31
15	Kalahandi	49321	15576	0	15088	79985	5074	74911	10619	4312	14931	9644	54648	20
16	Kandhamal	46661	5696	16364	5610	74331	4065	70266	7071	1776	8847	2530	60665	13
17	Kendrapara	5926	4318	179	7282	17705	924	16781	8917	673	9590	830	7034	57
18	Keonjhar	67852	5920	4720	7605	86097	4774	81323	18894	4395	23289	4787	57642	29
19	Khurda	27948	7316	8884	6639	50787	3169	47618	10478	5227	15705	7673	29467	33
20	Koraput	56710	7072	4249	5587	73618	4501	69117	3362	3409	6771	3905	61850	10
21	Malkangiri	25865	5111	1091	3824	35891	2293	33598	1858	1330	3188	1853	29887	9
22	Mayurbhanj	87685	31446	10090	29333	158554	10360	148194	37272	6469	43741	8384	102538	30
23	Nabarangapur	46035	1724	3824	1615	53198	2720	50478	4606	2986	7592	6630	39242	15
24	Nayagarh	25801	6297	6747	6714	45559	2877	42682	8293	2056	10349	2489	31900	24
25	Nuapada	25491	5113	0	5314	35918	2232	33686	5511	1522	7033	3262	24913	21
26	Puri	35384	7829	11480	8202	62895	4089	58806	9039	3259	12298	4136	45631	21
27	Rayagada	42949	10007	7779	9408	70143	4462	65681	6944	2774	9718	3161	55576	15
28	Sambalpur	34746	10749	0	10989	56484	3964	52520	5941	2594	8535	3181	43398	16
29	Subarnapur	17161	2348	607	2531	22647	1218	21429	2970	1273	4243	1606	16853	20
30	Sundergarh	65419	9060	0	7621	82100	4775	77325	12471	4628	17099	5389	59465	22
State Total (ham)		**1129184**	**252704**	**132929**	**262862**	**1777679**	**108593**	**1669086**	**381258**	**91622**	**472880**	**124175**	**1163653**	**28**
State Total (bcm)		**11.29**	**2.53**	**1.33**	**2.63**	**17.78**	**1.09**	**16.69**	**3.81**	**0.92**	**4.73**	**1.24**	**11.64**	**28**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

PUNJAB

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Amritsar	31831	73083	8390	23767	137072	13707	123365	217150	5008	222158	7810	-101596	180
2	Barnala	12058	34679	2239	16512	65488	6549	58939	118878	1254	120132	1839	-61778	204
3	Bathinda	27051	37913	5030	41144	111138	9458	101681	118446	3005	121452	4500	-21266	119
4	Faridkot	12575	35926	2187	17158	67846	6785	61061	95603	1943	97546	1943	-36485	160
5	Fateh Garh Sahib	16209	30474	3685	9542	59910	5991	53919	111180	2076	113256	2702	-59963	210
6	Ferozepur	40799	114703	8670	46442	210614	21061	189552	275576	3375	278951	4989	-91013	147
7	Gurdaspur	57702	92053	15253	31224	196232	18612	177621	219741	6637	226378	9313	-51433	127
8	Hoshiarpur	48029	27202	12219	11075	98525	8752	89774	87047	4917	91963	6248	-3522	102
9	Jalandhar	36096	61810	8341	24282	130529	13053	117476	267002	4729	271731	6813	-156339	231
10	Kapurthala	21559	38424	5914	7458	73355	7335	66019	150588	3900	154488	4693	-89261	234
11	Ludhiana	48155	110670	10141	62300	231265	23127	208139	336828	11229	348057	16442	-145131	167
12	Mansa	17834	35437	3586	20529	77386	7739	69647	144741	13	144754	13	-75107	208
13	Moga	21876	77174	4277	30642	133969	13397	120572	242148	1802	243949	2378	-123953	202
14	Muktsar	20934	28256	3921	33460	86571	8657	77914	51625	2460	54085	2460	23829	69
15	Nawan Shahr	20248	28986	4971	15512	69718	6972	62746	70742	1515	72256	1887	-9883	115
16	Patiala	44007	79988	9392	32670	166056	16606	149451	288631	4348	292979	6675	-145855	196
17	Ropar	18731	13350	4327	9215	45623	3794	41829	43775	2384	46159	3191	-5136	110
18	Mohali	19496	4665	4263	2113	30538	3054	27484	23576	4618	28194	5535	-1626	103
19	Sangrur	40154	76431	9016	19456	145057	14506	130551	366396	3031	369427	4445	-240290	283
20	Tarn Taran	27149	62516	7297	19040	116002	11600	104402	187566	2664	190230	4217	-87381	182
State Total (ham)		**582493**	**1063741**	**133119**	**473541**	**2252894**	**220752**	**2032142**	**3417238**	**70907**	**3488145**	**98094**	**-1483189**	**172**
State Total (bcm)		**5.82**	**10.64**	**1.33**	**4.74**	**22.53**	**2.21**	**20.32**	**34.17**	**0.71**	**34.88**	**0.98**	**-14.83**	**172**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
RAJASTHAN

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Ajmer	27610	1489	0	6412	35511	3305	32206	41547	4691	46238	4691	0	144
2	Alwar	57442	3380	7575	11154	79551	6382	73169	121552	9566	131118	9595	399	179
3	Banswara	10540	1050	0	14171	25761	2696	23066	9231	1961	11192	2853	10982	49
4	Baran	36263	5759	279	9666	51967	4804	47163	52596	3938	56534	4475	5562	120
5	Barmer	25196	622	0	1435	27253	2524	24729	23901	6766	30666	6847	2117	124
6	Bharatpur	36864	2580	1672	8134	49250	4314	44936	45839	6378	52218	6569	396	116
7	Bhilwara	33176	2310	0	10945	46431	4476	41955	50198	3980	54178	3980	0	129
8	Bikaner	24004	235	0	1026	25265	1263	24001	25867	8374	34241	9033	4011	143
9	Bundi	22293	2754	0	17217	42265	5970	36295	33669	2711	36380	3472	5328	100
10	Chittorgarh	25898	1833	0	7546	35276	3417	31860	43227	1379	44606	1379	0	140
11	Churu	14101	0	0	0	14101	705	13395	9445	2408	11854	4398	3096	88
12	Dausa	21700	1186	343	3145	26373	2620	23753	37886	2487	40374	2487	0	170
13	Dholpur	21430	1383	0	5499	28312	2382	25930	30706	2526	33233	2576	1596	128
14	Dungarpur	7986	1211	0	4906	14103	1291	12812	8396	882	9278	4416	0	72
15	Ganganagar	2711	14301	669	23118	40798	4080	36719	15617	545	16163	1033	20068	44
16	Hanumangarh	2954	6950	316	12429	22649	2265	20384	15716	705	16421	1107	3561	81
17	Jaipur	58832	2331	3333	6742	71238	6685	64552	108111	25686	133797	25733	979	207
18	Jaisalmer	6721	16	0	55	6792	633	6159	9356	2893	12249	2961	1874	199
19	Jalore	40787	1114	0	4383	46285	4086	42200	77952	4090	82042	4191	969	194
20	Jhalawar	36546	1968	0	5657	44171	2948	41223	47601	1583	49183	1940	479	119
21	Jhunjhunu	21173	213	3498	1466	26350	2350	24000	45604	8571	54175	8604	330	226
22	Jodhpur	38126	656	2139	2031	42952	4239	38713	73164	10415	83579	11303	4761	216
23	Karauli	31897	1162	0	4254	37313	3617	33697	41177	5064	46241	4984	1239	137
24	Kota	31458	3089	0	22142	56689	5359	51330	42097	4891	46988	6251	7776	92
25	Nagaur	51178	517	4161	2219	58075	5649	52426	81186	17893	99079	18953	4120	189
26	Pali	27262	848	0	4749	32859	3229	29630	31436	2747	34184	3048	959	115
27	Pratapgarh	11064	926	0	3532	15521	1436	14086	16884	597	17481	982	399	124
28	Rajsamand	8495	786	0	2592	11873	1187	10686	10270	1525	11795	1525	63	110
29	Sawai Madhopur	33916	1499	0	4222	39636	3594	36042	37408	7947	45355	8375	209	126
30	Sikar	26968	294	4006	880	32148	3037	29111	37052	5842	42894	6238	972	147
31	Sirohi	26211	878	0	3249	30338	2854	27485	29952	1108	31061	1484	1126	113
32	Tonk	36225	2834	0	9294	48353	4459	43894	35745	7635	43380	9104	1841	99
33	Udaipur	21242	1433	0	6010	28685	3394	25291	22931	3195	26125	3946	450	103
State total (ham)		**878268**	**67607**	**27990**	**220280**	**1194144**	**111249**	**1082895**	**1313318**	**170982**	**1484300**	**188532**	**91250**	**137**
StateTotal (bcm)		**8.78**	**0.68**	**0.28**	**2.20**	**11.94**	**1.11**	**10.83**	**13.13**	**1.71**	**14.84**	**1.89**	**0.91**	**137**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
SIKKIM

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	North	-	-	-	-	-	-	236	27	62	89	67	142	38
2	South	-	-	-	-	-	-	1336	89	210	299	247	1001	22
3	East	-	-	-	-	-	-	782	77	400	477	489	216	61
4	West	-	-	-	-	-	-	2062	81	189	269	219	1763	13
State Total (ham)			**-**	**-**	**-**	**-**	**-**	**4416**	**274**	**860**	**1134**	**1021**	**3121**	**26**
State Total (BCM)			**-**	**-**	**-**	**-**	**-**	**0.044**	**0.003**	**0.009**	**0.011**	**0.010**	**0.031**	**26**

Note: Assessment carried out by CGWB in absence of active participation of State Govt

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
TAMIL NADU

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Ariyalur	14374	15999	1851	2772	34996	3500	31497	13793	2359	16152	2506	15198	51
2	Chennai	1228	844	84	851	3007	301	2707		6125	6125	6961	-4255	226
3	Coimbatore	22784	10007	5971	9995	48757	4876	43881	44920	5695	50615	5338	-6376	115
4	Cuddalore	55022	70431	7592	4409	137454	13745	123708	49902	56774	106676	57188	16619	86
5	Dharmapuri	18693	15364	3936	3767	41760	4176	37584	47799	1931	49730	2191	-12406	132
6	Dindigul	23317	15306	6732	14261	59617	5962	53656	61267	2408	63675	2745	-10356	119
7	Erode	17229	47984	4619	7505	77336	7734	69603	58656	6512	65168	6986	3961	94
8	Kanchipuram	37896	62020	3830	13504	117250	11725	105525	63840	5579	69419	8940	32746	66
9	Kanniyakumari	2533	18039	9783	3473	33829	3383	30446	4257	1486	5743	1623	24566	19
10	Karur	13116	15136	4249	3414	35914	3591	32323	27922	1942	29864	2207	2194	92
11	Krishnagiri	19842	11431	5029	3135	39437	3944	35494	45189	1954	47144	2782	-12478	133
12	Madurai	14420	45407	4475	8885	73186	7319	65868	36412	1615	38027	1836	27620	58
13	Nagapattinam	8026	7311	1001	1347	17684	1768	15916	15168	1121	16288	1274	-525	102
14	Namakkal	14872	31112	3820	4832	54637	5464	49173	41563	2421	43984	1915	5695	89
15	Nilgiri	10390	139	2583	104	13216	1322	11894	545	587	1131	625	10724	10
16	Perambalur	8992	8970	2578	2530	23069	2307	20762	27053	1024	28076	1118	-7408	135
17	Pudukkottai	78395	52619	13699	14296	159009	15901	143108	29139	2299	31438	2427	111542	22
18	Ramanathapuram	26400	32551	8191	8712	75854	7585	68268	4856	3115	7970	3540	59872	12
19	Salem	24115	19454	5155	9450	58174	5817	52356	80527	5105	85632	2866	-31037	164
20	Sivagangai	26386	58885	6826	17446	109543	10954	98589	14120	1596	15716	1782	82687	16
21	Thanjavur	32512	40275	5469	9416	87673	8767	78905	79511	2421	81933	2752	-3358	104
22	Theni	9217	14943	8315	7211	39686	3969	35718	28804	1973	30778	2104	4809	86
23	Thiruvallur	28054	48973	2042	1864	80933	8093	72840	28804	20485	49289	21133	22902	68
24	Thoothukudi	17598	29460	6071	7377	60507	6051	54456	19506	4030	23536	4565	30385	43
25	Tirunelveli	21648	63404	9167	4482	98702	9870	88832	48721	2941	51662	3262	36849	58
26	Tiruppur	19141	14243	5060	10805	49250	4925	44325	52448	3801	56248	3676	-11799	127
27	Tiruvarur	14476	12448	1977	4410	33311	3331	29980	20077	1343	21420	1527	8376	71
28	Tirvannamalai	40015	66707	5000	9760	121482	12148	109334	87993	4444	92437	4972	16369	85
29	Trichy	22721	45849	5931	6121	80622	8062	72560	49777	7339	57115	2727	20056	79
30	Vellore	26695	29555	4974	4643	65867	6587	59280	53833	8311	62144	9304	-3857	105
31	Villupuram	51439	100300	6558	8178	166475	16648	149828	148243	5691	153935	6453	-4869	103
32	Virudhunagar	16818	22390	6888	8925	55021	5502	49519	32236	1950	34186	2481	14802	69
State total (ham)		**738364**	**1027559**	**169457**	**217880**	**2153260**	**215326**	**1937934**	**1316878**	**176378**	**1493256**	**181808**	**439247**	**77**
StateTotal (bcm)		**7.38**	**10.28**	**1.69**	**2.18**	**21.53**	**2.15**	**19.38**	**13.17**	**1.76**	**14.93**	**1.82**	**4.39**	**77**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMET
TRIPURA

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	4	5	6	7	8	9	10	11	12	13	14	15	16
1	West Tripura	48816	0	21602	25363	95781	8084	87697	7134	3104	10238	8463	72100	12
2	South Tripura	37250	0	21170	17420	75840	7027	68813	1980	1725	3705	5622	61211	5
3	North Tripura	20457	0	15954	9242	45653	3613	42039	174	1366	1540	4073	37792	4
4	Dhalai	18277	0	15317	7797	41390	4139	37251	30	745	775	1800	35421	2
State Total (ham)		**124800**	**0**	**74043**	**59821**	**258664**	**22864**	**235800**	**9318**	**6941**	**16259**	**19958**	**206524**	**7**
State Total (bcm)		**1.248**	**0.000**	**0.740**	**0.598**	**2.587**	**0.229**	**2.358**	**0.093**	**0.069**	**0.163**	**0.200**	**2.065**	**7**

Note: Assessment carried out by CGWB in absence of active participation of State Govt

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
UTTAR PRADESH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Agra	48347	12250	6827	23124	90549	8335	82214	87858	5693	93551	9317	5192	114
2	Aligarh	50778	13115	7430	24593	95916	9108	86808	65379	5920	71299	9842	12409	82
3	Allahabad	74231	23835	0	25782	123848	6317	117531	83812	11320	95132	15587	21956	81
4	Ambedkar Nagar	47963	24800	10664	24983	108410	5420	102989	53578	5016	58595	7932	41479	57
5	Amethi	54563	23534	3287	29977	111360	10580	100781	63720	5286	69006	8841	28220	68
6	Amroha (J P Nagar)	46911	8080	6880	12072	73944	7394	66549	69268	2878	72146	5033	4314	108
7	Auraiya	28211	12461	0	26951	67624	3381	64242	41471	2777	44249	3954	18817	69
8	Azamgarh	69175	23619	16826	30234	139854	6993	132861	73309	13186	86495	23148	37525	65
9	Baghapat	29823	6355	0	12872	49050	3681	45369	42401	2199	44600	3598	934	98
10	Bahraich	95364	5868	5581	10979	117793	10243	107549	52440	6798	59238	12951	42159	55
11	Ballia	47366	15753	10390	20126	93634	4682	88953	52184	6739	58924	10707	26062	66
12	Balrampur	73415	5612	0	10331	89359	4468	84891	38075	4219	42294	5583	41232	50
13	Banda	53101	9729	0	8661	71491	3945	67546	34094	2804	36898	3926	29526	55
14	Barabanki	91221	38900	18426	70014	218560	10928	207632	126319	7211	133529	10714	70599	64
15	Bareilly	135274	22746	0	32447	190467	16071	174396	97066	6785	103851	10476	66853	60
16	Basti.	68119	12767	14739	14931	110557	9512	101044	74544	4831	79375	7291	19209	79
17	Bijnor	113990	9571	12418	14144	150124	12605	137519	87228	5524	92752	9402	45971	67
18	Budaun	85934	10064	9611	16806	122415	11037	111378	88593	5799	94392	8359	17042	85
19	Bulandshahar	61151	35717	7471	62993	167331	15466	151866	118443	5953	124396	8403	26314	82
20	Chandauli	36585	22595	0	16261	75441	3772	71669	22954	4298	27251	8868	39848	38
21	Chitrakoot	23836	1162	0	1492	26490	1995	24495	14043	2155	16197	4206	7586	66
22	Deoria	64979	12674	9515	19333	106500	5325	101175	71517	7505	79022	10006	19652	78
23	Etah	32177	12040	5513	21601	71331	7133	64198	53131	3550	56682	5638	6878	88
24	Etawah	36418	13401	2330	25666	77814	3891	73924	31472	2522	33995	3276	39175	46
25	Faizabad	43060	13025	9073	15620	80778	8078	72700	41401	3810	45211	4731	26568	62
26	Farrukhabad	42839	6295	4413	11604	65151	3258	61894	46022	3394	49417	5225	10647	80
27	Fatehpur	67645	21328	0	30810	119784	8255	111528	100681	5500	106181	9581	4085	95
28	Firozabad	35467	13865	5719	25338	80390	7344	73046	81486	4055	85541	7144	5266	117
29	G.B.Nagar	19100	8500	2796	20515	50911	5091	45820	39872	2772	42644	3134	3944	93
30	Ghaziabad	13444	5484	1730	10938	31596	1580	30016	24457	7109	31567	12456	2452	105
31	Ghazipur	61401	25380	11594	34249	132624	7539	125085	77844	7770	85615	12708	34970	68
32	Gonda	79389	9364	18395	16039	123187	6159	117028	75828	6834	82662	9582	31618	71
33	Gorakhpur	121911	12732	30277	20613	185533	9277	176256	88964	7181	96145	13661	73632	55
34	Hamirpur	31678	5400	7263	12448	56788	5253	51535	30091	2952	33042	4944	16732	64
35	Hapur	21638	7009	2631	13209	44488	4449	40039	32979	2670	35649	3645	5045	89
36	Hardoi	94150	39799	7540	49433	190921	9546	181375	116701	7579	124280	11907	52767	69
37	Hathras	24475	12004	3954	22089	62522	5041	57482	45783	2802	48585	3871	10278	85

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
UTTAR PRADESH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
38	Jalaun	71566	28678	9862	84756	194862	9743	185119	48576	4395	52971	6333	130211	29
39	Jaunpur	70473	26135	0	39515	136123	11816	124306	101176	9427	110604	15990	14904	89
40	Jhansi	36077	4246	7258	16940	64522	3226	61296	37904	3802	41706	4380	19012	68
41	Kannauj	34481	9287	3845	20444	68057	3403	64654	39804	3238	43042	4635	24210	67
42	Kanpur Dehat	53789	14055	0	23613	91458	4573	86885	55181	3793	58974	5565	26139	68
43	Kanpur Nagar	48714	11846	0	22374	82934	4147	78787	56225	10375	66601	24734	0	85
44	Kasganj	27819	12595	4718	18766	63898	5807	58090	55147	2658	57805	4206	4026	100
45	Kaushambhi	37495	7631	1472	8897	55494	5549	49945	42184	3298	45482	5051	6575	91
46	Kushi Nagar	89472	32475	11618	41692	175257	8763	166495	71076	7644	78720	14300	81120	47
47	Lakhimpur Kheri	144565	37590	39274	78139	299568	14978	284590	169197	8240	177437	15233	100160	62
48	Lalitpur	27587	4824	5604	13695	51709	2585	49124	27215	3056	30271	3512	18397	62
49	Lucknow	37945	11883	0	17872	67700	3385	64315	39879	4232	44110	8375	16062	69
50	Maharajganj	56730	20125	14733	26478	118066	5903	112163	63577	5760	69337	10069	38516	62
51	Mahoba	13128	1222	0	3614	17965	1796	16168	16639	1496	18135	2675	23	112
52	Mainpuri	43035	16922	7561	32565	100084	8501	91583	74933	3612	78546	5280	14890	86
53	Mathura	40265	24647	7051	44494	116457	11646	104812	92384	4003	96387	6190	22239	92
54	Maunath Bhanjan	30417	6603	6224	7594	50838	2542	48296	29635	4125	33759	7289	11372	70
55	Meerut	47580	27422	5742	45769	126513	11353	115160	77433	3381	80814	4636	33560	70
56	Mirzapur	39704	11376	0	12274	63354	5535	57819	30919	5150	36070	10388	16889	62
57	Moradabad	56377	12133	6964	15468	90941	8245	82697	65493	4668	70161	7744	13956	85
58	Muzaffarnagar	51273	17292	9560	30232	108357	10218	98139	60527	4718	65246	7644	36019	66
59	Pilibhit	90623	18995	0	26764	136382	12452	123930	76128	3846	79974	6034	41768	65
60	Pratapgarh	72982	16173	12766	20501	122422	6778	115645	128377	34556	162933	44922	28204	141
61	Raebarely	42628	15568	7884	23772	89852	4493	85359	57189	4943	62132	8313	19857	73
62	Rampur	47689	10053	5521	14577	77840	7784	70056	70689	4014	74703	7026	7053	107
63	Saharanpur	71478	24900	12021	37966	146365	13284	133081	171402	5523	176925	8804	0	133
64	Sambhal	45853	7644	5124	12481	71103	7110	63993	65636	4095	69732	6459	1718	109
65	Sant Kabeer Nagar	50201	6318	12692	8673	77885	6683	71202	44391	3377	47768	5628	21183	67
66	Sant Ravidas Nagar	24920	8916	0	10577	44413	4441	39972	33608	3373	36980	6390	473	93
67	Shahjahnpur	103531	15180	10931	20921	150562	13295	137267	76348	5268	81616	7772	53147	59
68	Shamli	20672	8905	4384	13102	47063	4706	42357	56694	2636	59331	3841	447	140
69	Shrawasti	28955	3416	6988	5875	45234	3124	42110	27376	2239	29615	4315	10419	70
70	Siddhrth Nagar	104481	13407	22838	19393	160120	14848	145272	87581	5727	93308	9986	47705	64
71	Sitapur	124772	38248	9141	74188	246350	12317	234032	155285	9190	164475	14167	64580	70
72	Sonbhadra	18494	3239	0	1420	23153	2047	21106	7620	1480	9100	6706	6780	43
73	Sultanpur	52243	27371	2932	32534	115081	10539	104541	70793	5300	76092	9222	24526	73
74	Unnao	92496	35570	7583	56837	192486	17043	175443	108387	6163	114550	10001	57054	65
75	Varanasi	37096	7270	0	9628	53994	5399	48595	36338	5590	41928	11852	3402	86
State total (ham)		**4212738**	**1156994**	**515585**	**1833679**	**7718996**	**553211**	**7165785**	**4873956**	**403789**	**5277745**	**655313**	**1963555**	**74**
StateTotal (bcm)		**42.13**	**11.57**	**5.15**	**18.34**	**77.19**	**5.53**	**71.66**	**48.74**	**4.04**	**52.78**	**6.55**	**19.64**	**74**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

UTTRAKHAND

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Dehradun	28304	1344	5185	1782	36614	156	36458	4292	215	4507	4061	28105	12
2	Hardwar	22058	15348	5932	30839	74177	3074	71103	38104	1411	39515	2294	30705	56
3	Nainital	7713	546	1176	983	10418	76	10341	4369	87	4456	241	5731	43
4	Udham Singh Nagar	51388	8455	7703	15279	82825	1187	81639	63566	1271	64837	2747	15326	79
State Total (ham)		**109463**	**25692**	**19996**	**48884**	**204034**	**4493**	**199541**	**110330**	**2984**	**113315**	**9343**	**79868**	**57**
State Total (bcm)		**1.09**	**0.26**	**0.20**	**0.49**	**2.04**	**0.04**	**2.00**	**1.10**	**0.03**	**1.13**	**0.09**	**0.80**	**57**

Note: Assessment carried out in the valley areas of 4 districts out of total 13 districts in the State since rest of the areas are predominantly hilly

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT

WEST BENGAL

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Malda	98062	26189	8413	21102	153766	13854	139912	49349	6129	55478	9423	81140	40
2	Nadia	101137	45261	17298	44931	208627	17533	191095	168092	7923	176016	10348	12654	92
3	Kochbihar	186567	72428	4735	11049	274778	27478	247301	37722	4327	42049	5827	203752	17
4	North 24 Parganas	101900	29335	7576	23718	162530	14959	147570	78061	14044	92104	18559	50951	62
5	Dakshin Dinajpur	72030	19662	6151	17206	115049	11505	103544	45253	2562	47814	3276	55015	46
6	Uttar Dinajpur	123119	31595	7188	23230	185131	13839	171293	74202	4600	78802	7237	89853	46
7	Bankura	91833	27820	20483	29169	169305	15568	153736	56995	4586	61581	7181	89560	40
8	Purulia	46951	13027	7942	4650	72569	6612	65957	1456	4489	5944	6220	58281	9
9	Jalpaiguri	204758	61381	3840	11850	281830	28183	253647	7132	4278	11410	5751	240764	4
10	Barddhaman	185096	52724	12416	32365	282601	24719	257882	82336	9383	91719	15393	160154	36
11	Murshidabad	135790	44175	17016	45125	242107	19848	222259	165522	9871	175392	16623	40114	79
12	Birbhum	76316	20237	7257	14917	118728	11049	107679	32297	3825	36121	7537	67846	34
13	Howrah	14807	5416	1165	6865	28254	1879	26375	4561	2149	6710	5507	16307	25
14	Darjeeling	37197	10226	871	1279	49573	4957	44616	799	1436	2235	1956	41861	5
15	Hoogly	91552	26354	6476	22506	146888	13994	132895	52750	7038	59787	10471	69674	45
16	Paschim Medinipur	231961	70757	11561	38487	352767	32843	319924	95196	7714	102910	12536	212193	32
17	Purba Medinipur	53801	15030	1902	9873	80606	8061	72545	20226	2960	23186	4216	48102	32
	State total (ham)	**1852876**	**571618**	**142289**	**358325**	**2925107**	**266879**	**2658228**	**971947**	**97313**	**1069260**	**148060**	**1538221**	**40**
	StateTotal (bcm)	**18.53**	**5.72**	**1.42**	**3.58**	**29.25**	**2.67**	**26.58**	**9.72**	**0.97**	**10.69**	**1.48**	**15.38**	**40**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
ANDAMAN & NICOBAR

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Andaman Nicobar	26183	Nil	4621	Nil	30804	2156	28648	63	1208	1271	1375	27209	4.44
UT Total (ham)		**26183**	**Nil**	**4621**	**Nil**	**30804**	**2156**	**28648**	**63**	**1208**	**1271**	**1375**	**27209**	**4.44**
UT Total (bcm)		**0.262**	**Nil**	**0.046**	**Nil**	**0.308**	**0.022**	**0.286**	**0.001**	**0.012**	**0.013**	**0.014**	**0.272**	**4.44**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
CHANDIGARH

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Chandigarh UT	1545	62	488	61	2156	216	1940	0	0	0			0
UT Total (ham)		**1545**	**62**	**488**	**61**	**2156**	**216**	**1940**	**0**	**0**	**0**	**0**	**0**	**0**
UT Total (bcm)		**0.015**	**0.001**	**0.005**	**0.001**	**0.022**	**0.002**	**0.019**	**0.00**	**0.00**	**0.00**	**0.00**	**0.000**	**0**

Note: Ground water draft is through deep tubewells tapping confined aquifer

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
DADRA & NAGAR HAVELI

Sl. No.	District	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	UT of Dadra & Nagar Ha	4265	347	941	663	6216	311	5905	724	563	1287	997	4185	22
UT Total (ham)		**4265**	**347**	**941**	**663**	**6216**	**311**	**5905**	**724**	**563**	**1287**	**997**	**4185**	**22**
UT Total (bcm)		**0.043**	**0.003**	**0.009**	**0.007**	**0.062**	**0.003**	**0.059**	**0.007**	**0.006**	**0.013**	**0.010**	**0.042**	**22**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
DAMAN & DIU

Sl. No.	Union Territory	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Daman	978	122	0	159	1259	63	1196	938	125	1063	235	23	89
2	Diu	458	31	0	61	550	55	495	509	68	577	80	0	117
UT Total (ham)		**1436**	**153**	**0**	**220**	**1809**	**118**	**1691**	**1447**	**193**	**1640**	**315**	**23**	**97**
UT Total (bcm)		**0.014**	**0.002**	**0.000**	**0.002**	**0.018**	**0.001**	**0.017**	**0.014**	**0.002**	**0.016**	**0.003**	**0.000**	**97**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
LAKSHADWEEP ISLANDS

Sl. No.	Islands	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Agatti	-	-	-	-	108	72	35		28	28	-	-	78
2	Amini	-	-	-	-	103	69	34		28	28	-	-	82
3	Androth	-	-	-	-	193	130	62		41	41	-	-	66
4	Chetlat	-	-	-	-	41	28	14		9	9	-	-	63
5	Kadmat	-	-	-	-	124	83	41		20	20	-	-	48
6	Kalpeni	-	-	-	-	91	61	30		16	16	-	-	54
7	Kiltan	-	-	-	-	65	43	22		14	14	-	-	67
8	Kavaratti	-	-	-	-	144	96	48		41	41	-	-	85
9	Minicoy	-	-	-	-	186	122	64		38	38	-	-	59
UT Total (ham)		**0**	**0**	**0**	**0**	**1055**	**705**	**350**	**0**	**234**	**234**	**0**	**0**	**67**
UT Total (bcm)		**0**	**0**	**0**	**0**	**0.011**	**0.007**	**0.0035**	**0.000**	**0.0023**	**0.0023**	**0.000**	**0.000**	**67**

GROUND WATER RESOURCES AVAILABILITY, UTILIZATION AND STAGE OF DEVELOPMENT
PUDUCHERRY

Sl. No.	Region	Annual Replenishable Ground Water Resource					Natural Discharge During Non Monsoon Period	Net Ground Water Availability	Annual Ground Water Draft			Projected demand for Domestic and Industrial uses upto 2025	Net Ground Water Availability for Future Irrigation use	Stage of Ground Water Development (%)
		Monsoon Season		Non Monsoon Season		Total)			Irrigation	Domestic & Industrial Water Supply	Total			
		Recharge from Rainfall	Recharge From Other Sources	Recharge from Rainfall	Recharge From Other Sources									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Puducherry	6561	1925	575	2337	11398	1140	10258	11838	2392	14230	2732	-	139
2	Karaikal	2090	4047	241	880	7258	729	6529	537	388	924	353	5642	14
3	Mahe	246	0	24	0	270	27	243	0	150	150	154	89	62
4	Yanam	saline												
UT Total (ham)		**8897**	**5972**	**840**	**3217**	**18927**	**1896**	**17031**	**12375**	**2929**	**15304**	**3240**	**5732**	**90**
UT Total (bcm)		**0.089**	**0.060**	**0.008**	**0.032**	**0.189**	**0.019**	**0.170**	**0.124**	**0.029**	**0.153**	**0.032**	**0.057**	**90**

ANNEXURE – III

CATEGORIZATION OF BLOCKS/ MANDALS/ TALUKS IN INDIA (AS ON 31st MARCH 2011)

CATEGORIZATION OF BLOCKS/ MANDALS/ TALUKAS IN INDIA (2010-2011)

Sl. No.	States / Union Territories	Total No. of Assessed Units	Safe		Semi-critical		Critical		Over-exploited		Saline	
			Nos.	%	Nos.	%	Nos.	%	Nos.	%	Nos.	%
	States											
1	Andhra Pradesh	1110	877	79	97	9	15	1	83	7	38	3
2	Arunachal Pradesh	11	11	100	0	0	0	0	0	0	0	0
3	Assam	27	27	100	0	0	0	0	0	0	0	0
4	Bihar	533	522	98	11	2	0	0	0	0	0	0
5	Chattisgarh	146	125	86	18	12	2	1	1	1	0	0
6	Delhi	27	2	7	5	19	2	7	18	67	0	0
7	Goa	20	20	100	0	0	0	0	0	0	0	0
8	Gujarat	223	171	77	13	6	5	2	24	11	10	4
9	Haryana	116	23	20	7	6	15	13	71	61	0	0
10	Himachal Pradesh	8	5	63	0	0	2	25	1	13	0	0
11	Jammu & Kashmir	14	14	100	0	0	0	0	0	0	0	0
12	Jharkhand	210	199	95	5	2	0	0	6	3	0	0
13	Karnataka	270	152	56	34	13	21	8	63	23	0	0
14	Kerala	152	126	83	23	15	2	1	1	1	0	0
15	Madhya Pradesh	313	218	70	67	21	4	1	24	8	0	0
16	Maharashtra	353	325	92	16	5	2	1	10	3	0	0
17	Manipur	8	8	100	0	0	0	0	0	0	0	0
18	Meghalaya	7	7	100	0	0	0	0	0	0	0	0
19	Mizoram	22	22	100	0	0	0	0	0	0	0	0
20	Nagaland	8	8	100	0	0	0	0	0	0	0	0
21	Orissa	314	308	98	0	0	0	0	0	0	6	2
22	Punjab	138	22	16	2	1	4	3	110	80	0	0
23	Rajasthan	243	25	10	20	8	24	10	172	71	2	1
24	Sikkim	4	4	100	0	0	0	0	0	0	0	0
25	Tamil Nadu	1129	437	39	235	21	48	4	374	33	35	3
26	Tripura	39	39	100	0	0	0	0	0	0	0	0
27	Uttar Pradesh	820	559	68	82	10	68	8	111	14	0	0
28	Uttaranchal	18	11	61	5	28	2	11	0	0	0	0
29	West Bengal	271	217	80	53	20	1	0	0	0	0	0
	Total States	**6554**	**4484**	**68**	**693**	**11**	**217**	**3**	**1069**	**16**	**91**	**1**
	Union Territories											
1	Andaman & Nicobar	36	36	100	0	0	0	0	0	0	0	0
2	Chandigarh	1	1	100	0	0	0	0	0	0	0	0
3	Dadra & Nagar Haveli	1	1	100	0	0	0	0	0	0	0	0
4	Daman & Diu	2	0	0	1	50	0	0	1	50	0	0
5	Lakshdweep	9	6	67	3	33	0	0	0	0	0	0
6	Pondicherry	4	2	50	0	0	0	0	1	25	1	25
	Total Uts	**53**	**46**	**87**	**4**	**8**	**0**	**0**	**2**	**4**	**1**	**2**
	Grand Total	**6607**	**4530**	**69**	**697**	**11**	**217**	**3**	**1071**	**16**	**92**	**1**

Note

Blocks- Bihar, Chattisgarh, Haryana, Jharkhand, Kerala, M.P., Manipur, Mizoam, Orissa, Punjab, Rajasthan, Tripura, UP, UttaraKhand, WB
Taluks (Command/Non-Command) -Karnataka
Mandal - Andhra Pradesh
Taluks - Goa, Gujarat, Maharashtra
Districts (Valley) - Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura
Islands - Lakshdweep, Andaman & Nicobar Islands
Firka-Tamil Nadu
Region - Puducherry
UT - Chandigarh, Dadar & Nagar Haveli, Daman & Diu
Tehsil-NCT Delhi

ANNEXURE – IV

STATE-WISE CATEGORIZATION OF BLOCKS/ MANDALS/ TALUKS (AS ON 31st MARCH 2011)

***Please note that the district wise break up of states in which all the assessment units have been categorised as 'Safe' are not included in this annexure.**

CATEGORIZATION OF MANDALS IN ANDHRA PRADESH

Sl. No.	DISTRICT		SEMI-CRITICAL		CRITICAL		OVER EXPLOITED		Saline
1	Adilabad	1	Bhainsa			1	Nirmal		
		2	Chennur						
		3	Dandepally						
		4	Dilwarpur						
		5	Laxmanchanda						
		6	Lokeshwaram						
		7	Luxettipet						
2	Anantapur	1	Beluguppa	1	Roddam	1	Agali		
		2	Bukkapatnam	2	Talupula	2	Amadaguru		
		3	Dharmavaram			3	Amarapuram		
		4	Garladinne			4	Bathalapalli		
		5	Gudibanda			5	Brahmasamudram		
		6	Gummagatta			6	Gandlapenta		
		7	Kanaganapalli			7	Hindupur		
		8	Kudair			8	Kalyandurg		
		9	Narpala			9	Kambadur		
		10	O.D.Cheruvu			10	Kothacheruvu		
		11	Penukonda			11	Kundurpi		
		12	Puttaparthi			12	Lepakshi		
		13	Raptadu			13	Madakasira		
		14	Rayadurg			14	Parigi		
		15	Somandepalli			15	Peddapappur		
		16	Tanakallu			16	Putlur		
						17	Rolla		
						18	Tadimarri		
						19	Tadipatri		
						20	Yadiki		
						21	Yellanur		
3	Chittoor	1	Baireddypalli	1	Gudupalli	1	Nindra		
		2	CGGallu	2	Karvetinagaram	2	Pakala		
		3	Chittoor	3	Palasamudram	3	Penumuru		
		4	Chowdepalli	4	Pulicherla	4	Puthalapattu		
		5	G.D.Nellore	5	Punganur	5	R.C.Puram		
		6	Gangavaram			6	Ramakuppam		
		7	Irala			7	Ramasamudram		
		8	Madanapalli			8	S R Puram		
		9	Nimmanapalli			9	Santhipuram		
		10	Palamaneru			10	Thavanampalli		
		11	Pedda Thippa Samudram			11	Tirupathi®		
		12	Peddapanjani						
		13	Piler						
		14	V.Kota						
		15	Vijayapuram						
		16	Yadamarri						
4	Ease Godavari	1	Gandepalli					1	Allavaram
								2	Ipolavaram
								3	Kajuluru
								4	Karapa
								5	Katrenikona
								6	Mamidikuduru
								7	Sakhinetipalli
								8	Tallarevu
								9	Uppalaguptam
								10	Malkipuram
5	Hyderabad					1	Hyderabad		
6	Kadapa	1	Kalasapadu			1	Pulivendula		
		2	Kamalapuram			2	Vemula		
		3	Pendlimarri						
		4	Pullampeta						
		5	Vallur						
7	Khammam					1	Tirumalalayapelm		
8	Krishna	1	Nuzvid			1	Musunuru	1	Nandiwada
								2	Mandavalli
								3	Kaikaluru
								4	Kalidindi
								5	Kruthivennu
								6	Bantumilli
								7	Mudinepalli
								8	Gudlavalleru
								9	Pedana
								10	Machilipatnam
								11	Guduru
								12	Koduru
								13	Nagayalanka

CATEGORIZATION OF MANDALS IN ANDHRA PRADESH

Sl. No.	DISTRICT		SEMI-CRITICAL		CRITICAL		OVER EXPLOITED		Saline
9	Karimnagar	1	Chandurthy			1	Bheemadevarapally		
		2	Elkathurthy			2	Chigurumamidi		
		3	Siricilla			3	Gangadhara		
		4	Velagatur			4	Husnabad		
						5	Kathalapur		
						6	Keshavapatnam		
						7	Kodimyal		
						8	Mallial		
						9	Medipally		
						10	Mustabad		
						11	Ramadugu		
10	Mehboobnagar	1	Kalwakurthy	1	Midjil				
		2	Keshampeta						
11	Medak	1	Doulthabad	1	Chegunta	1	Chinnakodur		
		2	Jagdevpur			2	Dubbak		
		3	Kowdipally			3	Hathnura		
		4	Kulcharam			4	Kalher		
		5	Ramayampet			5	Kondapak		
		6	Shivampet			6	Mirdoddi		
		7	Tekmal			7	Mulugu		
						8	Nanganur		
						9	Narsapur		
						10	Nyalkal		
						11	Raikode		
						12	Siddipet		
						13	Thoguta		
						14	Wargal		
12	Nalgonda	1	Rajapet	1	Chandur	1	Munugode		
		2	Alair						
		3	Thirumalgiri						
		4	Jajireddi Gudem						
		5	Valigonda						
		6	Nakrekal						
		7	Kethepalle						
		8	Suryapet						
		9	Mothey						
		`10	Kanagal						
13	Nizamabad	1	Armoor	1	Jakranpally	1	Kamareddy		
		2	Balkonda			2	Sadashivanagar		
		3	Bheemgal			3	Velpoor		
		4	Domakonda						
		5	Machareddy						
		6	Makloor						
		7	Morthad						
		8	Nandipet						
14	Prakasam	1	Cumbum			1	Dornala	1	Karamchedu
		2	Komarole			2	Giddaluru		
						3	Markapuram		
						4	Peddaraveedu		
						5	Racherla		
						6	Y.Palem		
15	Ranga Reddy	1	Ibrahimpatnam_Rrd						
		2	Kandukur						
		3	Maheshwaram						
		4	Manchal						
		5	Medchal						
		6	Pargi						
		7	Shabad						
		8	Shamshabad						
		9	Shankarpally						
		10	Yacharam						
16	West Godavari	1	Lingapalem					1	Penumantra
								2	Palakollu
								3	Ganapavaram
								4	Poduru
								5	Palakoderu
								6	Veeravasaram
								7	Nidamarru
								8	Pentapadu
								9	Akiveedu
								10	Undi
								11	Mogalturu
								12	Kalla

CATEGORIZATION OF MANDALS IN ANDHRA PRADESH

Sl. No.	DISTRICT	SEMI-CRITICAL	CRITICAL	OVER EXPLOITED	Saline
16	West Godavari				13 Narasapuram
					14 Bhimavaram
17	Warangal	1 Cherial	1 Lingala Ghanpur	1 Bachannapet	
		2 Devaruppula	2 Mogullapally	2 Chennaraopet	
		3 Dharmasagar	3 Narmetta	3 Duggondi	
		4 Nellikudur	4 Raghunathpally	4 Geesugonda	
		5 Parvatagiri		5 Jangaon	
		6 Stn Ghanpur		6 Kodakandla	
		7 Zaffergadh		7 Maddur_Wgl	
				8 Rayaparthy	
				9 Thorrur	
				10 Wardhannapet	

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
1110	97	15	83	38

CATEGORISATION OF BLOCKS IN BIHAR

Sl.no.	District	Semi-critical	Critical	Over-exploited	Saline
1	Araria				
2	Arwal	1 Kurtha			
3	Aurangabad				
4	Banka				
5	Begusarai	1 Birpur 2 Naokothi			
6	Bhabhua				
7	Bhagalpur				
8	Bhojpur				
9	Buxar				
10	Darbhanga				
11	E.Champaran				
12	Gaya	1 Gaya sadar			
13	Gopalganj	-			
14	Jamui				
15	Jehanabad				
16	Katihar				
17	Khagaria				
18	Kishanganj				
19	Lakhisarai				
20	Madhepura				
21	Madhubani				
22	Munger				
23	Muzaffarpur	1 Mushahari			
24	Nalanda	1 Nagarnausa 2 Rajgir			
25	Nawada	1 Meskaur			
26	Patna	1 Sampatchak 2 Masaurhi			
27	Purnea				
28	Rohtas				
29	Saharsa				
30	Samastipur	1 Tajpur			
31	Saran				
32	Sheikhpura				
33	Sheohar				
34	Sitamarhi				
35	Siwan				
36	Supaul				
37	Vaishali				
38	West Champaran				

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
533	**11**	**0**	**0**	**Nil**

CATEGORIZATION OF BLOCKS IN CHHATTISGARH

Sl. No.	District	Semi-critical	Critical	Over-exploited	Saline
1	Bilaspur	1 Belha			
		2 Takhatpur			
2	Dhamtari	1 Kurud	1 Dhamtari		
		2 Nagri			
3	Durg	1 Balod			
		2 Bemetara			
		3 Dhamdha		1. Gurur	
		4 Durg			
		5 Patan			
		6 Saja			
4	Janjgir Champa	1 Malkharoda			
5	Kawardha	1 Kawardha			
		2 Pandariya			
6	Raigarh	1 Pussore	1 Baramkela		
7	Raipur	2 Dharsiwa			
		3 Fingeshwar			
8	Rajnandgaon	1 Dongargaon			
		2 Rajnandgaon			

ABSTRACT

No of Assessed Blocks	Semi Critical	Critical	Over Exploited	Saline
146	**18**	**2**	**1**	**Nil**

CATEGORIZATION OF TEHSILS IN DELHI

Sl. No.	District	Semi-critical	Critical	Over-exploited	Saline
1	Central			Karol Bagh	
				Pahar Ganj	
2	East	1 Gandhi Nagar		1 Preet Vihar	
				2 Vivek Vihar	
3	New Delhi		1 Chanakya Puri		
		1 Connaught Place	2 Parliament Street		
4	North			Kotwali	
				Sadar Bazar	
5	North East	1 Seelam Pur		Seema Puri	
		-		Shahdara	
6	North West	1 Narela		Model Town	
				Saraswati Vihar	
7	South			Defence Colony	
				Hauz Khas	
				Kalkaji	
8	South West			Delhi Cantonment	
				Najafgarh	
				Vasant Vihar	
9	West	1 Punjabi Bagh		Patel Nagar	
				Rajouri Garden	

ABSTRACT

No. of Assessed Tehsils	Semi Critical	Critical	Over-exploited	Saline
27	*5*	*2*	*18*	*Nil*

CATEGORISATION OF TALUKS IN GUJARAT

Sl. NO.	District	Semi Critical	Critical	Over-Exploited	Saline
1	Ahmedabad	1 Detroj Rampur 2 Viramgam	1 Dholka	1 City - Daskroi	1 Dhandhuka
2	Amreli	1 Khambha			
				1 Deesa	1 Wav
				2 Deodar	2 Bhabhar
				3 Dhanera	
3	Banaskantha		1 Palnapur	4 Kankrej	
				5 Tharad	
				6 Vadgam	
				1 Dehgam	
				2 Gandhinagar	
4	Gandhinagar			3 Kalol	
				4 Mansa	
			1 Bhuj	1 Bhachau	1 Gandhidham
5	Kachchh	1 Nakhatrana	2 Anjar	2 Mandvi	
		1 Kapadvanj			
6	Kheda	2 Kathlal			
		3 Mahemdabad			
			1 Vadnagar	1 Becharaji	
				2 Kadi	
				3 Kheralu	
7	Mahesana			4 Mahesana	
				5 Satlasan	
				6 Visanagar	
				7 Vijapur	
				8 Unjha	
				1 Chanasma	1 Harij
8	Patan			2 Patan	2 Sami
				3 Sidhpur	3 Rantanpur
					4 Santhalpur
9	Pobandar	1 Porbandar			
10	Rajkot				1 Maliya
		1 Prantij			
11	Sabarkantha	2 Talod 3 Idar			
		4 Vadali			
12	Surendranagar				1 Lakhtar
13	Vadodara	1 Vadodara			

ABSTRACT

No. of Assessed Units	Semi Critical	Critical	Over-exploited	Saline
223	13	5	24	10

CATEGORISATION OF BLOCKS IN HARYANA

Sl. No.	District	Semi critical		Critical		Over exploited		Saline
1	Ambala			1	Shazadpur	1	Barara	
						2	Naraingarh	
						3	Saha	
2	Panchkula			**1**	Pinjore			
				2	Raipur Rani			
				3	Barwala			
3	Fatehabad			1	Bhattu Kalan	1	Fatehabad	
						2	Ratia	
						3	Tohana	
						4	Jakhal	
						5	Bhuna	
4	Bhiwani	1	Dadri-II			1	Badra	
						2	Dadri-I	
						3	Kairu	
						4	Loharu	
						5	Siwani	
5	Hissar	1	Uklana			1	Narnaund	
							Hansi-II	
6	Gurgaon					1	Farukhnagar	
						2	Gurgaon	
						3	Pataudi	
						4	Sohna	
7	Mewat	1	Punhana	1	Ferozepur Zhirka		Tauru	
				2	Nuh			
8	Faridabad			1	Ballabhgarh			
				2	Faridabad			
9	Palwal			1	Hathin	1	Hassanpur	
				2	Hodel	2	Palwal	
10	Jhajjar	1	Bhadurgarh					
11	Jind	1	Pilukhera	1	Uchana	1	Alewa	
						2	Narwana	
						3	Safidon	
						4	Jind	
12	Kaithal					1	Gulha	
						2	Kaithal	
						3	Kalyat	
						4	Pundri	
						5	Rajaund	
13	Karnal					1	Assandh	
						2	Gharaunda	
						3	Indri	
						4	Karnal	
						5	Nilokheri	
						6	Nissang	

CATEGORISATION OF BLOCKS IN HARYANA

Sl. No.	District	Semi critical		Critical		Over exploited		Saline
14	Kurukshetra					1	Babain	
						2	Ladwa	
						3	Pehowa	
						4	Shahbad	
						5	Thaneswar	
15	Mahendragarh					1	Ateli	
						2	Kanina	
						3	Mahendragarh	
						4	Nangal Chaudary	
						5	Narnaul	
16	Panipat					1	Bapoli	
						2	Israna	
						3	Madlauda	
						4	Panipat	
						5	Samalkha	
17	Rewari			1	Jatusana	1	Khol	
						2	Nahar	
						3	Rewari	
						4	Bawal	
18	Rohtak	1	Lakhan Majra					
19	Sirsa					1	Ellenabad	
						2	Rania	
						3	Sirsa	
						4	Ns Chopta	
						5	Baraguda	
						6	Odhan	
						7	Dabwali	
20	Sonepat	1	Kharkhoda	1	Gohana	1	Ganaur	
						2	Rai	
						3	Sonepat	
21	Yamunanagar			1	Sadhuara	4	Chachrauli	
						5	Jagadhri	
						6	Mustafabad	
						7	Radour	
						8	Bilaspur	

ABSTRACT

No. of block Assessed	Semi critical	Critical	Over-exploted	Saline
116	**7**	**15**	**71**	**Nil**

CATEGORIZATION OF VALLEY IN HIMACHAL PRADESH

Sl. No.	DISTRICT	Semi-critical	Critical	Over-exploited	Saline
1	Sirmaur			1 Kala Amb Valley	
2	Una		1 Una Valley		
3	Una		2 Hum Valley		

ABSTRACT

No. of Assessed VALLEY	Semi Critical	Critical	Over-exploited	Saline
8	0	2	1	Nil

CATEGORIZATION OF BLOCKS IN JHARKHAND

Sl. No.	District	Semi-critical		Critical	Over-exploited		Saline
1	Bokaro	1	Chas				
2	Chatra						
3	Deoghar						
4	Dhanbad				1	Jharia	
					2	Dhanbad	
5	Dumka						
6	E-Singhbhum				1	Jamshedpur Sadar	
7	Garhwa						
8	Giridih						
9	Godda				1	Godda	
10	Gumla						
11	Hazaribagh						
12	Jamtara						
13	Khunti						
14	Koderma						
15	Latehar						
16	Lohardaga	1	Lohardaga				
17	Pakur						
18	Palamu						
19	Ramgarh				1	Ramgarh	
20	Ranchi	1	Ratu		1	Kanke	
		2	Ormanjhi				
21	Sahebganj						
22	Saraikela	1	Gumhariya				
23	Simdega						
24	W-Singhbhum						

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
210	**5**	**0**	**6**	**Nil**

CATEGORIZATION OF TALUKAS IN KARNATAKA

Sl No	Districts		Semi-critical		Critical		Over-Exploited	Saline
1	Bagalkot	1	Bilgi (NC)			1	Badami (C + NC)	
		2	Jamkhandi (NC)			2	Bagalkote (C + NC)	
						3	Hungund (NC)	
						4	Mudhol (NC)	
2	Bangalore Rural					1	Devenhalli (NC)	
						2	Dodaballapur (NC)	
						3	Hoskote (NC)	
						4	Nelamangala (NC)	
3	Bangalore Urban					1	Anekal (NC)	
						2	Bangalore East (NC)	
						3	Bangalore North (NC)	
						4	Bangalore South (NC)	
4	Belgaum	1	Athani (C)	1	Bailahongal (C)	1	Athani (NC)	
		2	Bailahongal (NC)			2	Chikodi (NC)	
		3	Saundatti (C)			3	Gokak (NC)	
						4	Hukkeri (NC)	
						5	Ramdurg (C + NC)	
						6	Raybag (NC)	
						7	Saundatti (NC)	
5	Bellary	1	Kudligi (NC)	1	Bellary (NC)	1	H.B.Halli (NC)	
				2	Hadagalli (NC)			
6	Bidar	1	Bhalki (NC)					
7	Bijapur	1	Basavana Bagevadi (C + NC)		Indi (NC)			
		2	Bijapur (NC)					
		3	Indi (C)					
		4	Muddebihal (NC)					
		5	Sindgi (NC)					
8	Chamrajnagara	1	Kollegal (NC)	1	Chamrajnagara (NC)	1	Gundlupet (NC)	
		2	Yelandur (C + NC)					
9	Chikballapur			1	Bagepalli (NC)	1	Chikballapur (NC)	
						2	Chintamani (NC)	
						3	Gauribidalur (NC)	
						4	Gudibanda (NC)	
						5	Sidlaghata (NC)	
10	Chikmagalur	1	Tarikere (NC)			1	Kadur (NC)	
11	Chitradurga			1	Hosadurga (NC)	1	Challakere (NC)	
						2	Chitradurga (NC)	
						3	Hiriyur (NC)	
						4	Holalkere (NC)	
12	Dakshin Kannada			1	Puttur (NC)			
13	Davangere	1	Channagiri (C)	1	Harihar (NC)	1	Channagiri (NC)	
		2	Honnalli (NC)			2	Davangere (NC)	
						3	Harpanahalli (NC)	
						4	Jagalur (NC)	
14	Dharwad	1	Navalgund (NC)					
15	Gadag	1	Gadag (C)			1	Gadag (NC)	
		2	Mundargi (NC)			2	Ron (NC)	
		3	Nargund (C)					
		4	Ron (C)					
16	Hassan			1	Hassan (NC)	1	Arsikere (NC)	
						2	C R Patna (NC)	
						3	Holenarsipur (NC)	
17	Haveri	1	Haveri (NC)	1	Byadgi (NC)			
		2	Hirekerur (NC)	2	Ranibennur (NC)			
18	Kolar					1	Bangarpet (NC)	
						2	Kolar (NC)	
						3	Malur (NC)	
						4	Mulbagal (NC)	
						5	Srinivaspur (NC)	
19	Koppal			1	Yelbarga (NC)	1	Gangawati (NC)	
						2	Koppal (NC)	
20	Mandya	1	Nagamangala (NC)	1	Maddur (NC)	1	Krishnarajpet (NC)	
						2	Malavalli (NC)	
						3	Mandya (NC)	
						4	Pandavapura (NC)	
21	Mysore	1	Mysore (NC)	1	Nanjangud (NC)	1	Krishnrajanagara (NC)	
				2	Tirumakudal narsipur (NC)			
22	Raichur	1	Lingsugur (NC)					
		2	Raichur (NC)					
23	Ramanagaram			1	Channapatana (NC)	1	Kanakapura (NC)	
				2	Magadi (NC)	2	Ranmanagaram (NC)	
24	Shimoga	1	Bhadravati (NC)					

CATEGORIZATION OF TALUKAS IN KARNATAKA

Sl No	Districts	Semi-critical	Critical	Over-Exploited	Saline
25	Tumkur	1 Pavagada (NC)	1 Gubbi (NC)	1 Chicknayakanhalli (NC)	
			2 Kunigal (NC)	2 Koratagere (NC)	
			3 Sira (NC)	3 Madhugiri (NC)	
				4 Tiptur (NC)	
				5 Tumkur (NC)	
				6 Turuvekere (NC)	
26	Yadgir	1 Shahpur (NC)			
		2 Yadgir (NC)			

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
270	34	21	63	Nil

176 taluks have been divided into Command and Non-command, thus adding up to 270 assessment units. Out of 270 assessment units, there are 5 taluks where both Command and Non-command units are falling in the same category and are shown as C+NC. Hence the whole taluk is categorized as OE or Semicritical without separate mention in the table. Even though 63 over exploited and 34 Semi critical units are present in the state, only 60 and 32 units are

CATEGORIZATION OF BLOCKS IN KERALA

Sl. No.	District	Semi-critical		Critical		Over-exploited		Saline
1	Alappuzha							
2	Ernakulam	1	Parakkadavu					
		2	Paravoor					
		3	Vypin					
3	Idukki	1	Kattappana					
		2	Nedumkandam					
4	Kannur	1	Kalyasseri					
		2	Panur					
5	Kasargod	1	Kanhangad	1	Kasargod			
		2	Karadka					
		3	Manjeswar					
6	Kollam	1	Chittumala					
7	Kottayam							
8	Kozhikode	1	Balussery					
		2	Kunnamangalam					
9	Malappuram	1	Kondotty					
		2	Tanur					
		3	Tirurangadi					
10	Palakkad	1	Pattambi	1	Malampuzha	1	Chittoor	
		2	Thrithala					
11	Pathanamthitta							
12	Thiruvananthapuram	1	Athiyannur					
		2	Nedumangad					
		4	Parassala					
13	Thrissur	1	Mathilakam					
		2	Thalikkulam					
14	Waynad							

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
152	**23**	**2**	**1**	**Nil**

CATEGORIZATION OF BLOCKS IN MADHYA PRADESH

Sl. No.	District	Semi-critical		Critical		Over-exploited		Saline
1	Barwani	1	Rajpur			1	Pansemal	
		2	Thikri					
2	Betul	1	Betul					
3	Bhopal	1	Berasia					
		2	Phanda					
4	Buhanpur	1	Burhanpur					
5	Chhatarpur	1	Badamalhara					
		2	Buxwaha					
		3	Chhatarpur					
		4	Nowgaon					
		5	Rajnagar					
6	Chhindwara	1	Chhindwara					
7	Damoh	1	Hatta					
		2	Pathariya					
8	Datia	1	Datia					
9	Dewas	1	Khategaon			1	Dewas	
						2	Sonkutch	
10	Dhar	1	Manawar			1	Badnawar	
		2	Tirla			2	Dhar	
						3	Dharampuri	
						4	Nalcha	
11	Guna	1	Guna					
12	Gwalior	1	Morar					
13	Indore	1	Mhow			1	Depalpur	
						2	Indore	
						3	Sanwer	
14	Jabalpur	1	Shahapura					
15	Khargone	1	Barwaha					
		2	Khargone					
		3	Mahashwar					
16	Khandwa	1	Chhegaon Makhan					
17	Mandsaur	1	Bhanpura			1	Mandsaur	
		2	Malahargarh			2	Sitamau	
18	Morena	1	Kailaras					
		2	Morena					
		3	Porsa					
		4	Sabalgarh					
19	Neemuch	1	Jawad					
		2	Neemuch					
20	Narsinghpur	1	ChanwarPatha	1	Narsinghpur			
		2	Gotegaon					
		3	Kareli					
21	Panna	1	Ajaygarh					
22	Rajgarh	1	Biora					
		2	Khilchipur					
		3	Narsinghgarh					
		4	Sarangpur					
23	Ratlam	1	Sailana			1	Alote	
						2	Jaora	
						3	Piploda	
						4	Ratlam	
24	Rewa	1	Gangeo					
		2	Sirmour					
25	Satna	1	Maihar	1	Amarpatan	1	Rampur Baghalan	
		2	Nagod	2	Sohawal			
26	Sagar	1	Banda					
		2	Sagar					
27	Sehore	1	Astha					
		2	Sehore					
28	Shajapur	1	Barod	1	Agar	1	Mohan Barodia	
		2	Kalapipal			2	Nalkhera	
		3	Shajapur			3	Shujalpur	
						4	Susner	

CATEGORIZATION OF BLOCKS IN MADHYA PRADESH

Sl. No.	District	Semi-critical	Critical	Over-exploited	Saline
29	Shivpuri	1 Badarwas			
		2 Karera			
		3 Khanniyadhana			
		4 Narwar			
		5 Pichor			
30	Sidhi	1 Sidhi			
31	Tikamgarh	1 Baldeogarh			
		2 Jatara			
		3 Niwari			
		4 Palera			
		5 Tikamgarh			
32	Ujjain	1 Khachrod		1 Badnagar	
		2 Mahidpur		2 Ghatia	
				3 Ujjain	

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
313	**67**	**4**	**24**	**Nil**

CATEGORIZTION OF TALUKAS IN MAHARASHTRA

Sr.No.	District	Semi-Critical		Critical		Over-exploited		Saline
1	Ahmednagar	1	Kopargaon			1	Rahata	
		2	Newasa					
		3	Sangamner					
		4	Shrirampur					
2	Amravati	1	Achalpur	1	Chandur Bazar	1	Daryapur	
						2	Morshi	
						3	Warud	
3	Buldhana	1	Motala			1	Jalgaon (Jamod)	
4	Jalgaon	1	Bodwad			1	Raver	
		2	Chopda			2	Yawal	
		3	Parola					
		4	Muktainagar					
5	Latur	1	Latur					
6	Nashik	1	Chandwad			1	Deola	
		2	Sinnar					
		3	Niphad					
7	Pune	1	Baramati					
		2	Purandhar					
8	Sangli			1	Kavathe Mahankal	1	Miraj	
9	Solapur					1	Malshiras	

ABSTRACT

No. of Assessed Tehsils	Semi Critical	Critical	Over-exploited	Saline
353	**16**	**2**	**10**	**Nill**

CATEGORIZTION OF BLOCK IN ODISHA

Sr.No.	District	Semi-Critical	Critical	Over-exploited		Saline
1	Bhadrak				1	Chandbali
2	Jagatsinghpur				2	Ersama
3	Kendrapara				1	Mahakalpara
					2	Marshaghai
					3	Rajkanika
					4	Rajnagar

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
314	**Nil**	**Nil**	**Nil**	**6**

CATEGORIZATION OF BLOCKS IN PUNJAB

Sl.No.	District:	Semi-Critical	Critical	Over-Exploited	Saline
1	Amritsar			1 Ajnala	
				2 Chogawan	
				3 Harsha China	
				4 Jandiala	
				5 Majitha	
				6 Rayya	
				7 Tarsika	
				8 Verka	
2	Barnala			1 Barnala	
				2 Mahal Kalan	
				3 Sehna	
3	Bathinda		1 Nathana	1 Phul	
			2 Rampura	2 Maur	
				3 Bathinda	
4	Faridkot			1 Faridkot	
				2 Kot Kapura	
5	Fatehgarh Sahib			1 Khera	
				2 Sirhind	
				3 Amloh	
				4 Bassi Pathana	
				5 Khamanon	
6	Ferozepur			1 Fazilka	
				2 Ferozpur	
				3 Ghall Khurd	
				4 Guru Har Sahai	
				5 Jalalabad	
				6 Makhu	
				7 Mamdot	
				8 Zira	
7	Gurdaspur	1 Narot Jaimal Singh	1 Gurdaspur	1 Batala	
				2 Fatehgarh Churian	
				3 Kahnuwan	
				4 Kalanaur	
				5 Qadian	
				6 Sri Hargobindpur	
				7 Dera Baba Nanak	
				8 Dhariwal	
9	Hoshiarpur	1 Talwara	1 Hoshiarpur-1	1 Dasuya	
				2 Garhsahnkar	
				3 Hazipur	
				4 Tanda	
10	Jalandhar			1 Adampur	
				2 Bhogpur	
				3 Rurka Kalan	
				4 Jalandhar-East	
				5 Jalandhar-West	
				6 Lohian	
				7 Nakodar	
				8 Nur Mahal	
				9 Phillaur	
				10 Shahkot	
11	Kapurthala			1 Nadala	
				2 Dhilwan	
				3 Kapurthala	
				4 Phagwara	
				5 Sultanpur Lodhi	
12	Ludhiana			1 Dehlon	
				2 Doraha	
				3 Jagraon	
				4 Khanna	
				5 Ludhiana	
				6 Mangat	
				7 Pakhowal	
				8 Raikot	
				9 Samrala	
				10 Sidhwan Bet	
				11 Sudhar	
13	Mansa			1 Bhikhi	
				2 Budhlada	
				3 Jhunir	
				4 Mansa	
				5 Sardulgarh	

CATEGORIZATION OF BLOCKS IN PUNJAB

Sl.No.	District:	Semi-Critical	Critical		Over-Exploited	Saline
14	Moga			1	Bagha Purana	
				2	Dharamkot (Kot Isa Khan)	
				3	Moga I	
				4	Moga Ii	
				5	Nihal Singh Wala	
15	Mukatsar			-		
16	Nawan Shahr			1	Aur	
				2	Nawan Shahr	
				3	Banga	
17	Patiala			1	Bhuner Heri	
				2	Ghanaur	
				3	Nabha	
				4	Patiala	
				5	Rajpura	
				6	Samana	
				7	Sanaur	
				8	Patran	
19	Ropar			1	Chamkaur Sahib	
				2	Morinda	
				3	Nurpur Bedi	
19	Mohali			1	Dera Bassi	
				2	Kharar	
20	Sangrur			1	Ahmedgarh	
				2	Andana	
				3	Bhiwanigarh	
				4	Dhuri	
				5	Lehraghaga	
				6	Maler Kotla	
				7	Sangrur	
				8	Sherpur	
				9	Sunam	
20	Tarn Taran			1	Bhikhiwind	
				2	Chola Sahib	
				3	Gandiwind	
				4	Khadur Sahib	
				5	Naushehra Panuan	
				6	Patti	
				7	Tarn Taran	
				8	Valtoha	

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
138	**2**	**4**	**110**	**Nil**

CATEGORISATION OF BLOCKS IN RAJASTHAN

Sl. No.	District	Semi-Critical	Critical	Over-Exploited	Saline
1	Ajmer	-	-	1.Arain	-
		-	-	2. Bhinai	-
		-	-	3. Jawaja	-
		-	-	4. Pisangan	-
		-	-	5. Silora	-
		-	-	6. Srinagar	-
		-	-	7 Kekri	-
		-	-	8 Masuda	-
2	Alwar	-	-	1.Behror	-
		-	-	2. Bansur	-
		-	-	3. Kathumar	-
		-	-	4. Kishangarh	-
		-	-	5. Kotkasim	-
		-	-	6. Laxmangarh	-
		-	-	7. Mandawar	-
		-	-	8. Neemrana	-
		-	-	9. Rajgarh	-
		-	-	10. Ramgarh	-
		-	-	11. Reni	-
		-	-	12. Tijara	-
		-	-	13. Umrain	-
		-	-	14 Thana ghazi	-
3	Banswara	-	-	-	-
		-	-	-	-
		-	-	-	-
		1. Kushalgarh	-	-	-
		-	-	-	-
		-	-	-	-
		-	-	-	-
4	Baran	1. Kishanganj	-	1. Atru	-
		-	-	2. Baran	-
		-	-	3 Anta	-
		-	-	4 Chhipabarod	-
		-	-	5 Chhabra	-
5	Barmer	-	1.Sindhri	1. Baetu	-
		-	2.Chohtan	2. Balotra	-
		-		3. Dhorimanna	-
		-		4. Siwana	-
		-		5. Sheo	-
6	Bharatpur	-	1.Bayana	1. Nadbai	-
		-	2.Deeg	2. Sewar	-
		-	3.Kama	3. Weir	-
		-	4.Nagar	4. Roopwas	-
		-	-	5. Kumher	-
		-	-	-	-
7	Bhilwara	-	-	1. Asind	-
		-	-	2. Banera	-
		-	-	3. Hurda	-
		-	-	4. Jahajpur	-
		-	-	5. Mandal	-
		-	-	6. Mandalgarh	-
		-	-	7. Raipur	-
		-	-	8. Suwana	-
		-		9. Kotri	-
		-	-	10. Sahada	-
		-	-	11. Shahpura	-
8	Bikaner	1. Kolayat	-	1. Bikaner	-
		-	-	2. Nokha	Khajuwala
		-	-	3 Dungargarh	-
9	Bundi	1. K.Patan	-	1. Hindoli	-
		-	-	2.Nainwa	-
		-	-	3.Talera	-
10	Chittorgarh	-	-	1. Begun	-
		-	-	2. Bhadesar	-
		-	-	3. Bhopalsagar	-
		-	-	4. Chittorgarh	-
		-	-	5. Dungla	-
		-	-	6. Gangrar	-
		-	-	7 Kapasan	-
		-	-	8. Nimbahera	-
		-	-	9 Rashmi	-
		-	-	10.Bari Sadri	-
		-	-	11 .Bhainsrorgarh	-

CATEGORISATION OF BLOCKS IN RAJASTHAN

Sl. No.	District	Semi-Critical	Critical	Over-Exploited	Saline
11	Churu	1.Churu	-	1.Rajgarh	-
		2.Ratangarh	-	2. Sujangarh	-
		-	-	-	1 Taranagar
12	Dausa	-	-	1. Bandikui	-
12	Dausa	-	-	2. Dausa	-
		-	-	3. Lalsot	-
		-	-	4. Mahua	-
		-	-	5. Sikrai	-
13	Dholpur	-	1. Bari	1.Dholpu	-
		-	-	2. Rajakhera	-
		-	-	3.Baseri	-
		-	-	-	-
14	Dungarpur	1. Bichhiwara	-	-	-
		2. Dungarpur	-	-	-
		3.Sagwara	-	-	-
		4.Simalwara	-	-	-
15	Ganganagar	-	-	-	-
		-	-	-	-
		-	-	-	-
		-	-	-	-
		-	-	-	-
		-	-	-	-
		-	-	-	-
			-	-	-
		-	-	-	-
16	Hanumangarh	-	-	-	-
		-	-	-	-
		-	-	-	-
17	Jaipur	1.Phagi	-	1. Amer	-
		-	-	2. Bairath	-
		-	-	3. Bassi	-
		-	-	4. Chaksu	-
		-	-	5. Govindgarh	-
		-	-	6. JamwaRamgarh	-
		-	-	7.Jhotwara	-
		-	-	8.Kotputli	-
		-	-	9.Sambher	-
		-	-	10.Sanganer	-
		-	-	11Shahpura	-
		-	-	12.Dudu	-
18	Jaisalmer	-	1. Sam	1. Jaisalmer	-
		-	-	2. Sankra	-
19	Jalore	-	-	1.Ahore	-
		-	-	2.Bhinmal	-
		-	-	3.Jalore	-
		-	-	4. Jaswantpura	-
		-	-	5. Raniwara	-
		-	-	6 Chitalwana	-
		-	-	7. Sanchore	-
		-	-	8. Sayla	-
20	Jhalawar	-	Khanpur/94.17	1. Manohar Thana	-
		-	-	2. Pirawa	-
		-	-	3.Bakani	-
		-	-	4.Dag	-
		-	-	5.J.Patan	-
21	Jhunjhunu	-	-	1.Buhana	-
		-	-	2.Chirawa	-
		-	-	3.Jhunjhunu	-
		-	-	4. Khetri	-
		-	-	5.Nawalgarh	-
		-	-	6.Surajgarh	-
		-	-	7.Udaipurwati	-
		-	-	8. Alsisar	-
22	Jodhpur	1. Luni	-	1.Balesar	-
		-	-	2.Bhopalgarh	-
		-	-	3..Bilara	-
		-	-	4. Mandore	-
		-	-	5. Osian	-
		-	-	6.Baori	-
		-	-	7.Shergarh	-
		-	-	8.Phalodi	-
23	Karauli	-	1. Nadauti	1.Hindaun	-
		-	2.Karauli	2. Sapotra	-
		-	-	3.Todabhim	-
24	Kota	1.Itawa	-		-

CATEGORISATION OF BLOCKS IN RAJASTHAN

Sl. No.	District	Semi-Critical	Critical	Over-Exploited	Saline
		2.Ladpura	-	1. Khairabad	-
		3.Sultanpur	-		-
		-	-	2. Sangod	-
25	Nagaur	-	1. Nagaur	1. Degana	-
		-	2.Ladnu	2. Didwana	-
		-	-	3. Kuchaman	-
		-	-	4. Merta	-
		-	-	5. Mundwa	-
		-	-	6.Parbatsar	-
		-	-	7. Riyan	-
		-	-	8.Makrana	-
		-	-	9.Jayal	-
26	Pali	1.Pali	1.Rohat	1. Jaitaran	-
		-	2.Sumerpur	2. Marwar Jn	-
		-	-	3. Rani	-
		-	-	4. Sojat	-
		-	-	5.Raipur	-
		-	-	6.Bali	-
		-	-	7.Desuri	-
		-	1.Dharyawad	1.Pratapgarh	-
		-	-	2. Chhoti Sadri	-
27	Pratapgarh	-	-		-
		-	-		-
		-	-	3.Arnod	-
28	Rajsamand	-	-	1. Amet	-
		-	-	2. Bhim	-
		-	-	3. Deogarh	-
		-	-	4. Khamnor	-
		-	-	5. Kumbhalgarh	-
		-	-	6.Railmagra	-
		-	-	7.Rajsamand	-
29	SawaiMadhopur	-	-	1. Gangapur	-
		-	-	2. SawaiMadhopur	-
		-	-	3.Bamanwas	-
		-	-	4.Khandar	-
		-	-	5.Bonli	-
30	Sikar	1. Fatehpur	-	1.Danta Ramgarh	-
		-	-	2.Dhod	-
		-	-	3. Khandella	-
		-	-	4. Lachhmangarh	-
		-	-	5.Neem Ka Thana	-
		-	-	6. Piprali	-
		-	-	7.Sri Madhopur	-
31	Sirohi	-	1.Abu Road	1. Reodar	-
		-	2.Pindwara	2. Sheoganj	-
		-	-	3. Sirohi	-
32	Tonk	1.Todaraisingh	1.Deoli	1.Malpura	-
		2.Tonk	-	-	-
		-	-	2.Newai	-
		-	-	3.Uniara	-
		-	-	-	-
33	Udaipur	1.Kotra	1.Lasadiya	1. Badgaon	-
		-	2.Jhadol	2. Bhinder	-
		-	3.Kherwara	3. Girwa	-
		-	4.Salumber	4.Gogunda	-
		-	5.Sarada	5. Mavli	-

ABSTRACT

No. of Assessed Blocks	Semi critical	Critical	Over Exploited	Saline
243	**20**	**24**	**172**	**2**

CATEGORISATION OF BLOCKS IN TAMIL NADU

Sl.No	District	Semi Critical	Critical	Over Exploited	Saline
1	Ariyalur	1 Sendurai		1 Suthamalli	
2	Chennai			1 Egmore - Nungambakkam--I	
				2 Egmore - Nungambakkam--Ii	
				3 Egmore - Nungambakkam--Iii	
				4 Egmore - Nungambakkam-Iv	
				5 Kottai - Thondiarpet-I	
				6 Kottai - Thondiarpet-Ii	
				7 Kottai - Thondiarpet-Iii	
				8 Kottai - Thondiarpet-Iv	
				9 Mambalam - Guindy-I	
				10 Mambalam - Guindy-Ii	
				11 Mambalam - Guindy-Iii	
				12 Mambalam - Guindy-Iv	
				13 Mylapore - Tiruvallikeni--I	
				14 Mylapore - Tiruvallikeni--Ii	
				15 Mylapore - Tiruvallikeni--Iii	
				16 Mylapore - Tiruvallikeni--Iv	
				17 Purasawalkam - Perambur-I	
				18 Purasawalkam - Perambur-Ii	
				19 Purasawalkam - Perambur-Iii	
				20 Purasawalkam - Perambur-Iv	
3	Coimbatore	1 Alandurai	1 Ottakkal Mandabam	1 Annur(N)	
		2 Annur(S)		2 Anupparpalayam	
		3 Karamadai		3 Coimbatore South	
		4 Kottur		4 Ganapathi	
		5 Madukkarai		5 Karumathampatti	
		6 Marchinaickenpalayam		6 Kinathukatavu	
		7 Mettupalayam		7 Kolarpatti	
		8 Saravanampatti		8 Kovilpalayam	
		9 Sarkar Samakulam		9 Perianaickenpalayam	
				10 Perianegamam	
				11 Perur	
				12 Pollachi(N)	
				13 Pollachi(S)	
				14 Ramapattinam	
				15 Selakkarichal	
				16 Singanallur	
				17 Sulur	
				18 Thondamuthur	
				19 Thudialur	
				20 Vadachittur	
				21 Varapatti	
4	Cuddalore	1 Panruti	1 Manjakkuppam	1 Kammapuram(E)	
		2 Sethiyathope	2 Nellikuppam	2 Kammapuram(W)	
		3 Thozhudur	3 Sirupakkam	3 Pennadam	
		4 Tittagudi (E)		4 Retty Chavadi	
		5 Veppur		5 Thiruvanthipuram	
		6 Virudhachalam (N)		6 Umangalam	
				7 Virudhachalam (S)	
5	Dharmapuri	1 Dharmapuri		1 Bommidi	
		2 Harur		2 Indur	
		3 Krishnapuram		3 Kadathur	
		4 Morappur		4 Kambainallur	
		5 Nallampalli		5 Karimangalam	
		6 Pappireddipatty		6 Marandahalli	
		7 Sunjalnatham		7 Palacode	
		8 Theerthamalai		8 Palayam	
				9 Papparapatty	
				10 Pennagaram	
				11 Perumbalai	
				12 Pulikarai	
				13 Thenkaraikottai	
				14 Vellichandai	
6	Dindigul	1 Athoor	1 Oruthattu	1 Ayyampalayam	
		2 Ayakudi	2 Pillaiyarnatham	2 Batlagundu	
		3 Ayyalur		3 Chinnakkampatti	
		4 Dharmathupatti		4 Chinnalpatti	
		5 Dindigul South		5 Devathur	
		6 Dindigul North		6 Eriodu	
		7 Kambiliampatti		7 Kallimanthayam	
		8 Korikadavu		8 Kottanatham	
		9 Natham		9 Kovilur	

CATEGORISATION OF BLOCKS IN TAMIL NADU					
Sl.No	**District**	**Semi Critical**	**Critical**	**Over Exploited**	**Saline**
6	Dindigul	10 Pappampatti		10 Nilakottai	
		11 Reddiapatti		11 Oddanchathram	
		12 Senthurai		12 Palakkanoothu	
				13 Palayam	
				14 Puliyurnatham	
				15 Reddiarchatram	
				16 Sanarpatti	
				17 Silvathur	
				18 Thoppampatti	
				19 Vadamadurai	
				20 Vedasandur	
				21 Viruveedu	
7	Erode	1 Ammapettai	1 Athani	1 Bhavanisagar	
		2 Anthiyur		2 Chennimalai	
		3 Arachalur		3 Elathur	
		4 Arasur		4 Erode East	
		5 Bhavani		5 Erode North	
		6 Erode west		6 Kodumudi	
		7 Kanjikoil		7 Modakurichi	
		8 Kasipalayam		8 Nambiyur	
		9 Kavandapadi		9 Perundurai	
		10 Kilampadi		10 Punjaipuliampatti	
		11 Kurichi		11 Vellode	
		12 Kuthiyalathur			
		13 Siruvalur			
		14 Sivagiri			
		15 Thalavadi			
		16 Thingalur			
		17 Sathyamangalam			
		18 Poondurai			
8	Kancheepuram	1 Acchirupakkam	1 Chittiambakkam	1 Govindhavadi	
		2 Arumpuliyur	2 Jameenendathur	2 L.Endathur	
		3 Chengalpattu	3 Pallur	3 Orathi	
		4 Cheyyur	4 Thirukazhukundram	4 Sirukaveripakkam	
		5 Chithamur	5 Thirupulivanam	5 Thiruppu Kuzhi	
		6 Guduvancheri		6 Walajabad	
		7 Kaliyampoondi			
		8 Kattankulathur			
		9 Kunnavakkam			
		10 Mamallapuram			
		11 Mangadu			
		12 Nerumbur			
		13 Onampakkam			
		14 Ponvilayanthakalathur			
		15 Uthiramerur			
9	Kanyakumari				
10	Karur	1 Chinthalavadi	1 Kattalai	1 K.Paramathy	
		2 Karur		2 Kadavur	
		3 Panjapatti		3 Mailampatti	
		4 Thalapatti		4 Pallapatti	
		5 Thogaimalai		5 Pugalur	
				6 Thennilai	
				7 Thoranakalpatti	
				8 Vangal	
				9 Velliyanai	
11	Krishnagiri	1 Bagalur		1 Alapatti	
		2 Barur		2 Bargur	
		3 Berigai		3 Guruparapalli	
		4 Hosur		4 Kallavi	
		5 Kaveripattinam		5 Krishnagiri	
		6 Kelamangalam		6 Mathur	
		7 Nagarasampatti		7 Palepalli	
		8 Periyamuthur		8 Pochampalli	
		9 Rayakottai		9 Samalpatti	
		10 Shoolagiri		10 Samarapatti	
		11 Uthanapalli		11 Singarapettai	
				12 Uthangarai	
				13 Veppanapalli	
12	Madurai	1 Madurai East	1 Sedapatti	1 Usilampatti	
		2 Madurai West		2 Uthappanaickanur	
		3 Pudukotta		3 Muduvarpatti	
		4 Kottampatti		4 Palamedu	

CATEGORISATION OF BLOCKS IN TAMIL NADU									
Sl.No	District	Semi Critical		Critical		Over Exploited		Saline	
12	Madurai	5	Vellalur						
		6	Athipatti						
		7	Elumalai						
		8	Peraiyur						
		9	Sivarakkottai						
		10	Kokkulam						
		11	Thirumangalam						
		12	Karumathur						
		13	Sindhupatti						
13	Nagapattinam	1	Thiurkannapuram	1	Madhanam	1	Kariyapattinam	1	Kangalancheri
				2	Sirkali	2	Kuttalam	2	Keelaiyur
						3	Manganallur	3	Kilvelur
						4	Mayiladuthurai	4	Nagappattinam
						5	Melaiyur	5	Nirmulai
						6	Palaiyur	6	Thagatur
						7	Pattavarthi	7	Thalainayar
						8	Puthur	8	Therkupoigainallur
						9	Sembanarkoil	9	Thevoor
						10	Thiruvilaiyattam	10	Thillayadi
						11	Vaitheeswaran Koil	11	Thirukkuvalai
								12	Thirumarugal
								13	Thiruvengdu
								14	Valivalam
								15	Velanganni
								16	Vedaranyam
14	Namakkal	1	Alanganatham			1	Erumaipatti		
		2	Jedarpalayam			2	Kalappanaikanpatti		
		3	Kumarapalayam			3	Mallasamudram		
		4	Manickampalayam			4	Mangalapuram		
		5	Molasi			5	Mohanur		
		6	Pallapatti			6	Mullukurichi		
		7	Pandamangalam			7	Nallipalayam		
		8	Tiruchengode			8	Nallur		
						9	Namagiripettai		
						10	Namakkal		
						11	Paramathi		
						12	Puduchatram		
						13	Rasipuram		
						14	Sellappampatti		
						15	Senthamagalam		
						16	Vaiyappamalai		
						17	Valaiyapatti		
						18	Vennandur		
15	Niligiri								
16	Perambalur	1	Keelapuliyur			1	Chettikulam		
		2	Kolakanatham			2	Kurumbalur		
		3	Vengalam			3	Pasumbalur		
						4	Perambalur		
						5	Valikandapuram		
17	Pudukkottai	1	Alangudi	1	Keeramangalam			1	Kottaipattinam
		2	Arasarkulam					2	Perumaruthur
								3	Sinkavanam
18	Ramanathapuram							1	Aappanur
								2	Kadaladi
18	Ramanathapuram							3	Melachelvanur
								4	S.Tharaikudi
								5	Sayalkudi
								6	Sikkal
								7	Mudukulathur South
								8	Keelakkarai
								9	Thirupullani
19	Salem	1	Karupur			1	Attur		
		2	Kolathur			2	Edappadi		
		3	Patchamalai			3	Ernapuram		
		4	Pottaneri			4	Gangavalli		
		5	Thevur			5	Kadayampatti		
		6	Veeraganoor			6	Karippatti		
						7	Kattukkottai		
						8	Konganapuram		
						9	Malliyakarai		
						10	Mecheri		
						11	Nangavalli		

CATEGORISATION OF BLOCKS IN TAMIL NADU

Sl.No	District	Semi Critical	Critical	Over Exploited	Saline
19	Salem			12 Omalur	
				13 Palamalai	
				14 Panamarathuppatti	
				15 Pethanaickanpalayam	
				16 Poolampatti	
				17 Salem_Town	
				18 Sankari East	
				19 Sankari West	
				20 Semmandappatti	
				21 Suramangalam	
				22 Thalaivasal	
				23 Tharamangalam	
				24 Thirumalaigiri	
				25 Valasaiyur	
				26 Vazhappadi	
				27 Veerapandi	
				28 Vembadithalam	
				29 Yethapur	
20	Sivagangai	1 Varappur			
21	Thanjavur	1 Budalur		1 Adirampattinam	1 Andikkadu
		2 Thirukkattupalli		2 Aduthurai	2 Vallam
		3 Cholanmaligai		3 Ammapettai	
		4 Thuvarankurichi		4 Avanam	
		5 Ulur		5 Ayyampettai	
		6 Peravurani		6 Devanancheri	
		7 Kavalipatti		7 Kabisthalam	
		8 Sillathur		8 Kandiyur	
				9 Kathiramangalam	
				10 Kumbakonam	
				11 Kuruchi	
				12 Kuruvikarambai	
				13 Melattur	
				14 Murukkangudi	
				15 Nachiyarkoil	
				16 Nadukaveri	
				17 Nambivayal	
				18 Nanjikottai	
				19 Pandanallur	
				20 Papanasam	
				21 Pattukkottai	
				22 Ramapuram	
				23 Thanjavur	
				24 Thirumangalakottai	
				25 Thiruvaiyaru	
				26 Thiruvidamarudur	
				27 Thondarampattu	
				28 Tiruchitrambalam	
				29 Tiruppanandal	
22	Theni	1 Cumbam	1 Andipatti	1 Erasakkanaickanur	
		2 Devathanapatti		2 Kandamanur	
		3 Kodangipatti		3 Kodivilarpatti	
		4 Mayladumparai		4 Rajathani	
		5 Rasingapuram		5 Thevaram	
		6 Theni			
		7 Thenkarai			
		8 Uthamapalayam			
23	Thiruvallur	1 Arani	1 Ammanambakkam	1 Ambattur	1 Minjur
		2 Kanagammachattram	2 Uthukkottai	2 Avadi	
		3 Kattur		3 Balapuram	
		4 Madhavaram		4 Cherukkanoor	
		5 Periyapalayam		5 Erumbi	
		6 Poonamallee		6 Kadambathur	
		7 Poonimangadu		7 Kannigaipair	
		8 Pothattur Pettai		8 Mappedu	
		9 Redhills		9 Pallipattu	
		10 Thirumazhisai		10 R.K.Pet	
		11 Tiruttani		11 Thiruninravur	
				12 Vengathur	
24	Thoothukudi	1 Kadambur	1 Parivallikottai	1 Ilayarasanendal	
		2 Kayathar		2 Ottapidaram	
		3 Kovilpatti		3 Pallakurichi	
				4 Sattankulam	
				5 Udangudi	

CATEGORISATION OF BLOCKS IN TAMIL NADU

Sl.No	District	Semi Critical	Critical	Over Exploited	Saline
25	Tirunelveli	1 Keezhapavoor	1 Ayikudi	1 Kallurani	
		2 Levinjipuram	2 Gudalur	2 Karisal Kulam	
		3 Panagudi	3 Nettur	3 Karivaklamvandanallur	
		4 Puliyankudi		4 Karuvantha	
		5 Thiruvengadem		5 Kurukkalpatti	
		6 Valliyoor		6 Pazhankottai	
		7 Vasudevanallur		7 Pazhavoor	
		8 Veerakeralampudur		8 Radhapuram	
		9 Venkadampatti		9 Sankarankoil	
				10 Sernthamangalam	
				11 Surandai	
				12 Tisayanvilai	
				13 Uthumalai	
				14 Vannikonenthal	
				15 Veerasigamani	
26	Tiruppur	1 Alangiyam	1 Vellakoil	1 Avinashi(E)	
		2 Dharapuram		2 Avinashi(W)	
		3 Madathukulam		3 Avinashipalayam(S)	
		4 Nathakadaiyur		4 Cheyur	
		5 Udumalpet		5 Gudimangalam	
				6 Kangeyam	
				7 Kannivadi	
				8 Karadivavi	
				9 Kundadam	
26	Tiruppur			10 Kunnathur	
				11 Mulanur	
				12 Palladam	
				13 Periavalavadi	
				14 Perumanallur	
				15 Pethappampatti	
				16 Pongalur	
				17 Ponnapuram	
				18 Samalapuram	
				19 Sankarandampalayam	
				20 Tiruppur (N)	
				21 Tiruppur (S)	
				22 Uthiyur	
				23 Uthukuli	
27	Tiruvarur	1 Koothanallur	1 Nannilam	1 Agarathirumalam	1 Alathampadi
		2 Sannanallur	2 Thiruvizhimazhalai	2 Alangudi	2 Edaiyur
				3 Avoor	3 Thiruthuraipoondi
				4 Kodavasal	4 Murhupet
				5 Koradacheri	
				6 Kulikkarai	
				7 Peralam	
				8 Thirukkannamangai	
				9 Valangaiman	
28	Tiruvannamalai	1 Anakavoor	1 Kettavarampalayam	1 Chengam	
		2 Chennavaram	2 Malaiyur	2 Cheyyar	
		3 Desur	3 Nayadumangalam	3 Kilpennathur	
		4 Dusi	4 Osur	4 Melpallipattu	
		5 Eraiyur	5 Pachal	5 Somaspadi	
		6 Kadaladi	6 Thanipadi	6 Thandarampat	
		7 Kalasapakkam	7 Thatchampattu	7 Thurinjapuram	
		8 Kelur	8 Vadathandalam	8 Veraiyur	
		9 Kilkodungalur			
		10 Kolappalur			
		11 Mandakolathur			
		12 Modayur			
		13 Nedungunam			
		14 Peranamallur			
		15 Polur			
		16 Pudupalayam			
		17 Santhavasal			
		18 Thachambadi			
		19 T.V. Malai			
		20 T.V. Malai			
		21 Vakkadai			
		22 Vandavasi			
		23 Vanapuram			
		24 Vettavlam			

CATEGORISATION OF BLOCKS IN TAMIL NADU

Sl.No	District	Semi Critical	Critical	Over Exploited	Saline
29	Trichy	1 Eragudi	1 Peruvalpur	1 Kannanur	
		2 Kattuputhur		2 Kariyamanickam	
		3 Mannachanallur		3 Koppampatti	
		4 Musiri		4 Manapparai	
		5 Thottiyam		5 Manikandam	
		6 Thuvarangurichi		6 Marungapuri	
		7 Uppiliyapuram		7 Pannappatti	
				8 Pulivalam	
				9 Sengattuppatti	
				10 Thathaiyangarpettai	
				11 Thumbalam	
				12 Thuraiyur	
				13 V.Periyapatti	
				14 Vaiyampatti	
				15 Valaieduppu	
30	Vellore	1 Agaram	1 Kaveripakkam	1 Ambalur	
		2 Alangayam	2 Pennathur	2 Ambur	
		3 Andiyappanur	3 Walajah	3 Ammanankoil	
		4 Arakonam(South)		4 Anaicut	
		5 Banavaram		5 Arcot	
		6 Kandhili		6 Gudiyatham (West)	
		7 Kaniyambadi		7 Gudiyatham(East)	
		8 Koratti		8 Jolarpet	
		9 Melpadi		9 K.V.Kuppam	
		10 Natrampalli		10 Kalavai	
		11 Odugathur		11 Katpadi	
		12 Pallur		12 Madhanur	
		13 Panapakkam		13 Melpatti	
		14 Paranji		14 Melasannankuppam	
		15 Pernampattu		15 Nemili	
		16 Ranipet		16 Pallikonda	
		17 Sholinghur		17 Pudupadi	
		18 Thiruvalam		18 Sathuvachari	
		19 Velam		19 Thuthipattu	
		20 Visharam		20 Timiri	
				21 Tirupathur	
				22 Ussoor	
				23 Vaduganthangal	
				24 Valathur	
				25 Vaniyambadi	
				26 Vellore	
31	Villupuram	1 Arakandanallur	1 Chinnaselam	1 Anniyur	
		2 Kallakurichi	2 Mailam	2 Arasur	
		3 Kanai		3 Avalurpettai	
		4 Kandamangalam		4 Brammadesam	
		5 Manalurpettai		5 Chithalingamadam	
		6 Rishivandhiyam		6 Elavanasurkottai	
		7 Sengurichi		7 Eraiyur	
		8 Thirukovilur		8 Gingee	
		9 Vadakanandal		9 Indili	
		10 Villupuram		10 Kalamarudur	
				11 Kanjanur	
				12 Kiliyanur	
				13 Marakkanam	
				14 Melmalaiyanur	
				15 Melolakkur	
				16 Nagalur	
				17 Nainarpalayam	
				18 Nemili	
				19 Olakkur	
				20 Sathampati	
				21 Sathiyamangalam	
				22 Siruvadi	
				23 Sithalampattu	
				24 T.V.Nallur	
				25 Thiyagadurgam	
				26 Tindivanam	
				27 Ulundurpettai	
31	**Villupuram**			28 Uppuvelur	
				29 Vadasiruvalur	
				30 Vallam	
				31 Vanur	

CATEGORISATION OF BLOCKS IN TAMIL NADU

Sl.No	District	Semi Critical	Critical	Over Exploited	Saline
31	**Villupuram**			32 Vikkiravandi	
32	**Virudhunagar**	1 Amathur	1 Elayiram- Pannai	1 Cholapuram	
		2 Iyankollankondan	2 Ethirkottai	2 Keelarajakularaman	
		3 Kottaiyur	3 Mallankinar	3 Nathampatti	
		4 Malli	4 Mangalam	4 Rajapalayam	
		5 Mandapasalai	5 Pillaiyarkulam	5 Vatchakara-Patti	
		6 Nalli	6 Salwarpatti		
		7 Ondipulinaickanur	7 Sivakasi		
		8 Srivilliputtur			
		9 Watrap			

ABSTRACT

No. ofAssessed Firkas	Semi critical	Critical	Over Exploited	Saline
1129	**235**	**48**	**374**	**35**

CATEGORIZTION OF BLOCKS IN UTTAR PRADESH

S. No.	DISTRICT NAME	SEMI-CRITICAL		CRITICAL		OVER-EXPLOITED		SALINE
1	Agra	1	Kheragarh		Jagner	1	Achhnera	
			-		-	2	Akola	
			-		-	3	Barauli Ahir	
			-		-	4	Bichpuri	
			-		-	5	Etmadpur	
			-		-	6	Fatehabad	
			-		-	7	Fatehpur Sikari	
			-		-	8	Khandauli	
			-		-	9	Saiyan	
			-		-	10	Shamsabad	
2	Aligarh		-	1	Chandaus	1	Iglas	
			-	2	-	2	Khair	
3	Allahabad	1	Urwa	3	Baheria	1	Bahadurpur	
			-	4	Pratappur	2	Chaka	
			-		-	3	Dhanupur	
			-		-	4	Holagarh	
			-		-	5	Mau-Aima	
4	Ambedkar Nagar	1	Bhiti		-		-	
5	Amethi	1	Amethi				-	
		2	Bahadurpur		-		-	
		3	Gauriganj		-		-	
		4	Jagdishpur		-		-	
		5	Sangrampur		-		-	
		6	Shahgarh		-		-	
6	Amroha	1	Gajraula	1	Joya	1	Amroha	
			-		-	2	Dhanaura	
7	Azamgarh	1	Azmatgarh	1	Palhani		-	
		2	Mirzapur	2	Sathiaon		-	
		3	Rani Ki Sarai		-		-	
		4	Tahabarpur		-		-	
8	Baghpat		-	1	Baghpat	1	Binauli	
			-	2	Baraut	2	Pilana	
			-	3	Chaprauli		-	
			-	4	Khekra		-	
9	Ballia		-	1	Rasara		-	
10	Banda	1	Jaspura	2	Tindwari		-	
11	Bareilly	2	Ram Nagar		-		-	
12	Bijnor		-		-	1	Aaku (Nehtaur)	
			-		-	2	Budhanpur (Seohara)	
			-		-	3	Jaleelpur	
			-		-	4	Noorpur	
13	Budaun	1	Bisauli	1	Asafpur	1	Ambiapur	
		2	Ujhani	2	Sahaswan	2	Islamnagar	
14	Bulandshahar	1	Agauta		B.B.Nagar	1	Gulauthi	
		2	Lakhaoti	1	Danpur	2	Sikandrabad	
		3	Pahasu	2	Khurja		-	
		4	Unchagaon	3	Shikarpur		-	
15	Chitrakoot	1	Mau		-	1	Karvi	
		2	Ram Nagar		-		-	
16	Etah	1	Sakeet	1	Awagarh	1	Jalesar	
			-	2	Nidholi Kalan		-	
17	Faizabad	1	Bikapur		-		-	
		2	Tarun		-		-	
18	Fatehpur	1	Deomai	1	Airayan		Bhitaura	
		2	Khajuha	2	Amauli		Malawan	
		3	Vijayeepur	3	Bahua		Teliyani	
			-	4	Dhata		-	
			-	5	Haswa		-	
			-	6	Hathgaon		-	
19	Firozabad	1	Aron		-	1	Firozabad	
			-		-	2	Khairgarh	
			-		-	3	Narkhi	
			-		-	4	Shikohabad	
			-		-	5	Tundla	
20	G B Nagar		-		-	1	Bisrakh	
			-		-	2	Jewar	
21	Ghaziabad		-		-	1	Bhojpur	
			-		-	2	Loni	
			-		-	3	Razapur	
22	Ghazipur	1	Barachawar		Ghazipur		-	
		2	Bhawarkol		Muhammadabad		-	
		4	Karanda		-		-	
		5	Kasimabad		-		-	
		6	Manihari		-		-	
		7	Sadat		-		-	

CATEGORIZTION OF BLOCKS IN UTTAR PRADESH								
S. No.	DISTRICT NAME		SEMI-CRITICAL		CRITICAL		OVER-EXPLOITED	SALINE
23	Hamirpur	1	Sareela	1	Sumerpur		-	
24	Hapur		-		-	1	Garh	
			-		-	2	Hapur	
			-		-	3	Simbholi	
25	Hardoi	1	Ahrauri		-		-	
		2	Harpalpur		-		-	
26	Hathras	1	Sahpau	1	Hathras	1	Mursan	
			-	2	Sadabad	2	Sasni	
27	Jaunpur	1	Jalalpur	1	Barsathi	3	Badlapur	
		2	Khutahan	2	Buxa	4	Karanja Kalan	
		3	Madiyahun	3	Dharmapur	5	Kerakat	
		4	Ram Nagar	4	Dobhi	6	Maharajganj	
		5	Rampur	5	Muftiganj	7	Sirkoni	
			-	6	Sikrara		-	
28	Jhansi	1	Babina					
		2	Mauranipur		-		-	
29	Kannauj	1	Gugrapur				Jalalabad	
		2	Kannauj		-		Talgram	
30	Kanpur Nagar	1	Chaubeypur		-		Kalyanpur	
		2	Ghatampur		-		-	
		3	Sarsaul		-		-	
		4	Shivrajpur		-		-	
31	Kasganj		-	1	Soron	1	Kasganj	
			-		-	2	Sahawar	
32	Kaushambi	1	Sarsawan	1	Manjhanpur	1	Chail	
			-	2	Newada	2	Kara	
			-		-	3	Moorat Ganj	
			-		-	4	Sirathu	
33	Lucknow	1	Malihabad		-	1	Chinhat	
34	Mahoba		-	1	Charkhari	1	Jaitpur	
			-	2	Kabrai	2	Panwari	
35	Mainpuri		-		-	1	Barnahal	
36	Mathura		-	1	Farah	1	Baldeo	
			-		-	2	Nohjhil	
			-		-	3	Raya	
37	Maunath Bhanjan	1	Badraon		-		-	
		2	Ranipur		-		-	
38	Meerut	1	Daurala	1	Kharkhoda	1	Rajpura	
		2	Hastinapur	2	Machhra		-	
			-	3	Meerut		-	
			-	4	Parichhat Garh		-	
39	Mirzapur	1	Chanbey	1	Kon		-	
		2	City	2	Majhawan		-	
		3	Marihan	3	Sikhar		-	
		4	Pahari		-		-	
40	Moradabad	1	Bhagatpur Tanda		-	1	Bilari	
		2	Deengarpur		-	2	Chhajlet	
			-		-	3	Dilari	
41	Muzaffarnagar		-		-	1	Bhaghara	
			-		-	2	Budhana	
			-		-	3	Charthawal	
			-		-	4	Shahpur	
42	Pratapgarh	1	Kalanker	1	Aspur-Deosara	1	Baba Bekhernath	
		2	Sangaipur		-	2	Gaura	
			-		-	3	Lakshmanpur	
			-		-	4	Lalganj	
			-		-	5	Mandhata	
			-		-	6	Mangraura	
			-		-	7	Patti	
			-		-	8	Pratapgarh Sadar	
			-		-	9	Rampur-Sangramgarg	
			-		-	10	Sandwa -Chandrika	
			-		-	11	Shivgarh	
43	Raibareli	1	Kheron	1	Sareni		-	
		2	Rahi		-		-	
44	Rampur		-		-	1	Chamraua	
			-		-	2	Saidnagar	
			-		-	3	Shahabad	
			-		-	4	Swar	
45	Saharanpur		-	1	Muzafarabad	1	Baliakheri	
				2	Puwarka	2	Deoband	
			-		-	3	Gangoh	
			-		-	4	Nagal	
			-		-	5	Nakur	
			-		-	6	Nanauta	

CATEGORIZTION OF BLOCKS IN UTTAR PRADESH

S. No.	DISTRICT NAME	SEMI-CRITICAL	CRITICAL	OVER-EXPLOITED	SALINE
		-	-	7 Rampur	
		-	-	8 Saduli Qudim	
		-	-	9 Sarsawa	
46	Sambhal	-	1 Asmoli	1 Bahjoi	
		-	2 Junawai	2 Baniakhera	
		-	-	3 Gunnaur	
		-	-	4 Pawansa	
		-	-	5 Sambhal	
47	St. Ravidas Nagar	-	1 Abholi	-	
		-	2 Aurai	-	
		-	3 Bhadohi	-	
		-	4 Deegh	-	
		-	5 Gyanpur	-	
		-	6 Suriyawan	-	
48	Shamli	-	1 Kairana	1 Kandhala	
		-	2 Thana Bhawan	2 Shamli	
				3 Un	
49	Sitapur	1 Machharehta	-	-	
50	Sonbhadra	1 Babhani	1 Ghorawal	-	
		2 Chatara	-	-	
		3 Duddhi	-	-	
		4 Robertsganj	-	-	
51	Sultanpur	1 Bhadaiyan	-	-	
		2 Dubeypur	-	-	
52	Unnao	1 Bigha Pur			
		2 Sikandar Sirausi	-	-	
53	Varanasi	1 Baragaon	1 Harhuwa	1 Arajiline	
		2 Chiraigaon	2 Pindra		
		3 Cholapur	-	-	

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over Exploited	Saline
820	82	68	111	Nil

CATEGORIZTION OF BLOCKS IN UTTRAKHAND

S. No.	District	Semi-critical	Critical	Over-Exploited	Saline
1	Dehradun	-	-	-	-
2	Haridwar	1 Bhagwanpur	-	-	-
		2 Laksar	-	-	-
		3 Khanpur	-	-	-
3	Nainital	-	-	-	-
		-	-	-	-
4	Udamsingh nagar	1 Gadarpur	1 Jaspur	-	-
		2 Rudrapur	2 Kashipur	-	-

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-Exploited	Saline
18	**5**	**2**	**0**	**Nil**

CATEGORIZATION OF BLOCKS IN WEST BENGAL

Sl. No.	District	Semi-critical	Critical	Over-exploited	Saline
1	Malda	-	-	-	-
2	Nadia	1 Chapra	-	-	-
		2 Hanskhali	-	-	-
		3 Kaligunj	-	-	-
		4 Karimpur-I	-	-	-
		5 Karimpur-II	-	-	-
		6 Nakashipara	-	-	-
		7 Tehatta-I	-	-	-
		8 Tehatta-II	-	-	-
3	Kochbihar	-	-	-	-
4	North 24 parganas	1 Barrackpore-II	-	-	-
5	Dakshin dinajpur	-	-	-	-
6	Uttar dinajpur	-	-	-	-
7	Bankura	1 Bishnupur	-	-	-
8	Purulia	-	-	-	-
9	Jalpaiguri	-	-	-	-
10	Barddhaman	1 Bhatar	-	-	-
		2 Kalna-II	-	-	-
		3 Katwa-II	-	-	-
		4 Ketugram-I	-	-	-
		5 Mangalkote	-	-	-
		6 Memari-II	-	-	-
		7 Monteswar	-	-	-
		8 Raina-I	-	-	-
		9 Raina-II	-	-	-
11	Murshidabad	1 Bhagabangola-I	-	-	-
		2 Bhagabangola-II	-	-	-
		3 Bharatpur-I	-	-	-
		4 Bharatpur-II	-	-	-
		5 Burwan	-	-	-
		6 Domkal	-	-	-
		7 Kandi	-	-	-
		8 Khargram	-	-	-
		9 Lalgola	-	-	-
		10 Mur-jiaganj	-	-	-
		11 Nabagram	-	-	-
		12 Raninagar-I	-	-	-
		13 Raninagar-II	-	-	-
		14 Sagardighi	-	-	-
12	Birbhum	1 Murarai-II	-	-	-
		2 Nalhati-II	-	-	-
		3 Nanoor	-	-	-
		4 Rampurhat-II	-	-	-
13	Howrah	-	-	-	-
14	Darjeeling	-	-	-	-
15	Hoogly	1 Arambag	1 Goghat-II	-	-
		2 Chinsurah-Mogra	-	-	-
		3 Goghat-I	-	-	-
		4 Pandua	-	-	-
		5 Polba-Dadpur	-	-	-
		6 Singur	-	-	-
16	West medinipur	1 Ghatal	-	-	-
		2 Pingla	-	-	-
		3 Sabang	-	-	-
17	East medinipur	1 Bhagawanpur-I	-	-	-
		2 Bhagawanpur-II	-	-	-
		3 Egra-I	-	-	-
		4 Moyna	-	-	-
		5 Panskura-I	-	-	-
		6 Potashpur-I	-	-	-
		7 Potashpur-II	-	-	-

ABSTRACT

No. of Assessed Blocks	Semi Critical	Critical	Over-exploited	Saline
271	**53**	**1**	**0**	**Nil**

CATEGORIZATION OF BLOCKS IN DAMAN&DIU

Sl. No.	Union Territory	Semi-critical		Critical		Over-exploited		Saline	
1	Daman	1	Daman	-	-	-	-	-	-
2	Diu	-	-	-	-	1	Diu	-	-

ABSTRACT

No. of Assessed Units	Semi Critical	Critical	Over-exploited	Saline
2	1	0	1	0

CATEGORIZTION OF ISLANDS IN LAKSHDWEEP

S. No.	Islands	Semi-Critical	Critical	Over-exploited	Saline
1	Agatti	1 Agatti	-	-	-
2	Amini	1 Amini	-	-	-
3	Androth	-	-	-	-
4	Chetlat	-	-	-	-
5	Kadmat	-	-	-	-
6	Kalpeni	-	-	-	-
7	Kiltan	-	-	-	-
8	Kavaratti	1 Kavaratti	-	-	-
9	Minicoy		-	-	-

ABSTRACT

No. of Assessed Islands	Semi Critical	Critical	Over-exploited	Saline
9	3	0	0	0

CATEGORISATION OF REGION IN UT of PUDUCHERRY

Sl.No	District	Semi Critical	Critical	Over Exploited	Saline
1	Puducherry	-	-	1 Puducherry	-
2	Karaikal	-	-	-	-
3	Mahe	-	-	-	-
4	Yanam	-	-	-	1 Yanam

ABSTRACT

No. of Assessed Regions	Semi critical	Critical	Over Exploited	Saline
4	**0**	**0**	**1**	**1**

APPENDICES

Appendix-A

(TO BE PUBLISHED IN THE GAZETTE OF INDIA PART-I, SECTION -I)

GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
Shram Shakti Bhavan, Rafi Marg, New Delhi

****

No. 3/10/2011-GW /121 Dated: 13th February, 2012.

MEMBER (SAM)
No. 807
12/2/14

RESOLUTION

Subject: Constitution of Central Level Expert Group for overall re-assessment of ground water resources of the country.

The last assessment of state-wise annual replenishable ground water resources for the entire country has been made as on 31 March 2009 based on the Methodology, Ground Water Resources Estimation Committee (GEC) -97. Since then there have been changes in ground water scenario in many places of the country. Accordingly, a Central Level Expert Group is hereby constituted for over-all supervision of the re-assessment of ground water resources in the entire country. The composition and terms of reference of the Expert Group are as follows:-

1. **Composition:**

(i)	Chairman, CGWB	-	Chairman
(ii)	Member(RM), CWC	-	Member
(iii)	Member (WP&P), CWC or representative	-	Member
(iv)	Member (SM&L), CGWB	-	Member
(v)	Member (ED&MM), CGWB	-	Member
(vi)	Member (T&TT), CGWB	-	Member
(vii)	Commissioner(MI), MOWR	-	Member
(viii)	Chief General Manager, NABARD	-	Member
(ix)	Director, NIHIH, Roorkee or representative	-	Member
(x)	Representative of Planning Commission	-	Member
(xi)	Joint Secretary, Ministry of Agriculture	-	Member
(xii)	Joint Secretary, Ministry of Environment & Forests	-	Member
(xiii)	Joint Secretary, Ministry of Rural Development (Watershed Development Programme)	-	Member
(xiv)	Joint Secretary, Department of Drinking Water Supply	-	Member
(xv)	Joint Secretary, Ministry of Urban Development	-	Member
(xvi)	Representative of IIT, Delhi (Water Resources Section)-Civil Engineering Department	-	Member
(xvii)	Chief Engineer (HQ), NWDA or representative	-	Member
(xviii)	Technical Expert (WM), NRAA, M/o Ag.& Coo.	-	Member
(xix)	Representative of India Meteorology Department	-	Member
(xx)	Representative of Geological Survey of India	-	Member
(xxi)	Secretary In-Charge, Water Resources, Uttar Pradesh	-	Member

(xxii) Secretary In-Charge, Water Resources, Punjab- Member
(xxiii) Secretary In-Charge, Water Resources, Maharashtra - Member
(xxiv) Secretary In-Charge, Water Resources, Andhra Pradesh- Member
(xxv) Secretary In- Charge, Water Resources, Rajasthan- Member
(xxvi) Representative of Department of Civil Engg., - Member
Indian Institute of Science(IISc), Bangalore
(xxvii) Member (SAM), CGWB - Member Secretary

The committee may co-opt any other Member(s), if necessary.

2. **Terms of Reference: –**

(i) To ensure assessment of ground water available in deep/unconfined aquifers.
(ii) To ensure the assessment of annual replenishable ground water resources of the States in coordination with the respective state level committees for the reference year 2011. The Committee will work on ground water assessments in accordance with the methodology and will adopt improved procedures and practices wherever possible for the sake of achieving greater accuracy of assessment(s).
(iii) To supervise the estimation of status of utilization of the annual replenishable ground water resource as on 31st March 2011 of the States to be carried by the respective State level committees.
(iv) To prepare a National level report on assessment of ground water resources and status of its utilization as on 31st March, 2011.
(v) To work towards integration of ground water and surface water data with a view to facilitating planning for constructive/integrated use of water resources.
(vi) Any other aspect relevant to the terms referred to above.

3. **Time frame:-**

The Committee will submit its report by 30.06.2012.

4. **Expenditure**

Expenditure on account of TA/DA to official Members of the Expert Group will be met from the source from which they draw their salaries and that of non-official Members (if any), will be borne by the Central Ground Water Board.

(Rajeev Kumar)
Director (GW)
Tele. Fax No. 23716683
email: dirgw-mowr@nic.in

ORDER

Ordered that the above RESOLUTION be published in the Gazette of India for general information.

(Rajeev Kumar)
Director(GW)

To

The Manager,
Government of India Press,
Faridabad (Haryana).

Copy to:

1. PS to Minister (WR), MoWR, New Delhi
2. PS to MoS (WR), MoWR, New Delhi
3. Sr. PPS to Secretary (WR)/PS to Additional Secretary(WR), MoWR, New Delhi
4. All Wing Heads, Ministry of Water Resources, New Delhi
5. All Organization Heads of Ministry of Water Resources, New Delhi

(Rajeev Kumar)
Director (GW)

Copy also forwarded for information to:

Ministry of Home Affairs (Shri S.K.Bhatnagar, Deputy Secretary), New Delhi- with reference to OM No. 5/2/2007- Public dated 21.07.2009.

(Rajeev Kumar)
Director (GW)

Appendix B

Joint Secretary
Ministry of Water Resources
Government of India
Tele Fax No. 23710343

D.O. No. 3/10/2011

Date: 15th January, 2012.

Dear Chief Secretaries/Administrators/Advisors to Governors,

As you may be aware that the last State-wise assessment of annual replenishable ground water resources for the entire country was done in the year 2009. Since then substantial changes have been observed in ground water scenario in many parts of the country. It is, therefore, necessary to initiate the process of re-estimation of ground water resources. A brief note on the methodology to be adopted is enclosed.

As you may be aware, the 4th Minor Irrigation Census undertaken by this Ministry for the entire country, with reference year 2006-07, is in advance stage of finalization. The census data could be suitably used for estimation of ground water draft, which is a vital input for accurate ground water resources estimation.

Draft Order for constituting the State Level Committee to steer the process of re-estimation is enclosed. The concerned Department of the State/UT Government may be advised to take necessary follow up action in this regard on priority.

With regards,

Yours sincerely,

Sd/-

(Sudhir Garg)

To

(As per list enclosed to all Chief Secretaries/Administrators/Advisors to Governors)

DRAFT ORDE

No.
State/UT Government of .....
Department of .....
*****

Dated the 201

ORDER

Subject: Estimation of annual replenishable ground water resources – constitution of State Level Committee for re-estimation of ground water resources - reg.

***

The last assessment of state-wise annual replenishable ground water resources for the entire country was made in the year 2009 based on the Methodology adopted by the Ground Water Resources Estimation Committee - 97. Since then changes in ground water scenario in many parts of the county has been observed. The National Water Policy, 2002 has also recommended that the ground water resources of the country should be re-assessed periodically. With a view to re-estimate ground water resources as on 31st March 2011, the State Level Committee is constituted with the following composition:-

1. Composition

(i)	Secretary in Charge of Water Resources	- Chairman
(ii)	Head, Water Resources Department	- Member
(iii)	Director, Ground Water Department	- Member
(iv)	Chief Engineer, Water Supply & Sanitation Department	- Member
(v)	Head, Dept. of Agriculture	- Member
(vi)	Chief Engineer, Public Health & Engineering Department	- Member
(vii)	Chief Engineer, Rural Water Supply department	- Member
(viii)	Chief Engineer, Minor Irrigation department	- Member
(ix)	Director, Department of Industries	- Member
(x)	General Manager, NABARD	-Member
(vii)	Regional Director, CGWB	- Member Secretary

The committee may co-opt any other Member(s) / special invitee(s), if necessary.

2. Terms of Reference: The broad terms of reference of the Committee would be as follows :–

(i) To estimate annual replenishable ground water resources of the state in accordance with the Ground Water Resources Estimation Methodology.
(ii) To estimate the status of utilization of the annual replenishable ground water resource.

3. **Time frame:** The Committee will submit its report within ..... Months/ Year from the date of its constitution.

4. **Expenditure:** Expenditure on account of TA/DA to official Members of the Committee will be met from the source from which they draw their salaries and that of non-official Members, will be borne by the Department of .....

(A.B.C.)
X.Y.Z.
Tele. No. .....
Fax No. .....
e-mail:.....

To

All members of the State Level Committee

Appendix C

Approvals of Ground water Resources Assessment Reports by the State Level Committees

Andhra Pradesh

Minutes Of 2nd State Level Committee Meeting On Re-estimation Of Ground Water Resources of Andhra Pradesh held on 22.12.2012, at Jalsoudha Building, Hyderabad

The 2nd State Level Committee Meeting on Re-Estimation of Ground Water Resources of Andhra Pradesh was held on 22.12.2012 at 1130 Hrs. in Godavari Hall, Jalasoudha Building, Hyderabad under the Chairmanship of Sri Ajoyendra Pyal, I.A.S., Special Chief Secretary, I&CAD, Government of Andhra Pradesh. List of members of State Level Committee and others who attended the meeting is given in **Annexure-I**. At the outset, Sri G. Sudarshan, Regional Director (I/C), Central Ground Water Board (CGWB) and Convenor, State Level Committee, welcomed Chairman and all the members to the meeting. He placed the Agenda items before the committee for approval.

AGENDA ITEM NO - 1:

Re-estimation of Dynamic Ground Water Resources of Andhra Pradesh as on March, 2011 – approval by Committee:

Sri G.Sudarshan, Regional Director(I/C), Central Ground Water Board(CGWB), requested Sri B.M.Murali Krishna Rao, Director, Ground Water Department (GWD) , Government of Andhra Pradesh to present the work done so far in finalizing the draft report of re-estimation of resource for 2010-2011.

Sri N. Srinivas, Assistnt Director(AD), GWD briefed the strenuous efforts put in by the officers in compiling the report. He informed that resource computations at district and state level are completed as per schedule. Field checks and data validation are also completed and the draft report is finalized and put before the august committee for approval.

The Special Chief Secretary congratulated the officers of Ground Water Department and Central Ground Water Board for completing the task in time and appreciated the efforts made in bringing out the draft report. He also acknowledged the cooperation of the member departments for their timely assistance in providing required data for finalization of the draft report as per schedule.

Contd…..

Sri N. Srinivas also informed that estimation was carried out on bottom to top approach and the apportioned the computations to watershed and mandal level. He informed that excess rainfall of 32% is recorded during the year of computation (2010-2011) when compared to deficit rainfall during earlier estimation (2008-09). He informed that total recharge is estimated as 32,513 MCM , draft for all uses as 14,509 MCM and stage of groundwater development as 45%. Later on, clarifications from members on the presentation were sought.

After brief discussion, the Committee approved the draft report on Estimation of Dynamic Ground Water Resources of Andhra Pradesh as on March, 2011.

AGENDA ITEM NO- 2:

Approval of Draft Report on Total Availability of Ground Water Resources of Andhra Pradesh as an March, 2009

Sri G. Sudarshan, Regional Director (I/C), CGWB informed that a Central Level Expert Group has been constituted for overall assessment and availability of the total ground water resources. He informed that Secretaries of various ministries of Central Government and State Government, Heads of different Scientific Departments, Universities and members of CGWB have been nominated as Members in the Expert Committee with the Chairman, CGWB as the Chairman and the first meeting took place in July, 2012, wherein it was decided to estimate the total availability of ground water resources of the country. He explained that the available resource can only be used during natural disasters with a blanket restriction on use of the same under normal circumstances. He informed that according to one estimate, 13,500 BCM of static water resource is available for the entire country, of which 93% of resources lies in Ganga Brahmaputra alluvial plain alone. He informed the august gathering that after putting in tremendous efforts, the report is brought out.

Sri A.V.S.S Anand, Scientist-C, CGWB briefed the concepts of resource computations in unconfined and confined aquifers. Sri G. Sudarshan, informed that this is the first approximation of the Total Ground Water Resources. In due course of time, methodology will be improved and near correct estimation will be done in future computations.

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Sri S.N. Rai, Chief Scientist, National Geographical Research Institute (NGRI), interacted on the need to assess resource availability particularly in confined aquifers too in hard rocks, since unconfined aquifer is exhausted. Dr. P.N. Rao, Scientist-D, CGWB, opined that proposed aquifer mapping may help in refinement of resource estimation in hard rock aquifers.

Sri B.M. Murali Krishna Rao, Director, GWD, informed that unless the dynamic ground water resource is exhausted, in-storage resources can not be utilized except only in conditions like extreme drought to meet the urgent drinking water requirements. It was felt by the Members that while making use of this resource, the rate of recoupment should also be ensured.

After brief discussion, Agenda Item No.2 i.e., the draft report on total availability of ground water resources of Andhra Pradesh as on March, 2009 was approved by the august Committee.

AGENDA ITEM NO – 3:

Data Acquisition for National Aquifer Mapping Project

The main objective of taking up Aquifer Mapping in the country was briefed by Sri G. Sudarshan, Regional Director (I/C), CGWB. He informed that a web based aquifer information and management system with participatory approach is being developed under the project. He elucidated salient features of the Project. He further mentioned about the modus operandi of the project and its execution. He requested all the Member Departments to provide available data for making use in National Aquifer Mapping Project. He recalled the recent visit of Chairman, CGWB to Hyderabad and meeting with Special Chief Secretary, I&CAD with regard to data sharing by the Central and State agencies for Andhra Pradesh State.

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AGENDA ITEM NO – 4:

ANY OTHER ITEM WITH THE PERMISSION OF THE CHAIR - STRENGTHENING OF STATE GROUND WATER DEPARTMENT

Sri N. Srinivas, Assistant Director, APGWD brought to the notice of the Special Chief Secretary that work load in the Department has increased enormously and so many new items of works are coming up and there is a huge manpower shortage to attend all these items of works. He informed that there is no recruitment in the Department and 185 posts, i.e 60% of the 306 total sanctioned field level posts are lying vacant. The Special Chief Secretary expressed concern over this and advised the Director, GWD to fix a separate meeting to discuss this aspect He advised to flag up these issues on Aquifer mapping for appropriate decision making and the finance department may be requested to fill the vacant posts and sanction of additional posts, as Andhra Pradesh State is one of the key States included in aquifer mapping, he has advised Director, Ground Water Department to initiate measures in this direction to complete as scheduled. Based on the workload on the aquifer mapping, it is estimated that 650 technical officers are required by APGWD. It was requested to fill up the vacancies in the sanctioned posts immediately and the balance in due course by fresh requirement. The Special Chief Secretary advised the Director, APGWD, to chalk out a proposal for staff component and expenditure provision for this item, as this is 10 years project.

Dr. S.N. Rai, Chief Scientist, NGRI suggested to procure multi electrode equipment, which gives continuous ground data within a short time. He informed that NGRI can train Scientists on this aspect. Special Chief Secretary felt that young scientists could be trained on latest equipment for achieving better results. It was informed by the Regional Director(I/C), CGWB, that under pilot project of aquifer mapping, these equipments are being procured.

Special Chief Secretary expressed that it would be better to convene a separate meeting with Heads of Departments for evolving roadmap in data sharing for Aquifer Mapping.

The meeting ended with vote of thanks by Sri G. Sudarshan, Regional Director I/C, CGWB.

19/1/13

(Ajayendra Pyal
Spl. CS to Govt.

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List of Members (Annexure-I)

1. Sri Ajoyendra Pyal, I.A.S., Spl. Chief Secretary, I&CAD, Government of Andhra Pradesh.(Chairman)
2. Sri G. Sudarshan, Regional Director (I/C), CGWB, SR, Hyderabad,(Convener)
3. Sri B.M. Murali Krishna Rao, Director, Ground Water Department,

   Government of Andhra Pradesh
4. Dr. S.N. Rai, Chief Scientist, NGRI, Hyderabad
5. Sri C. Venugopala Chary, CE, Minor Irrigation
6. Sri M. Satya Murthy, CE, Operations, APTRANSCO, Hyderabad
7. Sri C.V.S. Sandalya, Group Head, Geosciences Dept. APSRAC, Hyderabad
8. Smt. V. Pratima, Jt. Director, Department of Economics & Statistics, Govt. of AP
9. Sri K. Somasekhara Reddy, Dy. Director, Commissionerate of Industries, Hyderabad
10. G. Vidya Sagar, Asst. Director, Department of Agriculture, O/o Commissioner of Agriculture, Hyderabad
11. Sri Ch. Mallikarjunudu, Dy. Chief Engineer, PH&ME Department, Govt. of Andhra Pradesh
12. Dr. M.V.S.S. Giridhar, Assistant Professor, Centre for Water Resources, JNTU, Hyderabad
13. Sri G.V. Subrahmanyam, Executive Engineer, O/o Chief Engineer,

    Inter State Water Resources, Government of Andhra Pradesh
14. Sri B. Venkateswarlu Naik, State Technical Expert, O/o Commissioner, Rural Development, Government of Andhra Pradesh
15. Sri Y. Narasimlubabu, Senior. Geologist, O/o RWS&S, Eramanjil, Hyderabad

The following also attended the meeting

16. Dr. P.N. Rao, Scientist-D, CGWB, SR, Hyderabad
17. Sri K. Venugopal, Joint Director, GWD, Govt. of AP
18. Sri A. Kumar Das, Team Leader, APSRAC
19. Sri P. Prakash, Team Leader, APSRAC
20. Sri P. Sudhakar, Scientist-C, CGWB
21. Sri AVSS Anand, Scientist-C, CGWB
22. Sri G. Sashi Kumar, Deputy Director, GWD, Govt. of AP

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23. Sri K. Dhananjaiah, Deputy Director, GWD, Govt. of AP
24. Dr. P. Prasad , Deputy Director, GWD, Govt. of AP
25. Sri B. Narender, Deputy Director, GWD, Govt. of AP
26. Sri V. Vijaya Babu, Assistant Director, GWD, Govt. of AP
27. Sri M. Rama Rao, Assistant Director, GWD, Govt. of AP
28. Sri N. Srinivas, Assistant Director, GWD, Govt. of AP
29. Sri V. Kanna Babu, Assistant Director, Department of Economics & Statistics, Govt. of AP
30. Sri P. Raghupath Reddy, Assistant Geophysicist, GWD, Govt. of AP
31. Sri E. Sunil Kumar, Assistant Hydrogeologist, GWD, Govt. of AP
32. Sri A. Ramanna, Assistant Hydrologist, GWD, Govt. of AP
33. Sri R.S. Narasimha Rao, Assistant Hydrogeologist, GWD, Govt. of AP
34. Sri T. Hansraj, Assistant Hydrogeologist, GWD, Govt. of AP
35. Sri K. Maruthi Prasad, Assistant Chemist, CGWB

ARUNACHAL PRADESH

Minutes of the meeting of State Level Committee (SLC) for reconciliation of Dynamic Ground Water Resources, 2011 for Arunachal Pradesh held in the Chamber of the Secretary, Water Resources Department, Govt. of Arunachal Pradesh at Itanagar on 16/07/2012.

A meeting of the State Level Committee(SLC) for reconciliation of Dynamic Ground Water Resources for 2011 in Arunachal Pradesh was convened by the Secretary, Water Resources Department, Govt. of Arunachal Pradesh cum Chairman, SLC in his office chamber on 16/07/2012.

At the outset, the chairman, SLC welcomed all the members present in the meeting and requested the Member Secretary to brief the house about the current assessment of Dynamic Ground Water Resources in Arunachal Pradesh.

In his address, the Member Secretary, SLC briefed the house on the Dynamic Ground Water assessment in Arunachal Pradesh upto March 2011, where a little changes have been reported as compared to the assessement made during 2009. The Member Secretary placed the Comparision Report regarding the assessment before the house.He also informed the house that assessment was based on the GEC 97 methodology.

Comparison between Ground Water Resources of Arunachal Pradesh (Based of GEC 1997

Sl. no	Item	Year of Estimation (2009)	Year of Estimation (2011)	Comparison
1	Total Replenishable Ground Water Resources (BCM)	4.45	4.51	0.06
2	Existing Gross Draft (BCM)	0.0027	0.003	0.0003
3	Irrigation uses (BCM)	0.00215	0.002	0.00015
4	Domestic and Industrial uses (BCM)	0.00056	0.001	0.00044
5	Stage of GW Development (%)	0.07	0.08	0.01
6	Provision for domestic, Industrial and other uses (BCM)	0.01	0.006	0.004
7	Provision for future irrigation (BCM)	3.996	4.05	0.054

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All the members, then compared the district wise Ground Water Resources of Arunachal Pradesh shown at Annexure III D-1 of the booklet i.e, at page 22/23. The net ground water availability of 4.06 BCM as assessed showing an increase of 0.05 BCM from the previous assessment has been agreed by all the members of the board.

The stage of ground water development which showed an increase of 0.01% has also been agreed by all the members.

While assessing gross ground water draft for irrigation, the Chairman pointed out that ground water draft can never be "0" as mentioned in the chart in respect of Anjaw, Dibang Valley, West Siang, Upper Siang , West Kameng, Upper Subansiri, Tawang, Kurung Kumey. To this query of Chairman, SLC, the Member Secretary explained that assessment regarding ground water draft etc. in these districts are yet to be taken up, hence zero report has been shown. However, the Member Secretary alongwith other members have agreed for "NA" report instead of "0" in this districts. The Chairman and Chief Engineer, WRD requested the Member Secretary to take up early initiative towards assessment in these districts to support implementation of ground water irrigational projects in these districts.

The Committee unaminously agreed in favour of rest of the assessments and comparisions with a view to take up assessments of ground water in Arunachal Pradesh every two years with special attention to the districts where ground water assessments are yet to be taken up for consideration. If required, the steps to augment the required infrastructures for the purpose may also be taken up in due course.

Subsequently, discussion was held regarding spring development in Arunachal Pradesh. The Chief Engineer (S&I) requested the Member Secretary and Regional Director , CGWB for initiating R&D supported projects by CGWB for spring development in this state. To this, the Chairman also discussed regarding Tubewell recharging through artificial recharge and spring development and stressed for implementation of these projects in the state for agriculture and horticulture purposes.

Discussion were also held to ensure that all abandoned wells in the State are properly capped/sealed to avoid any untoward incident as are being noticed in other states. Even in case of all irrigation projects, proper care need to be taken for head works.

The meeting ended with a vote of thanks to the Chair, the members present in the meeting has been appended in Annexure-I

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(Er.G. Ete)

Secretary cum Chairman

Water Resource Department

Govt. of Arunachal Pradesh
Itanagar

(U. Gogoi)

Regional Director cum Member Secretary

CGWB (NER), MOWR, GOI

Guwahati, Assam

(Er. L. Angu)

Chief Engineer

Water Resource Department

Govt. of Arunachal Pradesh

Itanagar

(H. Kanu)

Director

Department of Agriculture

Govt. of Arunachal Pradesh

Itanagar

(Dr. P. Radhakrishnan)

General Manager

NABARD

Itanagar

16.7.2012

(Er.V.N. Pandey)

Superintending Engineer & Nodal Officer

TW & GW, WRD

Govt. of Arunachal Pradesh

Itanagar

ASSAM

MINUTES OF THE STATE LEVEL COMMITTEE (Ground Water Resource Estimation) MEETING HELD ON 18th March, 2013, IN THE CHAMBER OF THE SECRETARY, IRRIGATION, GOVT. OF ASSAM FOR RECONCILIATION OF THE DYNAMIC (2011) AND TOTAL GROUND WATER RESOURCES (2009) OF THE STATE OF ASSAM

A State Level Standing Committee (SLSC) for Ground Water Assessment has been convened for reconciliation of the Dynamic Ground Water Resources, 2011 and Total Ground Water Resources, 2009 for the state of Assam. The meeting was held on 18th March, 2013 in the chamber of the Secretary, Irrigation, Govt. of Assam. The Secretary, Irrigation, Govt. of Assam chaired the meeting. The following members attended the meeting:

i) Sh. T.C. Das, Secretary, Irrigation Department, Govt. of Assam
ii) Sh. D. Bhattacharjee, Dy. Secretary, Water Resources Department, Govt. of Assam
iii) Sh. A.K. Gohain, Chief Engineer, Irrigation Department, Govt. of Assam
iv) Sh. K.K. Choudhury, S.E., Department of Agriculture, Govt. of Assam
v) Sh. A.J. Bordoloi, S.E. Public Health Engineering Department, Govt. of Assam
vi) Sh. U. Gogoi, Regional Director, CGWB, NER, Guwahati

The draft assessment, prepared by CGWB, was circulated among the members. The Chairman of the Committee Sh. T.C. Das, Secretary, Irrigation Department, Govt. of Assam welcomed all the members to the meeting. The Regional Director, CGWB, NER has briefed the ground water resources of Assam State. Sh. P. Kalita, Scientist-D explained elaborately the methodology of Ground water Resources Estimation for both Dynamic and Total.

A detailed discussion was held and the following decisions were taken:

1. During discussion it has been decided by all the members that Director, Geology and Mining, Govt. of Assam should be co-opted as Special Invitee in the Ground Water Resources Estimation Committee
2. The Committee after detailed discussion decided to approve the draft report on Dynamic G.W. Resources (2011) and Total G.W. Resources (2009) prepared by CGWB, NER.

It was decided that the suggestions as made here in above may be given due attention in the next estimation.

Currently, the assessment of Dynamic Ground Water Resources, as on March, 2011, has been prepared for 27 districts of Assam. The net dynamic ground water resources available is 25.79 BCM (2011), the allocation for domestic and industrial uses upto the year 2025 is 0.78 BCM, where as the ground water draft for all uses is 3.49 BCM. The net ground water resources for future irrigation uses are 22.14 BCM. The stage of ground water development is 14% and all districts are falling under Safe category.

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While computing the Total In storage Ground Water Resource, the drilled depth up to 300 m bgl has been considered. Fresh In storage ground water resources of Assam has been computed as 252.98 BCM (2009) and total ground water resource up to 300 m bgl is 280.80 BCM.

The above Ground water resources estimate for the state of Assam is approved by the State Level Standing Committee of Assam.

(T.C. Das)
Secretary, Irrigation
Govt. of Assam
& Chairman, SLSC

(D. Bhattacharjee)
Dy. Secretary,
Water Resources Dept,
Govt. of Assam

(K.K. Gohain)
Chief Engineer,
Irrigation Department
Govt. of Assam

(A.J. Bordoloi)
Suptd, Engineer
Public Health Engineering Department,
Govt. of Assam

(K.K. Choudhury)
Suptd.Engineer
Dept,Department of Agriculture,
Govt. of Assam

(U.Gogoi)
Regional Director
CGWB, NER, Guwahati

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BIHAR

Minutes of the 3rd meeting on State Level Committee for finalisation of Replenishable Ground Water Resources held on 29 July 2012

The 3rd meeting of State Level Technical Committee for Dynamic/Replneshible Groundwater Estimation -2011 for the state of Bihar was held on 19.07.2012 under the chairmanship of the Secretary, Minor Water Resource Department, Govt of Bihar, in the official chamber of the Regional Director, Central Ground Water Board, Mid-Eastern Region, Patna. The committee members from different organisations, who attended the meeting, are as below;

1. Dr. Deepak Prasad, Secretary, Minor Water Resource Deparment, Govt. of Bihar
2. Dr. D. Saha, Regional Director, CGWB, MER, Govt. of India
3. Rambali Chaudhary, Aggriculture Department, Govt. of Bihar
4. Dr. Abdul Islam, ICAR, RCER, Patna
5. Kishore Kumar, Director, Ground Water Department, Govt. of Bihar
6. R. P. Mauli, Chief Engineer, Minor Water Resource Department, Govt. Of Bihar
7. Mohan Prasad, Manager, NABARD, Patna
8. K. Kumar, Ground Water Directorate, Govt. of Bihar
9. R. P. Singh, Senior Statistical Asstt. Groundwater Directorate, Govt. of Bihar
10. S.K. Mishra, Senior Engineer, Minor Water Resource Department (MI), Govt. of Bihar
11. S. Sahu, Sc-C, CGWB, MER, Govt. of India
12. S. S. Purty, ScB, CGWB, MER, Govt. of India.

The meeting started with the welcome address by Dr. D. Saha, Regional Director, CGWB, MER, Govt. of India. The method approved by SLTC for GW estimation, salient feature and findings were delivered by Sh. S. Sahu, Sc-C, CGWB, MER, Patna. The discussions were held on the results of Replenishable Groundwater Estimation-2011. The salient features of the Estimation are as below.

				2011
1.		Geographical Area of the state	:	94163 Sq. km
		Total assessment area (after deducting hilly area)		90307 Sq. km
2.		No. of Assessment Units	:	533 Blocks
		Groundwater Recharge		
3.	(a)	Recharge During Monsoon Period	:	23.49 BCM
	(b)	Recharge During Non-Monsoon Period	:	5.84 BCM
	(c)	Total Annual Groundwater Recharge	:	29.34 BCM
4.		Net Groundwater Resource	:	26.87 BCM
		Groundwater Draft		
5.	(a)	Groundwater Draft for All Uses	:	11.95 BCM
	(b)	Groundwater Draft for Irrigation	:	10.25 BCM
	(c)	Groundwater Draft for Domestic & Industrial Water Supply	:	1.70 BCM
		No. of Block Categorised Under		
7.	(a)	Safe	:	522
	(b)	Semi-Critical	:	11 (see overleaf)

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List of semi-critical blocks as on 31st March 2011

SN	District	Block	Stage of GW Development (%)
1	Arwal	Kurtha	84.6
2	Begusarai	Birpur	92.4
3	Begusarai	Naokothi	97.5
4	Gaya	Gaya Sadar*	76.1
5	Muzaffarpur	Mushahari	93.5
6	Nalanda	Naganausa*	95.8
7	Nalanda	Rajgir*	72.1
8	Patna	Sampatchak	82.1
9	Patna	Masaurhi	83.1
10	Nawada	Meskaur*	77.4
11	Samastipur	Tajpur	80.5

**Block categorized under semi-critical as on 31st March 2009.*

The results of the estimation where the above mentioned 11 block have been categorised as 'semi-critical' were agreed upon and approved by the committee.

Besides above, discussions with the Secretary, MWRD, Govt of Bihar, were held on various issues of groundwater in the state and the mutual cooperation required between Ground Water Directorate, Govt. of Bihar and Central Ground Water Board, Patna, Ministry of Water Resources, Govt. of India. The following recommendations were made by the Secretary, MWRD, Govt. of Bihar.

1. Ground water development plan and the well design for different parts of the state are to be prepared in consultation with CGWB.
2. CGWB to provide the modalities for issuing NOC to industries in the state.
3. A request to be sent to the Secretary, MWRD, Govt. of Bihar, regarding the cooperation and the involvement required from the state government office in the aquifer mapping project.
4. One nodal officer is to be assigned to attend meeting every Thursday in the chamber of Secretary, MWRD, Govt. of Bihar. Preferably, Regional Director, CGWB, MER, Patna, is invited to attend the meeting.
5. Regarding Hydrograph Network monitoring, the work of CGWB and GWD, Govt. of Bihar should be done in close co-ordination.

D. Saha 19/7/12
(D. SAHA)

9.9.12

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2nd meeting of SLTC for Replenishable Ground Water Resource Estimation-2011 for the State of Bihar
UNDER CHAIRMANSHIP OF SECRETARY, MINOR WATER RESOURCE DEPT. GOVT. OF BIHAR

Date: 19th July 2012

Venue: Office of the Regional Director CGWB, MER, Patna

Sl No	Name & Designation	Department	Signature
1.	Dr Deepak Prasad, Secy.	Dpt of MWRD, GOB	19.7.12
2.	Ramasali Chaudhary	Dy. Dir. Agri. Deptt.	19/7/12
3	Dr Aduul Islam	ICAR RCER, Patna	
4.	Kishore kumar	Director GWD Bihar	
5	R.P. Mahli	C.E MWRD, patna	
6	Mohan Prasad	Manager, NABARD, Patna	19.7.12
7	K. Kumar	Ground water Director (Hydrologist)	19.7.12
8	R.P. Singh	Senior Statistical Asst Groundwater Directorate	19.7.12
9.	S. K. Mishra	S.E. MWRD(M2)	19.7.12
10.	D. SAHA	CGWB)	D.S.A
11.	SS PURTY Sc-B	CGWB	19/7/12
12.	Dr. R. Sinha, Sc-'B'	CGWB	19.7.12
13.	S.N. Dwivedi, Sc-C	CGWB	19/7/12
14.	D. G. Dastidar	CGWB	19/7/12
15.	Seal illegible	CGWB	19/7/12

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CHHATTISGARH

MINUTES OF SECOND MEETING OF THE STATE LEVEL GROUND WATER RESOURCE ESTIMATION COMMITTEE.
Held on 30.07.2012

The second meeting of the State Level Ground Water Resource Estimation Committee was held in the office chamber of the Principal Secretary, Water Resources on 30th July' 2012 at 5.00 PM. The meeting was chaired by Shri N.K.Aswal, Principal Secretary (WRD), Govt. of Chhattisgarh. The meeting was attended by representatives from CGWB, Water Resources Department, Public Health Engineering Department and Department of Agriculture,. The list of participants attended the meeting is appended in Annexure-I.

At the outset of the meeting, Shri N.K.Aswal, Principal Secretary (WRD), Govt. of Chhattisgarh & Chairman of meeting of State Level Ground Water Resource Estimation Committee welcomed all the members and requested the Regional Director to give a brief introduction about the work done for Dynamic Ground Water Resources of Chhattisgarh State (As on March'2011.

Shri K.C.Naik, Regional Director, CGWB, NCCR, Raipur as the Member Secretary gave a brief introduction about the gist of the report on 'Dynamic Ground Water Resources of Chhattisgarh State (As on March'2011).

Shri A.K.Patre, Scientist 'C', CGWB.NCCR, presented the salient features of the report and highlighted the variations in the stage of development in the assessment of 2009 and 2011.

Shri S.K.Verma, Scientist 'C', CGWB.NCCR explained the criteria of categorisation of the blocks. He informed the committee that in the earlier assessment of 2009 there were 14 blocks falling under semi-critical category but as per assessment of 2011 there are 18 blocks in semi-critical, 2 blocks in critical and 1 block in over exploited categories.

Shri N.K.Aswal, Principal Secretary (WRD), Govt. of Chhattisgarh & Chairman of meeting of State Level Ground Water Resource Estimation Committee expressed his concern over the increasing number of semi-critical, critical and over exploited blocks and he advised the committee to suggest suitable necessary measures to be taken up in these blocks. The committee unanimously agreed on the following measures.

1. All the Central and State Govt. Departments like Water Resources Department, Watershed Development Department, Forest Department, Public Health Engineering

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Department, Rural Development Department etc involved in ground water sector should give priority for implementation of ground water conservation and artificial recharge schemes in these blocks.

2. All the district collectors of concern districts may be requested to give priority to these blocks while implementing any schemes on water conservation and augmentation.
3. Farmers should be discouraged to go for further construction of ground water abstraction structures.
4. While sanctioning loan for construction of ground water abstraction structures the loan sanctioning agencies may consider the categorisation criteria in these blocks.
5. Withdrawal of ground water by industries for industrial use should be discouraged.
6. Mass awareness programmes on ground water conservation, protection, development and management should be conducted in theses blocks on priority.

All the members of the State Level Ground Water Resource Estimation Committee appreciated the work carried out by State Ground Water Department, Govt. of Chhattisgarh & Central Ground Water Board, Govt. of India for bringing out the report on 'Dynamic Ground Water Resources of Chhattisgarh State (As on March'2011'**which will be helpful for proper development and management of ground water resources in the state of Chhattisgarh and finally the committee approved the report**

The meeting ended with a vote of thanks to the chair.

Approved by

Principal Secretary, WRD Govt of Chhattisgarh
& Chairman of State Level Ground Water
Resource Estimation Committee

Officer on Special Duty
Water Resources Department,
Mantralaya, Raipur

MINUTES OF MEETING OF STATE LEVEL TECHNICAL ADVISORY COMMITTEE HELD ON 18.02.2013 AT THE COMMITTEE ROOM OF DEPARTMENT OF URBAN DEVELOPMENT, DELHI SECRETARIAT

The fourth meeting of the State Level Technical Advisory Committee (SLTAC) was held under the Chairmanship of Secretary, Department of Urban Development, GNCTD on 18.02.2013 in the Committee Room of Department of Urban Development, Delhi Secretariat. The following were present:-

1. Dr. Anil Kumar, Director, Department of Environment
2. Sh. Harish Chander, Executive Engineer (RWH), DJB
3. Sh. S.L.S. Yadav, Director (M), PWD
4. Sh. A.D. Rao, Member Secretary & OIC, CGWB Delhi

1.0. Chairman welcomed all present in the meeting. The agenda circulated for meeting was next discussed item by item as follows:-

1.1. **Agenda item No.1**

Approval of the report on Dynamic Ground Water Resources of NCT Delhi as on March 2011

Sh. A.D. Rao, Superintending Hydrogeologist, CGWB and Member Secretary (SLTAC) apprised the Committee about the outcome of the latest assessment of the Dynamic Ground Water Resources of Delhi computed by CGWB, Delhi State Unit Office with base year 2010-11. Member Secretary informed that as per the above assessment, except in two tehsils viz. Daryaganj and Civil Lines, all other tehsils of Delhi are falling in the Critical and Over-exploited category. The Dynamic / Replenishable Ground Water Resources of the State of Delhi stands at 0.287 BCM as on March, 2011.

The Committee approved the above Report on Dynamic Ground Water Resources of NCT Delhi as on March' 2011.

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1.1. **Agenda item No.2**

Approval of the report (revised) on Total Ground Water Availability in NCT Delhi as on March 2009

The total Ground Water Resources of the State has been assessed earlier in the month of March'2012 and approved by the SLTAC on 28.03.2012. Sh. A.D. Rao, Member Secretary informed that as per revise guidelines suggested by Central Level Expert Group it has been re-assessed in the month of Nov'2012.

The fresh in storage ground water resources below the depth of water level fluctuation zone is estimated to be 1.248 BCM of which 1.242 BCM is in alluvial areas and 0.006 BCM in Hard Rock areas. Thus the total fresh ground water resources available in the State come to 1.535 BCM. Additionally, 1.264 BCM saline water is available below the fresh water zone. In previous estimation the total fresh ground water resources was estimated 1.558 BCM. So the change in Total fresh Ground Water Availability with respect to the earlier estimation is 0.023 BCM.

The Committee approved the above Report on Total Ground Water Availability in NCT Delhi as on March' 2009.

2.0. The meeting ended with a vote of thanks to the Chair.

(A.D.Rao)
Member Secretary &
Officer-in-Charge
Central Ground Water Board
State Unit Office
New Delhi

Copy to:-

1. Superintending Engineer (Planning Water), DJB, Room No.207, Varunalaya Phase-II, Jhandewalan, Karol Bagh, New Delhi-110005
2. Director, Department of Environment, Govt. of NCT Delhi, C Wing, 6th Level, Delhi Secretariat, I.P. Estate, New Delhi-110002

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3. Superintending Engineer (PH), N.D.M.C, Civil Engineering Department Palika Kendra, Sansad Marg, New Delhi
4. Superintending Engineer (Design II), DDA, Central Design Office, 14th floor, Vikas Minar, New Delhi-110002
5. Director (Monitoring), PWD Govt. Of NCT Delhi, 12th floor, MSO Building (Delhi Police Head Quarter Building), ITO, New Delhi
6. Superintending Engineer, Irrigation & Flood Control, Opposite ESI Hospital, Basaidarapur, New Delhi
7. Superintending Engineer (TAS), CPWD, Nirman Bhawan New Delhi
8. Joint Director (Agriculture), Development Department, 5/9 Under Hill Road, Delhi-110054
9. Dr. Anil Kumar, Director, Department of Environment
10. Sh. Harish Chander, Executive Engineer (RWH), DJB
11. Sh. S.L.S. Yadav, Director (M), PWD

Copy for Information to:

1. PS to Secretary, Urban Development Deptt, Govt. of NCT Delhi, C Wing, 9th floor, Delhi Secretariat, New Delhi-110002
2. PA to Special Secretary (Water), Urban Development Deptt, Govt. of NCT Delhi, C Wing, 9th floor, Delhi Secretariat, New Delhi-110002

(A.D.Rao)
Member Secretary &
Officer-in-Charge
Central Ground Water Board
State Unit Office
New Delhi

GUJARAT

Minutes of the meeting with the Secretary (WR) Narmada Water Resources, Water Supply and Kalpsar Department on 31/01/2013 at 10.30 Hrs in the Committee Room of N, WR, WS & K department, Block No-9, Secretariat, Gandhinagar

A meeting was held with the Secretary (WR) Narmada Water Resources, Water Supply and Kalpsar Department on 31.01.2013 at 10.30 Hrs in the Committee Room of N, WR, WS & K Department, New Sachivalaya, Block – 9, Gandhinagar. Following members of the State Level Committee attended the meeting.

1	Shri S J Desai – Secretary(WR) Narmada , Water Resources, Water Supply & Kalpsar Department - **Chairman**
2	Shri O T Gulati, Chief Engineer & Additional Secretary, Water Resources, Water Supply & Kalpsar Department - **Member**
3	The Director (Agriculture), Directorate of Agriculture, Gandhinagar-**Member** Shri S. J. Solanki, Joint Director (Agri): Representative
4	Shri A.N.Mistry, The Managing Director, GWRDC Ltd – **Member**
5	The Chief General Manager NABARD-**Member** Ms. Meenakshi Gosain, Asst Manager, NABARD: Representative
4	Shri C. Paul Prabhakar – Regional Director (I/c) – **Member Secretary**

The list of all officers along with the members of State Level Committee is given in Annexure - I

The minutes of the meeting are as follows.

1. Shri C. Paul Prabhakar, Regional Director (I/c) welcomed all the members present in the meeting. With the permission of the Chair. Sri P R Gupte Scientist-C, made the presentation regarding the Dynamic Ground Water Resources of Gujarat as on 31st March 2011 and Total Availability of Ground Water Resources (static) of Gujarat as on March 2009 duly modified as suggested in previous meeting held on 01.11.2011.
2. Shri O T Gulati, Chief Engineer (Panchayat) and Additional Secretary pointed out that in many talukas of North Gujarat and Kachchh region, both marginally brackish quality aquifer and relatively fresh groundwater aquifer are sandwiched between saline aquifers or underlain by brackish to saline aquifers are also being developed. The resources of such areas should not be termed as either brackish or saline.
3. It was pointed out that 40% area of Gujarat State have inferior quality of ground water. Moreover it was opined that the present data base in respect of

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saline talukas is inadequate and it needs to be improved with establishment of close monitoring network and field checks, so that adequate data can be generated which in turn will help in improvising the estimates of ground water resources. In this context, it was also suggested that there should be sub categorization of the saline areas in to coastal salinity, desert salinity, inherent salinity etc. Accordingly, optimum no. of observation stations has to be worked out keeping in view the geology, hydrogeology, aquifer geometry to ascertain this sub-categorization of the saline areas.

4. Sh. O.T.Gulati, Chief Engineer (Panchayat) & Additional Secretary and Sh. S.J.Solanki, Jt. Director-Agriculture suggested that in future, the resource estimation of the saline areas may be further classified in terms of TDS value and depicted in the maps for proper understanding of the ground water quality.
5. It was further suggested to take up following studies:

    a. To keep track of the trends in ground water development in the areas where rapid developmental activities are taking place and caution is to be issued where situation is rapidly deteriorating.
    b. The change in water quality (improvement/deterioration) over a period of time may be studied in canal command and Artificial recharge project areas in detail.
    c. An extensive study covering all the assessment units in terms of quantity and quality of ground water should be carried out.

Gujarat Water Resources Development Corporation Ltd., Govt. of Gujarat should take up the studies as mentioned in a time frame manner and should come out with a report on the same.

6. The reports on Dynamic Water Resources of Gujarat state as on 31st March 2011 and Total availability of Ground Water Resources as on 31st march 2009 was approved by the State Level Committee.
7. The Meeting ended with vote of thanks.

Secretary (W.R.)
Narmada, Water Resources,
Water Supply & Kalpasar Deptt.,
Sachivalaya, Gandhinagar.

Minutes of the meeting of State Level Committee for Estimation of Ground Water Resources Potential held on 29.01.2013 under the chairmanship of Sh. Roshan Lal, IAS, Principal Secretary to Govt., Haryana, Agriculture Department.

The list of participants is enclosed.

2. At the very outset, the Chairman welcomed all the participants and asked the Regional Director, CGWB to initiate the discussions on the subject.

3. Regional Director, Central Ground Water Board dwelt upon the methodology adopted in estimation of current Ground Water Resource Potential in Haryana as on 31st March, 2011. The Ground Water Resources had been worked out on the basis of the Guidelines of the Groundwater Estimation Committee-1997 jointly by the CGWB, NWR, Chandigarh and Ground Water Cell of Agriculture Department, Haryana.

4. Dr. Shailendra Singh, Assistant Hydrogeologist made a brief presentation on the resource assessment methodology, norms used for various parameters and results of the assessment. It included comparison with last assessment as on 31st March, 2009. It was informed that in the current Ground Water Resource Potential for Haryana as on 31st March, 2011, 71 Blocks fall under Over-exploited, 15 Critical, 07 Semi-critical and 23 Safe categories.

5. The members of the committee discussed at length the various issues related to the ground water quality like occurrence of Fluoride, Arsenic etc, which needed to be incorporated in the report. The same

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was clarified mentioning that GEC 1997 Methodology did not cover these aspects but only the ground water worthy area i.e. fresh and marginal (up to 6000 EC) was considered for the calculations of water resource. However, the saline areas calculations are separately given in the report. Regional Director, CGWB replied that PHED department should get the water samples collected and analyzed every year for the above components as these constituents get concentrated over the period due to decline of water table. He further informed that the report on ground water quality can be collected from his office.

6. The Chairman enquired from the representative of NABARD whether Banks provide loans for the installation of the tubewells in the Over-exploited blocks of the State or not. The officers from NABARD replied that no re-finance was being provided to Banks by NABARD for installation of tubewells in the critical and over-exploited blocks of the state, whereas Private Banks were perhaps providing such loans. Chairman desired that the case for complete ban for such financing in the above restricted areas should be taken up with the Government.

7. After detailed deliberations, the House approved the Draft Report on Dynamic Ground Water Resources as on 31st March, 2011 for Haryana.

The meeting ended with a vote of thanks to the Chair.

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LIST OF PARTICIPANTS

Sr. No.	Name S/Shri	Designation & Department
1.	Manpal Singh	Chief Engineer, Public Health Engineering Department
2.	A.K.Gupta	Chief Engineer, Irrigation Department
3.	Birendra Singh	Chief Engineer, Command Area Development Authority,
4.	A. K. Bhatia	Regional Director, Central Ground Water Board
5.	S. C. Maan	Sr. Scientist, Haryana Pollution Control Board
6.	Ashwni Gupta	Additional Director, Industries Department
7.	J.P.Singh	Project Director, Hisar Agriculture University
8.	R.K.Jhorar	HOD (SWE), Hisar Agriculture University
9.	P. K. Garg	DGM (IA), Haryana State Industrial & Infrastructure Development Corporation
10.	K.Subramanian	NABARD, Chandigarh
11.	A.K.Rayberman	NABARD, Chandigarh
12.	Rajiv Bansal	Executive Engineer, Irrigation Department
13.	R.K.Mehta	Joint Director, Rural Development Department
14.	S.M.Vig	Assistant Secretary, Haryana State Cooperative Agricultural & Rural Development Bank Ltd.
15.	Sanjiv Chadha	Hydrologist, Ground Water Cell
16.	Dr. Shailendra Singh	AHG, Central Ground Water Board

HIMACHAL PRADESH

Minutes of 4th Meeting of "State Level Standing Committee on Ground Water Resource Assessment in State of Himachal Pradesh"

4th meeting of State Level Standing Committee on Ground Water Resource Assesment was convened on 21st March, 2013 at 11.00hrs at Committee Hall, Armsdale building, H. P. Secretariat, Shimla under the Chairmanship of Shri Vineet Chawdhry, Principal Secretary, I&PH, Govt of Himachal Pradesh. The list of participants is given in Annexure-I.

At the outset of the meeting, the Member Secretary & Head of Office, Central Ground Water Board, Dharamsala welcomed the members and with the permission of the chair started the proceedings by presentation explaining the details of the Dynamic Ground Water Resource Estimation as on March, 2011 taken up by Central Ground Water Board in co-ordination with State Ground Water Organization, I&PH Deptt., Himachal Pradesh. The discussions held and decisions taken during the meeting are as under:

1. Engineer-in-Chief, I&PH Deptt. suggested that water level data of piezometers installed by I&PH Deptt. under Hydrology Project-II may be reflected in the report for computation of Dynamic Ground Water Resource. CGWB has suggested that for the computation of water level trend, long term data is required, as these piezometers are being monitored since January, 2010 onward, therefore it was suggested that pre & post-monsoon water level data may be considered for computation of water level fluctuation for the assessment year, 2010.
2. Engineer-in-Chief, I&PH Deptt. informed that latest census data of 2011 has been published by Directorate of Census Operations, Himachal Pradesh and suggested to incorporate the latest census data in the report.
3. Assistant Manager, NABARD has pointed out that the No. of wells for domestic draft in Indaura valley, Distt. Kangra and Paonta valley, Distt. Sirmaur is lesser as compared to the data of 2009. I & PH Deptt. clarified that the some of the wells for domestic draft shown in 2009 are being used for irrigation as well as domestic purpose as on March 2011.
4. CGWB has requested the State Ground Water Authority, I&PH Deptt. to notify the over exploited valley areas as per the latest Ground Water Resource Estimation report.

I&PH Deptt has agreed to verify the total number of industrial tube wells in Kala Amb valley, Distt. Sirmaur.

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5. Chairman cum Principal Secretary, I&PH advised to submit the action taken note on the decision taken during the last meeting on artificial recharge schemes. Meeting ended with the vote of thanks to the chair.

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Annexure-I

The list of the Officers who attended the 4rd Meeting of "State Level Standing Committee on Ground Water Resource Assessment in State of Himachal Pradesh" on 21.03.2013 at Shimla

1. Sh. Vineet Chawdhry, Principal secretary (I&PH) - in Chair
2. Er. R.K.Sharma, Engineer –in –Chief IPH Deptt., Himachal Pradesh.
3. Er. R.P. Tandon, Chief Engineer, IPH Deptt, Shimla Zone,
4. Er. H.S. Kanwar, Chief Engineer (D&M), IPH Deptt., Shimla.
5. Er. Rakesh Bhakshi, S.E., P & I-I, IPH Deptt., Shimla.
6. Sh. Kuldeep Singh Mandhortra, Sr. Hydrogeologist (IPH).
7. Er. Ashwani Kumar, Divisional Engineer, Directorate of Agriculture, Shimla.
8. Sh. Jitendra Sangta, Jt. Director cum Deputy Secy, Rural Development Deptt.
9. Sh. R.C. Gupta, Asstt. Engineer, Director of Urban Development, Shimla.
10. Sh. Amit Pandey, Astt. Manager, NABARD, Shimla.
11. Sh. Shailendra Padiyan, Astt. Manager, NABARD, Shimla.
12. Sh. Shyam Rattan Dikshit, STA, I&PH Deptt, Shahpur, Distt Kangra.
13. Sh. Dalel Singh, Head of Office, CGWB, NHR, Dharamshala.
14. Sh. Vidya Nand Negi, Scientist 'C', CGWB, NHR, Dharamshala.

JAMMU & KASHMIR

Minutes of Meeting of State Level Committee to Estimate the Ground Water Resources for Jammu and Kashmir State, held on 10.01.2013.

A meeting of State Level Committee (SLC) on estimation of the Ground Water Resources for Jammu and Kashmir State was held under the Chairmanship of Commissioner Secretary, Public Health Engineering and Irrigation & Flood Control Department, Government of Jammu and Kashmir, on 10th January, 2013 at 1700 hrs in the Chamber of Commissioner Secretary. Following Members attended the meeting

1. Sh. Ashwini Sharma, Chief Engineer, Public Health Engineering, Jammu.
2. Sh. Mir Javed Jaffar, Chief Engineer, Public Health Engineering, Kashmir.
3. Sh. K. K. Gupta, Chief Engineer, Irrigation & Flood Control, Jammu.
4. Sh. A. Muzaffar Lankar, Chief Engineer, Irrigation & Flood Control, Kashmir.
5. Sh. F. A. Khan, Director Geology and Mining, J & K.
6. Sh. S.S. Shafi, Joint Director, Planning, PHE & I&FC, J&K
7. Dr. S. S. Jamwal, Joint Director, Agriculture, Jammu –represented Director Agriculture, Jammu.
8. Sh. S. R. Kalgotra, Joint Director, Agriculture, Kashmir –represented Director Agriculture, Kashmir.
9. Sh. V. D. Bohra, Deputy General Manager, NABARD, Jammu – represented General Manager, NABARD.
10. Sh. Manoj Shrivastava, Regional Director, Central Ground Water Board, Jammu
11. Sh. N. R. Bhagat, Scientist D, Central Ground Water Board, Jammu.
12. Ms. Priya Kanwar, Scientist, CGWB, NWHR, Jammu.

The Commissioner Secretary, asked the Regional Director, to introduce himself to the members of the SLC. The Regional Director introduced himself and explained the concept of Dynamic and In-storage ground water resources and salient features of estimation of ground water resources, to the members of the committee. A small presentation on the Total Ground Water Resources (as on March 2009) and the Dynamic Ground Water Resources (as on March 2011) of Jammu and Kashmir State was made.

All the members deliberated on the methodology of estimation of ground water resources. Sh. Mir Javed Jaffar, Chief Engineer, Irrigation and Flood Control, Kashmir pointed that the estimates appeared to be on lower side as compared to Jammu Region, then Regional Director explained that because of low rainfall and non availability of rains to recharge the aquifer was the reason for such difference.

Commissioner Secretary pointed out that the resources may be further refined along with the surveys being carried out on the scale of 1:50,000 and subsequently on the scale of 1: 10.000.

(Action: Regional Director, CGWB, Jammu)

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Regional Director also explained the work undertaken in the National Aquifer Mapping Program which is being carried out in the XIIth plan on the scale of 1:50,000 and the same will be incorporated in the Dynamic and Total Ground Water Resources as on March 2013.

DGM, NABARD pointed out the need of State Ground Water Department to develop and manage te Ground Water Resources of Jammu and Kashmir State. Commissioner Secretary asked Sh. S. S. Shafi to initiate the proposal of Ground Water Department in Jammu and Kashmir State. He also inquired about the state having a good Ground Water Department with suitable infrastructure and working with a similar physiographic set-up as that of Jammu and Kashmir. The Regional Director also emphasized that the Aquifer Management Plan can only be implemented with the existence of a State Ground Water Department and suggested State Ground Water Department of Maharashtra, Punjab and Uttarakhand can be considered to devise the set up of the Ground Water Department in Jammu and Kashmir. Regional Director further informed the members that under National Aquifer Mapping Program, Central Ground Water Board can provide a lot of hand holding support in the field of capacity building, infrastructure development and organizing training courses.

(Action: Joint Director, Planning, PHE and I&FC)

The point-wise agenda items were taken up, after the presentation and the total ground water resources of J&K as on March 2009 and dynamic resources as on March 2011 were approved by the committee.

Under the last agenda item the Regional Director pointed out that the existing PHED tube wells, do not have provision of water level monitoring and having such a provision would go a long way in monitoring of ground water situation in the state. Commissioner Secretary advised the Chief Engineers of PHED Kashmir and Jammu to have such provision built in the cost estimates of all the PHED tube wells to be drilled in future.

(Action: Chief Engineers, PHE, Kashmir and Jammu)

Regional Director further requested all the members to nominate the officers in the Orientation Training Program (Tier-II) of Central Ground Water Board. Members of State Level Committee assure to send the nominations in 7-10 days time.

(Action: All Members of SLTC)

The meeting ended with vote of thanks to the chair.

(Manoj Shrivastava)
Regional Director &
Member Secretary (SLTC)

JHARKHAND

MINUTES OF THE 2nd MEETING OF STATE LEVEL COMMITTEE OF RE-ASSESSMENT OF DYNAMIC GROUND WATER RESOURCE OF JHARKHAND STATE FOR THE YEAR 2009- 2011 HELD ON 1st AUGUST 2012.

Second meeting of the State Level Committee of re-assessment of dynamic groundwater resource of Jharkhand state for the year 2009-2011 was held on 1st August 2012 in the chamber of the Special Secretary, Water Resources Department, Government of Jharkhand, in Nepal House, Ranchi. The list of the participants attending the meeting is attached. The Special Secretary, Water Resources Department, Government of Jharkhand, welcomed the members and reviewed on the action taken on different agenda put up during first meeting.

Shri S.N.Sinha, Officer in Charge, CGWB, SUO, Ranchi briefed about the dynamic resources of Jharkhand (2009-11) jointly worked out by Central Ground Water Board and Ground Water Directorate. The committee members were asked to give their opinions and suggestions on the findings of the re-assessment of dynamic groundwater resource of Jharkhand state for the year 2009-2011.

Discussions on various agenda items were held is as below:

Agenda 1 Close monitoring of categorized blocks

Special Secretary recommended to keep the close monitoring of over-exploited and Semi-Critical blocks of Jharkhand. The committee fully agreed to the point.

Agenda 2 Uploading in the Web site.

Special Secretary recommended that in simple language the brief write up of the findings of dynamic groundwater resource of Jharkhand state for the year 2009-2011 may be uploaded in Web site of Water Resources Department to make aware the layman about ground water resources. It would be uploaded once approved by CHQ, Faridabad.

Agenda 3 Awareness among peoples

As pointed out by Shri Mahadev Singh, Ex.Engineer, MI, WRD, the Special Secretary recommended for initiation should be taken to aware people about the status of ground water in Jharkhand.
Mass awareness programme in over-exploited and semi-critical blocks may jointly be organised by CGWB and Water Resources Department, Government of Jharkhand to bring awareness among layman and students.

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ATTENDANCE SHEET

The Second meeting of State Level Committee of re-assessment of dynamic groundwater resource of Jharkhand state for the year 2009-2011 on 1st August 2012 in the chamber of the Principal Secretary, Water Resources Department, Government of Jharkhand.

Sl.No.	Name	Designation	Department	Signature
1.	B. C. NIGAM	Spl Secy WRD	WRD, Jharkhand	1/8/12
2.	R. P. SINGH	Director, Soil conservation Jh. Ranchi	Ag. Deptt	1/8/2012
3.	G. K. ROY	Scientist-D	CGWB	
4.	R. A. Kujur	Scientist-C	CGWB	
5.	T. B. N. Singh	Scientist-C	CGWB	01/08/12
6.	Madhav Singh	Executive Engineer	(Minor Irrm) W.R. Deptt	01/8/12
7.	Ashok Kumar	Chief Engineer (Marketing) JUNIDCO	WRD	1/8
8.	N. K. Roy	Consultant-I	WRD	1/8/12
9.	S. L. S. Jageshwar	Director	GWI WRD	1/8/12
10.	M M Behera	AGM	NABARD	1/8/12
11.	Sunil Toppo	Sc - B	CGWB	01/08/12
12.	K. Ramesh Reddy	Sc. 'B'	CGWB	01/08/12
13.	Y. N. Mishra	Consultant (MI)	GoJ, WRD	01/08/12
14.	S. N. Sinha	Sc 'D'	CGWB	
15.				
16.				
17.				
18.				

KARNATAKA

Minutes of the State Level Committee meeting for Estimation of Dynamic Ground Water Resources of Karnataka held on 26-06-2013 in Vikas Soudha, Bangalore

The Meeting of the State Level Committee constituted vide Government Order No.MID5AaJaAa2012 Bangalore, dated 25th May, 2012 for reconciliation of the Dynamic Ground Water Resources as on March, 2011 was held on 26-06-2013 in Vikas Soudha, Bangalore. The meeting was chaired by **Sri.P.N.Sreenivasachary, Principal Secretary, Water Resources (MI), Govt. of Karnataka,** and was attended by the following Members:

S.No	Name & Designation (S/Sri)	Department/Organisation
1	P.N.Srinivasachary, IAS Principal Secretary	Water Resources (MI), GOK Chairman of the Committee
2	M.Maheshwara Rao, IAS Comm. of Indl. Dev & Director	Industries & Commerce, GOK & Member of the Committee
3	Dr.K.Md.Najeeb, Regional Director	Central Ground Water Board, SWR,Govt. of India, Bangalore, Member Secretary of the Committee
4	P.Venugopal, Addl. Director(GW)	Mines & Geology Deptt., GOK, Member
5	Jyothis Jagannadh, AGM	NABARD, Member
6	Prabhakar, H.Chini,Chief Engineer	PRED, GOK, Member
7	S.B.Siddagangappa,Chief Engineer	Minor Irrigation (North), Member
8	Ramakrishna, H.R.	WRDO, GOK, Member
9	B.S.Govindaraj, DCE	KUWS&DB, Member
10	M.T.Rajashekharaiah, EE(D), CE	Minor Irrigation(South) CE Office, Member
11	C.I.Ashok, Dy.Director	Mines & Geology Deptt., GOK
12	K.C.Siddappa, Under Secretary	Minor Irrigation Department
13	Dr.K.R.Sooryanarayana, Sc.'D'	Central Ground Water Board, SWR, GOI, Bangalore
14	J.Sivaramakrishnan, AHG	Central Ground Water Board, Bangalore
15	A.S.Umashankara	Mines & Geology Deptt., GOK

Dr.K.Md.Najeeb, Regional Director, Central Ground Water Board, Bangalore & Member Secretary welcomed the gathering and presented the Ground Water Resources, reconciled with the Mines & Geology Deptt., estimated as on March, 2011. He has explained the background highlights of the methodology and improvement and deviations from the suggested norms in the methodology, and the reasons for such deviation considering the ground reality wherever the case may be. The Committee after deliberations has approved the Dynamic Ground Water Resources of Karnataka as on March, 2011 and the figures of the estimation are as below:-

PARTICULARS	As on March, 2011
Net annual ground water availability (HAM)	1481141
Existing ground water draft for irrigation (HAM)	858592
Existing ground water draft for domestic and industrial water Supply (HAM)	81986
Existing ground water draft for all uses (HAM)	941188
Provision for domestic and industrial requirement supply for 2025 (HAM)	106370
Stage of ground water development (%)	64
Number of OE taluks	30

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Various doubts and clarifications sought by the members during the deliberations has been properly explained and the Committee expressed satisfaction for taking higher value of 35% as the natural outflow in the coastal area due to peculiar terrain conditions and appreciated the efforts. The Chairman was inquisitive on the variations in ground water abstraction structures between 2009 & 2011 and the reasons for the same. Further, he also sought clarification on the impact of ground water conservation structures in the ground water resources of the State. He further suggested that a separate study to quantify the exact effect on the improvement of the ground water scenario in the State due to water conservation structures/interventions vis-à-vis improvement in methodology/parameters used.

Thereafter, the Regional Director, CGWB & Member Secretary has presented the total ground water resources as on March, 2009 and explained the background of the estimation viz., dynamic resource plus static resource as on 3/2009 and informed the house that it is one time exercise for arriving at total ground water resources to meet any exigencies and also informed that the static resources were arrived at, is not for development on normal years. The methodology and the norms used for estimation of the static resource was also explained and there were detailed deliberations particularly on the specific yield values to be used for hard rock terrain below the zone of fluctuation and also the thickness of the fractured zones. Sri.M.Maheshwar Rao, IAS, Commissioner of Indl. Dev & Director of Industries & Commerce enquired about the depth to which the resource has to be considered under different terrain conditions. It was explained that in general, a depth of 200m is considered except for granite and gneisses where the depth is considered as 350m in certain districts like Kolar and Bangalore.

The Committee unanimously approved the static ground water resources which works out to be 3.4 times that of dynamic resources. The salient details are furnished below:

Total resources	As on March, 2009
Total Dynamic Ground Water Resource (TDGWR)	1481003 ham
Total Static Ground Water Resource (TSGWR)	5037025 ham
Total Ground Water Resources Availability (TGWRA)	6518028 ham

The meeting ended with a vote of thanks to the Chair and other esteemed members of the Committee.

(P.N.SREENIVASACHARY)
Principal Secretary, Water Resources (M.I)
& Chairman of the Committee

KERALA

MINUTES OF THE SIXTH MEETING OF THE STATE LEVEL STANDING COMMITTEE FOR RE-ESTIMATION OF GROUND WATER RESOURCES OF KERALA, HELD ON 31.07.2012.

The sixth meeting of the State Level Standing Committee for Re-estimation of Groundwater resources of Kerala was held at 16.30 hrs in the Chamber of Principal Secretary, Water Resource Department, Govt of Kerala AT Trivandrum on 31.07. 2012. The meeting was chaired by Shri V.J. Kurian IAS, Principal Secretary (Water Resources), Govt of Kerala. The following members /invitees attended the meeting:

1.	Shri. Ashok Kumar Singh IAS, Managing Director, Kerala Water Authority, Government of Kerala.	Member
2.	Shri. K.K. Naik, Asst General Manager, NABARD, Trivandrum	Member
3.	Shri M. Rajasekhar, Joint Director, Irrigation Department, Government of Kerala	Member
4.	Dr. Dinesan V.P. Scientist, CWRDM, Kozhikode	Member
5.	B.Krishnakumari, Joint Director, Directorate of Agriculture, Government of Kerala	Member
6.	Shri K.S. Madhu, SE, State Ground Water Department, Government of Kerala, Trivandrum	Member
7.	Dr. Nandakumaran.P, Regional Director, CGWB, Kerala Region, Trivandrum	Member Secretary
8.	Shri Gopa Kumar, Hydrogeologist, State Ground Water Department, Trivandrum	Invitee
9.	Smt. T S Anitha Shyam, Scientist C, CGWB,KR, Trivandrum	Invitee
10.	Smt. Mini Chandran, Scientist C, CGWB,KR, Trivandrum	Invitee

The Chairman of the committee welcomed the members. Dr. Nandakumaran. P, Regional Director, CGWB and Member Secretary presented a copy of the report on Dynamic Ground Water Resources of Kerala (2008-09) to the Principal Secretary. The Member Secretary informed that the copies of the report shall be made available to all the Committee members.

The agenda items were then taken up for discussion.

AGENDA ITEM NO. 6.1: Assessment of Total Availability of Ground Water in Kerala as in March 2009:

Member Secretary appraised the committee on the status of assessment of the **Total availability of Ground Water Resources in Kerala as in March 2009**. The total availability is equal to the sum total of the Dynamic Ground Water Resources within the zone of water level fluctuation and the In-storage Ground Water Resources occurring below this zone. This has been assessed jointly by the Central Ground Water Board, Government of India and the Ground Water Dept., Government of Kerala as per guidelines issued by the Central Ground Water Board.

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The committee was informed that the availability of in-storage ground water resources has been assessed as the product of thickness of unconfined aquifer (granular/productive zone) below the zone of water level fluctuation, specific yield of the formation and area of the aquifer in the case of unconfined aquifers in alluvial aquifers and in weathered and fractured hard rock aquifers. In the case of confined aquifers in alluvial areas, the resources have been computed as the product of thickness of confined aquifers down to explored depth, storativity of the aquifer zone and the areal extent of the aquifer. He also mentioned that as the resources have been computed for assessment units and not for individual aquifers, certain generalizations in terms of aquifer thickness and parameters have been necessary.

As per the computations, the total availability of ground water in Kerala is of the order of 16.22 billion cubic meters (bcm), out of which the dynamic and in-storage resources are of the order of 6.03 bcm and 10.19 bcm respectively.

The committee was requested to deliberate on the methodology and details of the computation. Clarifications sought by members were provided by the Member Secretary. After detailed deliberations, the assessment was unanimously approved by the Committee and it was decided that the details of the assessment shall be sent to CGWB, Faridabad for incorporation in the national report.

Agenda Item No. 6.2: Estimation of Dynamic Ground Water Resources of Kerala (As in March 2011).

The Member Secretary informed the Committee that the **Dynamic Ground Water Resources of Kerala as in March 2011** have been assessed jointly by the Ground Water Department, Government of Kerala and the Central Ground Water Board. The methodology adopted for the estimation of resources and the final results of the computations were deliberated in detail by the committee.

- The committee was informed that the assessment has been carried out for 152 blocks of the State, including the new blocks formed during the re-organization of blocks in 2010.
- As decided during the 5th meeting of the Committee, the irrigation draft data collected from the Department of Minor Irrigation, Government of India for the 2009 estimation has been used for the current assessment due to the non-availability of current data and also due to lack of evidence indicating substantial increase in ground water extraction for irrigation on the basis of available statistics collected from the field.
- Ground water draft for domestic uses in the assessment units have been updated based on projected population.
- As per the assessment carried out, the Net Annual Ground Water Availability and Gross Ground Water Draft for all uses in Kerala are of the order of 6.07 bcm and 2.84 bcm respectively. The net Ground Water Availability for Irrigation Development has been computed as 3.07 bcm. The Stage of Ground Water Development, computed as the ratio of Gross Ground Water Draft to Net Ground Water Availability as in March 2011 is 47%.
- Based on the assessment of available resources and quantum of ground water extraction, Chittur block in Palakkad district has been categorized as 'Over-exploited'. Two blocks viz. Malampuzha (Palakkad district) and Kasargod (Kasargod district) have been categorized as 'Critical' and 23 blocks, spread over various districts except Alappuzha, Kottayam,

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Pathanamthitta and Waynad come under 'Semi-Critical' category. Remaining 122 blocks in the State fall under 'Safe' category as in March 2011.

- A comparison of the major components of dynamic ground water resources of Kerala during 2009 and 2011 indicate a marginal increase in both Net Annual Ground Water Availability and Gross Annual Ground Water Extraction for all uses. Consequently, the Net Annual Ground Water Availability during 2011 is found to be about 2% higher when compared to 2009. The stage of ground water development during the two periods remains constant at about 47%. As far as the categorization of assessment units is concerned, the number of Critical blocks has reduced from 3 in 2009 to 2 in 2011 whereas the number of Semi-Critical blocks has increased from 22 in 2009 to 23 in 2011. The number of over-exploited and critical blocks remained the same during both the assessments.

During discussions, Chairman of the Committee suggested that quality issues if any may also be indicated in the tables showing the status of ground water resource development in the blocks. Subject to this modification, the assessment of dynamic ground water resources of Kerala as in March 2011 was unanimously approved by the Committee.

Agenda Item No. 6.3: National Aquifer Mapping Program of Central Ground Water Board.

The Member Secretary informed the Committee that the Central Ground Water Board has embarked upon a major programme for micro-level mapping (on 1:50,000 or larger) of the extents and characteristics of the important aquifer systems in the country during the XII and XIII Plan periods with the principal aim of formulating comprehensive Aquifer Management Plans for their sustainable development. An area of about 20,000 sq.km in Kerala is proposed to be covered under this programme during the XII Plan period (2012-2017). Parts of Kasargod, Malappuram, Palakkad and Alappuzha districts, covering a total area of about 2000 sq.km have been taken up for the study during the current year (2012-13).

Ground water-related data generated by various agencies over the years will form valuable inputs for this ambitious venture. He requested the Committee to extend their valuable cooperation and collaboration in providing the data available especially departments dealing with water and related resources for incorporation into its aquifer database. In the ensuing discussions, Chairman of the Committee appreciated the pioneering efforts of CGWB for detailed mapping of the aquifers and expressed the hope that this will provide a sound base for taking up measures for ensuring the long-term sustainability of our precious ground water resources. He requested all members of the Committee to ensure that the data available with the respective agencies are provided to CGWB for the purpose.

The meeting ended with thanks to the Chair.

APPROVED FOR ISSUE

(V.J. KURIAN)
PRINCIPAL SECRETARY (WATER RESOURCES)
GOVT. OF KERALA

MADHYA PRADESH

Minutes of Meeting of State Level Committee for re-estimation of Ground Water Resources for approval of Dynamic Ground Water Resources of Madhya Pradesh (As on March 2011) held on 2nd April 2013

The Meeting of State Level Committee for approval of draft report on Estimation of **"Dynamic Ground Water Resources of Madhya Pradesh, as on March 2011"** was held under the Chairmanship of **Shri R.S.Julaniya**, Principal Secretary, Water Resources, Govt. of Madhya Pradesh on 02-04-2011 (4:30 PM). Following members and invitees attended the meeting.

1. Shri **M.G. Choubey**, Engineer –in – Chief, Water Resources Department, Govt. of MP.
2. Shri **S.K.Khare**, Chief Engineer, BODHI, Water Resources Department, Govt. of MP.
3. Shri **H.P.Shivhare**, Chief Engineer, Rural Engineering Services, Govt of MP.
4. Shri **Kuldeep Singh**, Asstt General Manager, NABARD.
5. Shri **A. K. Jain**, Superintending Engineer, Public Health Engineering Department, Govt. of MP.
6. Shri **C.S.Ramteke**, Superintending Engineer, Ground Water Survey Department, Bhopal.
7. Dr. **Jitendra Jain**, Resource Scientist, State Ground Water Data Centre, Bhopal.
8. Shri **R.P.Sahu**, Joint Directopr. Agriculture Department, Govt of MP, Bhopal
9. Shri **Dhiren Kumar Chavda**, Hydrogeologist, Public Health Engineering Department, Govt. of MP.
10. Shri **P.K.Jain**, Scientist 'D', CGWB, NCR, Bhopal.
11. Dr. **Seraj Khan** , Scientist 'B', CGWB, NCR, Bhopal.

Shri **Parvinder Singh**, Superintending Hydrogeologist and Head of Office, CGWB, NCR, Bhopal and Member Secretary welcomed all the committee members and invitees.

Shri, S.K.Khare, Chief Engineer, Water Resources Department, Govt of MP, Bhopal made a brief presentation on the draft report on Dynamic Ground Water resources assessment of Madhya Pradesh, jointly prepared by Ground Water Survey, Water Resource Department and Central Ground Water Board.

The report was discussed in detail, Principal Secretary, Water Resources expressed that the provision for domestic and industrial requirement for the next 25 years appears to be unusually high compared to the provisions made 2 years ago. The data was rechecked and provision for domestic and industrial requirement supply for next 25 year is corrected as 1,90,723 ham and the thus Net Ground Water Availability for future Irrigation Development comes to 13,90,050 ham. With these corrections the Report on **"Dynamic Ground Water Resources of Madhya Pradesh, as on March 2011" was approved**. The salient features of the report are as under.

Net Annual Ground water Availability	33,28,860 ham
Existing Gross Ground water Draft for Irrigation	17,48,087 ham
Existing Gross Ground water Draft for Domestic & Industrial water Supply	1,35,265 ham
Existing Gross Ground water Draft for all uses	18,83,352 ham
Provision for domestic, and industrial requirement supply to next 25 year	1,90,723 ham
Net Ground water Availability for future irrigation development	13,90,050 ham
Number of Safe Blocks	218
Number of Semi-Critical Blocks (Non Command)	67
Number of Critical Blocks (Non Command)	04
Number of Over Exploited Blocks (Non Command)	24

Principal Secretary, Water Resources, desired that the areas where water level trend is rising should be marked so that ground water development in those areas may be planned. It was decided that Central Ground Water Board will prepare a report demarcating areas having premonsoon depth to water level less than 5 meters below ground level (mbgl) and have rising water level trend.

The meeting ended with vote of thanks to the Chair.

Parvinder 10.4.13

(Parvinder Singh)
Head of Office
CGWB, NCR, Bhopal
and
Member Secretary
State Level Committee
For Re-Estimation of Ground Water Resources

MAHARASHTRA

MINUTES OF THE SECOND MEETING OF STATE LEVEL TECHNICAL COMMITTEE FOR FINALISATION AND APPROVAL OF GROUND WATER RESOURCES – 2011 OF MAHARASHTRA
Dated 28th February 2013

The Meeting of the State Level Committee for finalization and approval of the Ground Water Resource Estimation for 2011 for the State of Maharashtra was held under the Chairmanship of Shri Sunil Porwal, IAS, Principal Secretary to Govt. of Maharashtra, Water Supply and Sanitation Department (WSSD), Mumbai on 28th February 2013 at 01.00 p.m. The meeting was held at the Committee Room, WSSD, 7th Floor, GT Hospital Building, Mumbai to review, finalize and approve the Ground Water Resource Estimation of Maharashtra for the year 2011 jointly carried out by Ground Water Surveys & Development Agency (GSDA), Pune and Central Groundwater Board (CGWB), Central Region, Nagpur. The list of members who attended the meeting is enclosed (Annexure-I).

At the outset, Dr. P.K. Jain, Scientist-D, Central Groundwater Board, Central Region, Nagpur and representing Regional Director & Member Convener of the SLC welcomed the Members and gave opening remarks about the Dynamic Ground Water Resource Estimation of Maharashtra for the year 2011. He informed that the extended deadline given by CGWB, CHQ for completing the state level exercise on or before 31st December 2012 has already elapsed and the Ministry of Water Resources, GoI is pressing hard for its submission. The Member Convener appreciated the role of GSDA in completing the present exercise which involved collection of enormous data from various State Govt. agencies, and its validation by GSDA & CGWB during mammoth reconciliation exercises held in 2 phases. He informed that the first reconciliation was held during 8th to 12th October 2012 at GSDA, Nagpur wherein all the district level Officers were called and the data of all the districts was checked and verified and necessary corrections were suggested. The second reconciliation was held at GSDA, Pune from 13th to 15th February 2013 for finalization of Dynamic Ground Water Resource Estimation. He also appreciated the enthusiasm shown by GSDA in completing the assessment inspite of various difficulties for the year 2011. He also explained to the Members about the Central Government Policy of carrying out the ground water assessment every two years.

Shri Rupinder Singh, IAS, Director, GSDA, Pune informed that the department has been carrying out ground water assessment after its formation in 1973.

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Shri Shashank Deshpande, Senior Geologist, Groundwater Estimation Cell, GSDA, Pune presented the highlights of the draft report on the Groundwater Resource Assessment for 2011. He whole heartedly thanked the various departments, particularly, Agriculture, Irrigation and Water Conservation Departments at State and District level for providing the various relevant data required for the assessment well in time. During the presentation, the committee had a detailed discussion on the recharge due to rainfall, surface irrigation, canals, draft for irrigation from dug wells /bore wells and industrial draft etc.

The Principal Secretary, WS & SD and Chairman of the committee inquired about the source of irrigation borewell data and it was explained by Shri Shashank Deshpande that the 4th MI census figures or revenue data, whichever was higher was used for estimating draft for irrigation by dugwells and borewells.

Shri Vikas A. Londhe, Asstt. Chief Engineer, Water Conservation Department enquired about the reduction in recharge due to water conservation structures. Shri Shashank Deshpande informed that reduction may be due to the silting of the structures causing ultimate reduction in recharge capacity of the structures.

Shri S.B. Khemnar, Joint Director, Agriculture Dept., Pune indicated that all the talukas falling in over-exploited, critical and semi-critical category are producing cash crops based on ground water irrigation. Further he stressed that some policy measures should be taken to control the over exploitation situation in these talukas. Shri Rupinder Singh, IAS & Director GSDA explained that due care has been taken to address this issue in the Maharashtra Groundwater (Development and Management) Act 2009, which has been passed by the Legislature and has been sent to Hon'ble President of India for his assent.

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As proposed by Shri Shashank Deshpande the committee also approved the re-estimation of mini watershed wise ground water resource assessment for the over exploited and critical watersheds as per the prevailing norms.

The Committee unanimously accepted the draft report on the Dynamic Groundwater Resources of Maharashtra 2011.

It has been decided to submit the accepted resource assessment figures in national format to GoI by 15th March 2013 through Central Ground Water Board, Ministry of Water Resources.

The meeting ended with the vote of thanks from Dr. P.K. Jain, Scientist-D, CGWB, Nagpur.

MANIPUR

Reconciliation of Dynamic Ground Water Resources of Manipur as on March, 2011, and Total Ground Water Resources of Manipur as on March, 2009

Central Ground Water Board, North Eastern Region, Guwahati circulated to all the members of SLTCC, Manipur vide letter No.845/69/CGWB/NER/GWRE/2011 dated 24.05.2012 towards the reconciliation of Dynamic and Total Ground Water Resources of Manipur as on March, 2011 and March, 2009 respectively.

In this regard Regional Director, CGWB, NER, Guwahati had a meeting with Chief Engineer, IFCD, Govt of Manipur on 11th March 2013 for finalisation of the reports. He informed that since non of the members reported any reservation to the calculations done by Central Ground Water Board, North Eastern Region, same may be accepted.

As per calculation submitted by Central Ground Water Board, North Eastern Region, Guwahati, the total annual groundwater recharge in the state of Manipur is 0.44 BCM. The net groundwater availability of the state worked out 0.39 BCM after deducting the natural discharge during non-monsoon season. The existing gross groundwater draft for all uses is 0.004 BCM of which 0.003 BCM is the gross groundwater draft for irrigation use and 0.0007 BCM is the gross groundwater draft for domestic use. The over-all stage of groundwater development of Manipur is 1.02%.

Computation for Total Ground Water Resources shows that the Net Ground Water Availability and the Fresh In-Storage Ground Water Resource in Manipur State are 0.40 BCM and 2.85 BCM respectively. The Total Fresh Ground Water Availability in the State has been computed as 3.25 BCM.

The members accepted the estimated ground water resources of Manipur submitted by Central Ground Water Board, North Eastern Region, Guwahati.

Commissioner & Secretary
IFCD, Govt of Manipur, Imphal

Chief Engineer
PHED, Govt of Manipur

Chief Engineer
M.I.D, Govt of Manipur

Chief Engineer
Public Health Engg. Deptt.
Manipur

Chief Engineer
Minor Irrigation Deptt.
Govt. of Manipur

Director
Agriculture, Govt of Manipur

Director of Agriculture
MANIPUR

Director
Com. & Ind., Govt of Manipur

Director
Commerce & Industries
Government of Manipur

Regional Director
C.G.W.B, NER, MOWR
GOI, Guwahati

Chief Engineer
IFCD, Govt of Manipur

Chief Engineer
LRC Deptt., Manipur

MEGHALAYA

Shillong Dated 28th March, 2013

Minutes of the Second meeting of the State Level Committee on Ground Water Resources Assessment, Meghalaya

The Second meeting of the State Level Committee on Ground Water Resources Assessment, Meghalaya, convened for reconciliation of the Dynamic Ground Water Resources Assessment of Meghalaya (as on March, 2011) and Total Ground Water Availability in Meghalaya (as on 31st March, 2009), estimated by the Central Ground Water Board, State Unit Office, Shillong was held on 25th March, 2013 at 14:00 hrs in Room No. 317, Committee Room II, Main Secretariat Building, Shillong under the chairmanship of Smt M.H.K. Marak, Commissioner & Secretary, Govt. of Meghalaya, Water Resources, Shillong. The following members were present

1. Chief Engineer, Water Resources, Govt. of Meghalaya, Shillong.
2. Representative of the Chief Engineer, Public Health Engineering Department, Govt. of Meghalaya, Shillong.
3. Representative of the Director, Horticulture Department, Govt. of Meghalaya, Shillong.
4. Representative of the Regional Director, Central Ground Water Board, North Eastern Region, Guwahati

Initiating the deliberations, the Chairperson, Smt M.H.K. Marak, Commissioner & Secretary, Govt. of Meghalaya, Water Resources welcomed all the members present and with her permission, the meeting started with a presentation of GEC '97 methodology for estimation of Ground Water Resources by Sri Tapan Chakraborty, Officer-in-Charge, Central Ground Water Board, State Unit Office, Shillong on the Dynamic Ground Water Resources Assessment of Meghalaya (as on March, 2011) and Total Ground Water Availability in Meghalaya (as on 31st March, 2009), estimated by the Central Ground Water Board, State Unit Office, Shillong. Shri P.S. Lyngdoh, Chief Engineer, Water Resources, Govt. of Meghalaya, Shillong informed that the state of Meghalaya being mostly hilly terrain has till date no major irrigation projects. The State is however blessed with abundance of rivers, streams and rivulets which can be tapped for providing irrigation facilities to agriculture/ horticulture lands where mostly Minor irrigation projects are constructed which may be considered as command areas for the computations of Ground Water Resources. Few medium irrigation projects are under various formulation stages and yet to be implemented.

Shri Chakraborty put forward the constraint of non availability of data in carrying out the computations, especially command area, water-spread area of various ponds and reservoirs number of ground water structures for irrigation, industrial use and drinking water in Meghalaya State and requested the members to provide the current data on district-wise and preferably block-wise basis for estimation of Ground Water Resources to be taken up during 2013. Shri. P.S. Lyngdoh, Chief Engineer, Water Resources and Shri Choudhary, SE, PHED agreed to provide the data.

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All the members of the committee agreed upon the figures on Dynamic Ground Water Resources Assessment of Meghalaya (as on March, 2011) and Total Ground Water Availability in Meghalaya (as on 31st March, 2009).

The meeting ended with a vote of thanks to the chair.

Commissioner & Secretary
Govt. of Meghalaya,
Water Resources
Shillong

Officer-in-Charge
CGWB, Shillong for
Regional Director,
CGWB, NER, Guwahati

Director,
Horticulture Department,
Govt. of Meghalaya
Shillong.

Chief Engineer,
Public Health Engineering,
Govt. of Meghalaya,
Shillong

Chief Engineer,
Water Resources
Govt. of Meghalaya,
Shillong

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Government of India
Ministry of Water Resources
Central Ground Water Board
State Unit Office, Shillong
Keat[illegible] Road, Shillong 793 001

Second meeting of the State Level Committee on Ground Water Resources Assessment, Meghalaya.

Date: 25th March, 2013 Time : 14:00 hrs

Venue: Room No. 317, Committee Room II, Main Secretariat Building, Shillong

		Signature of Member/ Representative	E-mail & Contact No.
Commissioner & Secretary Govt. of Meghalaya, Water Resources, Shillong.	Chairman		9436111153.
Chief Engineer, Water Resources, Govt. of Meghalaya, Shillong.	Member		[illegible]
Chief Engineer, Public Health Engineering, Govt. of Meghalaya, Shillong.	Member	25/03 SE (PHE), O/o the CE (PHE), Megh, Shg	9863091774
Director, Agriculture Department, Directorate of Agriculture, Govt. of Meghalaya, Shillong.	Member		
General Manager, NABARD, Dhankheti, Shillong.	Member		
Director, Directorate of Industries, Govt. of Meghalaya, Shillong.	Member		
Regional Director, Central Ground Water Board, North Eastern Region Guwahati	Member Secretary	OIC, SUO, CGWB Shillong.	9436940661
For Director of Horticulture Meghalaya, Shillong.	E. Walam	25/03.	ewallong58@gmail.com 9856887717.

MIZORAM

MINUTES OF THE STATE LEVEL STANDING COMMITTEE (SLSC) MEETING HELD ON 30th JANUARY, 2013 IN THE CHIEF SECTETARIES CONFERENCE ROOM, AIZAWL FOR SCRUTINY /RECONCILIATION OF THE DYNAMIC (2011) AND TOTAL (2009) GROUND WATER RESOURCES FOR THE STATE OF MIZORAM.

The Regional Director & Member Secretary, State Level Standing Committee (SLSC) for Ground Water Assessment had convened a meeting of the committee for scrutiny and re-conciliation of the dynamic ground water resources-2011 and total ground water resources-2009 for the state of Mizoram. The meeting was held on 30th January, 2013 in the conference room of Chief Secretary, Govt. of Mizoram at Aizawl. Smt. L.Tochhong, Chief Secretary, Govt. of Mizoram has chaired the meeting.

The other members attended are

1. Er.R.Lalfanliana, Engineer in Chief, PHED, Govt of Mizoram.
2. Er.C.Lalremsiama, Chief Engineer, (M &I) PHED, Govt of Mizoram.
3. Sri. Lalthanliana, Chief Engineer, M.I. Mizoram
4. Sri. Lalrinliana, Joint Director, Agriculture Deptt.
5. Sri. M.M. Senjit, Manager, NABARD, Aizawl.
6. Sri. Lalnunthanga, Dy. Director, Industry Department, Govt. of Mizoram.
7. Sri. R.Lalruatkima, Hydrogeologist, PHED, Govt. Of Mizoram.
8. Dr. B.Umamaheswara Rao, Officer Incharge, CGWB, SUO, Agartala.

One draft assessment for Dynamic Resource (2010-11) and Total resource (2008-09) was prepared by the Office of the Regional Director and circulated among the members in advance.

On behalf of the Regional Director, CGWBNER, the Officer In charge, CGWB, SUO, Agartala has invited the members and briefed about the ground water resources of Mizoram State.

Under request from the Chief Secretary and other members, the draft was presented in power point by Dr. B.Umamaheswara Rao, Scientist-D, CGWB before the members and thorough inter-action was made.

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The following decisions were taken in the meeting-

1. The assessment of ground water resources made on the basis of standard method given by GEC-97 and based on available field data was found methodically in order.
2. Water Level monitoring to be done by the PHED on regular and continuous basis for want of water level data for estimating the ground water recharge based on water level fluctuation method also.
3. During interaction, it was felt that information on recharge, specific yield, infiltration factor, unit draft etc. were adopted from the GEC-97 which is a general type of recommendation. Here it was suggested for taking some experimental work for deciding these factors more scientifically.

This being an assessment based on 2011 (dynamic) & 2009 (total) resources, it was decided that the suggestions as made here in above may be given due attention in the next estimation.

Currently, the assessment made for Net dynamic ground water resources available is 0.0273 BCM (2011), the allocation for domestic and industrial uses upto the year 2025 is 0.0008 BCM, where as the ground water draft is 0.0096 BCM. The net ground water resources for future irrigation uses are 0.0265 BCM. The Stage of Ground Water Resources is 3.52% and all the blocks in the State are falling under Safe category.

The ground water resource in storage up to the depth of 300 m bgl is 0.01 BCM (Estimated for Mamit district only (2009) and total ground water resource up to 300 m bgl is 0.05 BCM.

The above Ground water resources estimate for the state of Mizoram is approved by the State Level Standing Committee of Mizoram.

30/1/13

(Smt. L. Tochhong)
Chief Secretary, Govt of Mizoram

30/1

(R. lalfanliana)
Engineer in Chief, PHED, Govt of Mizoram

21/1/2013

(Lalrinliana)
Jt. Director, Agriculture

(C. Lalremsiama)
Chief Engineer, (M &I) PHED, Govt of Mizoram

30/1/2013

(Lalmanliana)
Chief Engineer, M.I.D, Mizoram

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(M.M. Senjit)
(Manager, NABARD, Aizawl)

30/1/13
(Lalnuntluanga)
Dy. Director, Industry Department, Govt. Of Mizoram

30/1/13
(R. Lalruatkima)
Hydrogeologist, PHED, Govt. Of Mizoram

30/1/2013
(Dr. B.Umamaheswara Rao)
Officer Incharge, CGWB, SUO, Agartala

NAGALAND

MINUTES OF THE STATE LEVEL STANDING COMMITTEE (SLSC) MEETING HELD ON 12th MARCH, 2013 IN THE CHAMBER OF SECRETARY, GEOLOGY AND MINING FOR SCRUTINY /ASSESSMENT OF THE DYNAMIC (2011) AND TOTAL GROUND WATER RESOURCES (2009) OF THE STATE OF NAGALAND.

The Regional Director & Member Secretary, State Level Standing Committee (SLSC) for Ground Water Assessment had convened a meeting of the committee for scrutiny and re-conciliation of the dynamic ground water resources, 2011 and total ground water resources, 2009 for the state of Nagaland.

The meeting was held on 12th March 2013 in the office chamber of Secretary, Geology and Mining, Govt. of Nagaland & Chairman of the Committee. The Chairman Welcome the Shri P Kalita Scientist-D and also all the Members present and appraised the purpose of the meeting. He also requested the CGWB, NER Govt. of India to extend all possible support to the State for development of ground water in hilly area of the State. On behalf of the Regional Director, CGWBNER, Sh. P. Kalita, Scientist D, CGWB, NER Guwahati has invited the members and briefed the ground water resources of Nagaland State.

The draft assessment report for both Dynamic Ground Water Resources as on 31st March 2011 and Total Ground Water Availability of Ground Water Resources as on as on 31st March 2009 were prepared by the Office of the Regional Director and circulated among the members in advance. The list of Members attended the meeting were:

- Shri Bendang Longchari, IAS Secretary, Geology and Mining, Govt. of Nagaland & Chairman
- Shri E. Kikon Addl. Director, Geology and Mining, Govt. of Nagaland
- Shri I. Panger Addl. Director, Agriculture Department Govt. of Nagaland
- Er. Njilo Rengma S E. Irrigation & Flood Control, Govt. of Nagaland
- Er. T. Sangtam S.E. Public Health Engineering Department, Govt. of Nagaland
- Er. S.Temsulong Jamir Joint Director, Industries and Commerce Govt. of Nagaland.
- P. Kalita, Scientist-D, Central Ground Water Board, NER, Guwahati

Shri O. Koratemjen , OSD, Geology and Mining and Dr. O. Chochibeni Ezong, Hydrogeologist were also present as special Invitee.

The assessment of ground water resources made on the basis of standard methodology given by GEC-97 and based on available field data.

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A detailed discussion was held and the following decisions were taken:

1. **The Committee after deliration decided to approved the draft report on Dynamic G .W. Resources (2011) and Total G.W. Resources (2009) prepared by CGWB, NER.**
2. **The Committee also decided that the next Resources estimation will be prepared based on the data available in various departments of the state. In this regard all the members agree to furnish the data to Directorate of Geology and Mining.**
3. **The Directorate of Geology of Mining will circulate the requisite format to all the department within 31st March 2013.**

This being an assessment based on 2011 (dynamic) & 2009 (total) resources, it was decided that the suggestions as made here in above may be given due attention in the next estimation.

Currently, the assessment made for Net dynamic ground water resources available is 0.55 BCM (2011), the allocation for domestic and industrial uses upto the year 2025 is 0.1 BCM, where as the ground water draft is 0.03 BCM. The net ground water resources for future irrigation uses are 0.54 BCM.

The ground water resource in storage up to the depth of 200 m bgl is 0.74 BCM (2009) and total ground water resource up to 200 m bgl is 1.11 BCM. The above Ground water resources estimate for the state of Nagaland is approved by the State Level Standing Committee of Nagaland.

(Sh. Bendang Longchari) IAS
Secretary, Geology & Mining
Chairman, SLSC

(Shri E. Kikon)
Addl. Director, Geology & Mining.

(Shri I. Panger)
Addl. Director, Agriculture Deptt.

(Er. T. Sangtam)
S.E., PHED

(Er. Njilo Rengma)
S.E., IFCD

(Er. S.Temsulong Jamir)
Joint Director, Industries & Commerce Deptt.

(P. Kalita)
Scientist-D, CGWB, NER

ODISHA

MINUTES OF INCEPTION MEETING OF STATE LEVEL COMMITTEE FOR FINALIZATION OF STATIC / IN-STORAGE GROUND WATER RESOURCES OF ODISHA (AS ON 31-03-2009) AND RE-ESTIMATION OF DYNAMIC GROUND WATER RESOURCES OF ODISHA (AS ON 31-03- 2011) HELD ON 06th MARCH 2012 UNDER THE CHAIRMANSHIP OF THE PRINCIPAL SECRETARY TO GOVT., DEPARTMENT OF WATER RESOURCES, GOVT. OF ODISHA

The meeting of State level Committee (SLC) for Static / In-storage Ground Water Resources of Odisha (as on 31-03-2009) and Re-estimation of Dynamic Ground Water Resources of Odisha (as on 31-03-2011) washeld on 06th March 2011, at 1300 hrs, in the Mini Conference Hall of Department of Water Resources, RajivBhawan, Bhubaneswar, under the Chairmanship of the Principal Secretary to Govt., Department of WaterResources, Govt. of Odisha with the following agenda:

1. Finalisation of the Static / In-Storage and Total Ground Water Resources of Odisha (as on 31-03-2009).
2. Methodology to be adopted for Re-estimation of Dynamic Ground Water Resources of Odisha (as on 31-03-2011).
3. Status of data preparedness for Re-estimation of Dynamic Ground Water Resources of Odisha (as on 31-03-2011).
4. Road map for re-estimation of Ground Water Resources of Odisha (as on 31-03-2011).
5. Any other relevant issues with the kind permission of the Chair.

Initiating the discussion, Sri D. P. Pati, Superintending Hydrogeologist, on behalf of the Regional Director, Central Ground Water Board (CGWB), South Eastern Region (SER), Bhubaneswar welcomed the Chairman and all the Members present in the meeting and with the kind permission of the Chair presented theagenda for the meeting and explained the background of Estimation of Static / In-Storage Ground WaterResources. Sri A. K. Nayak, Chief Engineer & Director, Ground Water Survey & Investigation (GWS&I), DoWR, Govt. of Odisha along with Sri S.K. Mahapatra explained the SLC about the concept of Dynamic, Static and Total Ground Water Resources and also briefed about the discussion held during the Brain Storming Session on the subject held on 26-07-2011 at New Delhi. Sri B. Mishra, Engineer-In-Chief (WR) enquired about the usability of Static Water Resources in Odisha context. Sri D. P. Pati, Superintending Hydrogeologist, CGWB clarified that the Static Ground Water Resources

should not be exploited as it is normally not replenished in nature. It can be used only for Contd…..

mitigating emergency situations. Sri A. Choudhury of CGWB delivered a presentation on the brief overview of methodology, norms and parameters adopted for Estimation of Static / In Storage and Total Ground Water Resources of Odisha (as on 31-03-2009) and the district-wise draft result of the same. It was strongly suggested by GWS&I that for the time being the saline / brackish ground water resources may not be presented as this could create confusion among the users and chance of overexploitation could take place. The draft figures of the static and total resources were unanimously accepted and it was also decided not to present the saline / brackish water resources for the time being. The Chairman shared his experience on the yield characteristics vis-à-vis depth of weathering, lithology and topography of the bore wells drilled by OLIC Ltd in different districts of Odisha under the on-going deep

irrigation bore well scheme. He advised that the huge dataset generated from this mass drilling programme may be well documented and shared with all the user agencies for further refinement of ground water knowledgebase - particularly regarding the drought prone areas of Odisha. He also desired that water conservation and rainwater harvesting should be encouraged in every sector. In this context he shared his experience during his visit to other parts of the country in his capacity as member of various committees of Government of India. Sri N. K. Mahapatra, Chief Engineer, Minor Irrigation informed that water conservation efforts will be greatly enhanced with the full mplementation of the ongoing “RRR Schemes” undertaken by Minor Irrigation in different parts of the State. It was unanimously decided that the same SLC that was constituted for re-assessment of dynamic ground water resources of Odisha as on 31-03-2009 will continue for re-assessment of Dynamic Ground Water Resources of Odisha as on 31-03-2011. Sri D. P. Pati, Superintending Hydrogeologist, CGWB, SER appraised the SLC about the background and time schedule of re-assessment of dynamic ground water resources (as on 31-03-2011). He informed that as per the guidelines received from CGWB, CHQ, the entire exercise needs to be completed and the final report to be submitted to CGWB, CHQ by April 2012. The roadmap for reassessment was discussed in detail. It was decided that the methodology as adopted in the previous assessment (as on 31-03-2009) will be followed till any further guidelines are received. Blocks will be adopted as basic assessment units instead of watersheds because of absence of uniform data on watershed basis. GWS&I made a presentation on data preparedness for re-estimation of ground water resources of Odisha (as on

31-03-2011). As the time frame for re-estimation exercise was very short, and there has not Contd…..

been any major changes in either climatological, hydrological or hydrogeological condition, it was suggested that the same annual replenishable ground water availability, natural discharge and net ground water availability adopted during the re-estimation exercise (as on 31-03-2009) may be kept unchanged and only the sectoral draft / utilization figures be updated. Chairman advised that this must be cross-checked at every step and in case where significant changes are reported, the exercise for that assessment unit may be carried out in entirety. He also desired that the effect of recharge resulting from implementation of various water conservation schemes may also be incorporated as per data availability. He emphasised on refining the industrial draft calculation as well as the

draft due to increase in population etc. The industrial draft recalculation will be done on the available data of CGWB and concerned State Govt. Agencies. The complete re-estimation of ground water resources will be done again in the next assessment after the current one. The GWS&I proposed the road map for re-estimation of ground water resources of Odisha (as on 31-03-2011) as follows: Data Collection and Computerization : 15-05-2012 Preparation of sample GW Re-Assessment Reports for discussion and scrutiny : 31-05-2012 Finalization of sample Reports : 05-06-2012 Preparation of Reports for 314 Blocks : 30-06-2012 Presentation of GW Re-Assessment Reports (2011) of 314 Blocks before State Level Committee for review and approval : 05-07-2012 Submission of final GW Re-Assessment Report (2011) Odisha to Govt. of India : 15-07-2012

Sri D. P. Pati, Superintending Hydrogeologist, CGWB, SER, reiterated that CGWB, CHQ has conveyed that MoWR has advised to strictly follow time schedule of submission of approved report of re-estimation of ground water resources of Odisha (as on 31-03-2011.) by April 2012. Sri A. K. Nayak, Director & Chief Engineer, GWS&I opined that since most of the officers will remain pre-occupied for the on-going field works and Assembly Session, it will be difficult to adopt the time schedule prescribed by CGWB. After detailed discussions, the SLC unanimously adopted the time schedule proposed by GWS&I.

The Chairman enquired about the availability of data and their sources. GWS&I mentioned the names of various departments involved in the re-assessment exercise and the types of data required and their sources.

The Chairman himself interacted with all the members and requested for sharing of available data as required for the current exercise. It was suggested that request letters may be sent to all concerned agencies / departments for providing the available data. The Chairman expressed his

concern regarding actual utilization of ground water by the various sectors. He stressed upon Contd…..

the compilation of accurate and reliable ground water usage data from all the sectors, particularly the industrial sector. He emphasised on construction of artificial recharge structure in the vulnerable urban, industrial and mining areas to preserve the ground water resources within the safe limit. He also suggested that Schemes for adoption of artificial recharge structures in ground water vulnerable areas should be made mandatory. To popularize such Scheme, Govt. may provide subsidy to reimburse part of the construction cost, as is being done in some of the States. The meeting ended with a vote of thanks to the Chair. Presentation of GW Re-Assessment Reports (2011) of 314 Blocks before SLC : 05-07-2012 for review and approval

(Sri Suresh Chandra Mahapatra, IAS)
Principal Secretary to Govt.
Department of Water Resources
Govt. of Odisha &Chairman,
State Level Committee (SLC)

PUNJAB

Minutes of Meeting of State Level Committee on Ground Water Resource Estimation of Punjab held on 03.04.2013

1. The meeting of State level committee on Ground Water Resource Estimation of Punjab was held on 03.04.2013, at 1100hrs under the chairmanship of Principal Secretary, Irrigation, Govt. of Punjab in the committee room of Punjab Mini Secretariat, Chandigarh to consider and approve the Draft Report on Dynamic Ground Water Resources of Punjab State as on 31.3.2011. The meeting was attended by the Committee Members and officers of various departments as per the list attached.

2. At the outset, the Principal Secretary, Irrigation-cum-Chairman of the Committee welcome all the participants and asked the Regional Director, Central Ground Water Board, NWR, Chandigarh to proceed with the presentation of the Draft Report. The presentation on Dynamic Ground Water Resources Assessment of Punjab State as on 31.03.2011 was given by the officer of Central Ground Water Board, NWR, Chandigarh wherein the various components of the Report were highlighted relating to recharge of the ground water and draft of ground water. Following main features of the Draft Report were presented.

- Net Annual ground water availability 2032142 ham
- Existing Annual ground water draft for all uses 3488145 ham
- Net Annual ground water availability for future irrigation development (-)1483189 ham
- Stage of ground water development of Punjab State 172%

In addition to above, the following conclusions and recommendations of the Draft Report were presented.

- The Ground Water Estimation has been done as per GEC-1997 Methodology adopted by CGWB and based on the data observed in the field for the last five years i.e. 2006-10.
- There is over-exploitation of ground water to meet the agriculture requirement of the state as surface water is limited and over all stage of ground water development of the State as estimated in this Report is 172%. As per this Report about 80% area of the State is over exploited. Out of 138 blocks, 110 blocks are

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"over exploited", 4 blocks are "critical", 2 blocks are "semi-critical" and 22 blocks are in "safe category".

- The criteria adopted by CGWA for notifications of blocks as notified at National Level should not be applicable to the Punjab State which has multi layered aquifer system with high ground water potential in the alluvial strata in Punjab. Keeping in view the availability of high potential multi layered aquifers in Punjab, no more blocks/areas should be notified by the CGWA.

3. The discussion on the above findings of the Report was initiated by the Chairman and he apprised the Committee that the notification of CGWA for notifying areas in Punjab is a matter of concern for the State as the restrictions imposed by CGWA are harsh and affecting the development of the agriculture and industry in the state and this needs to be reconsidered by the CGWB & CGWA. During the discussions, the representative of Agriculture Department pointed out that the GEC-1997 Methodology adopted by CGWB is detrimental to the Punjab State and this Methodology needs to be reconsidered by the CGWB. Director, Water Resources & Environment Directorate, Punjab, Chandigarh apprised the participants that observations of Punjab State on GEC-1997 Methodology has been incorporated in this Report and it has been mentioned in the Report that this Methodology is not fully commensurate with the alluvial strata in Punjab State and needs to be relooked by CGWB. The representative of PAU, Ludhiana desired to look into the draft of ground water in view of Sub-soil Conservation Act imposed in the Punjab State.

4. It was deliberated during the meeting that Punjab has multi layered aquifers with high water potential and the alluvial strata in the State and there is abundant ground water reserve for future use. The Chairman desired that in view of the high potential multi layered aquifers existing in Punjab, no more blocks should be notified by the CGWA & CGWB should take up this issue with CGWA as these notifications are affecting the development activities of the State.

5. Director, Water Resources & Environment Directorate, Punjab, Chandigarh pointed out that out of 45 blocks notified by the CGWA, 11 blocks have stage of development less than 200% and in view of this, these Blocks be considered for de-notification by CGWA. The Chairman desired to take up the issue to de-notify such

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notified blocks and/or de-notify deeper aquifers beyond 150m at higher level with the concerned Authorities. Regional director assured to take up the case with higher authorities of CGWA.

6. The Chairman suggested during the meeting that Punjab Remote Sensing data and the Hydrology Project-II data be considered and used for such studies.

7. The Committee approved the said Report with clear understanding emphasized by the Chairman that no more blocks in Punjab State should be notified and the Regional Office of CGWB shall take up the various issues discussed in the meeting at higher level with CGWB and CGWA.

The meeting ended with a vote of thanks to the Chair.

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LIST OF MEMBERS WHO ATTENDED THE MEETING

Sr. No.	Name & Designation	Department
1.	Mr. A.K. Bhatia, Regional Director	Central Ground Water Board, Chandigarh.
2.	Mr. S.C. Behera, Scientist-D	Central Ground Water Board, Chandigarh.
3.	Dr. Shailendra Singh, AHG	Central Ground Water Board, Chandigarh.
4.	Er. R.K. Garg, Chief Engineer/WR	Irrigation Works, Punjab, Chd.
5.	Mr. S.K. Goyal, Consultant	Punjab Irrigation Department.
6.	Er. P.S. Bhogal, Director	Water Resources & Envn. Dte Punjab, Chandigarh.
7.	Mr. Ashish Midha, S.E. IB Circle	Punjab Irrigation Department
8.	Ms. Ritu Aggarwal, Special Secretary	Punjab Irrigation Department.
9.	Mr. R.R. Badyal, AGM	NABARD, Chandigarh
10.	Mr. K. Subramanian, Manager	NABARD, Chandigarh
11.	Rajesh Vashisht, Geologist/Hydrologist	Agriculture Department, Chd.
12.	Mr. Neeraj Pandit, Asstt. Geologist	Agriculture Department, Chd.
13.	Dr. A.K. Jain	Department of Soil & Water Engineering, PAU Ludhiana.
14.	Mr. T.L. Khosla, Joint Director	Department of Industries & Commerce
15.	Mr. S.P. Singh, OSD	Department of Industries & Commerce
16.	Mr. N.K. Dhir, Superintending Engineer	Punjab Water Supply and Sanitation Circle, Chandigarh.
17.	Dr. S.S. Ladhar	Punjab State Council for Science & Technology

RAJASTHAN

MINUTES OF MEETING OF STATE LEVEL COMMITTEE (SLC) FOR APPROVAL OF REPORT ON GROUND WATER ASSESSMENT OF STATE OF RAJASTHAN HELD ON 05/04/2013

The meeting of State Level Committee (SLC) for re-estimation of ground wate resource of Total Groundwater Resources assessed jointly by the Ground Wate Department, Govt. of Rajasthan and Central Ground Water Board, Western Region as or 31/03/2009 & Dynamic Groundwater resources as on 31/03/2011 was held under the Chairmanship of Dr. Purshottam Agrawal, Principal Secretary, PHED & GWD, Govt. o Rajasthan in the conference room No. 2 of the Secretariat at Jaipur on 05/04/2013 a 17:00 hrs.

The meeting was attended by following officers:-

1. Sh.Naresh Pal Gangwar,Secretary,Energy,Govt.of Rajasthan,Jaipur — Member
2. Sh.D.K.Nagori,Addl.Director,Representative of Commissioner Industries, Jaipur. — Member
3. Sh.Suresh Gautam,Jt.Director,Representative of Commissioner Agriculture, Jaipur — Member
4. Sh.Narendra Mertiya,Chief Engineer, SWRPD, Jaipur — Member
5. Sh.Anil Bhargav,Chief Engineer, (HQ) PHED, Jaipur — Member
6. Sh.Narendra Kumar Meena,Chief Engineer, GWD, Jodhpur — Member
7. Sh.P.K.Parchure,Regional Director, CGWB, WR, Jaipur — Member Secretary

Following officers were also present:-

1. Sh.K.L.Agarwal,Deputy Secretary II,WRD,Jaipur.
2. Sh.N.K.Vaishnav,Suptg.Hydrogeologist,GWD,Jodhpur
3. Sh.Yogesh Sharma, Suptg.Hydrogeologist,GWD,Jaipur
4. Sh.R.S.Vyas, Senior Hydrogeologist,GWD,Jodhpur
5. Sh.B.K.Maheshwari, Senior Hydrogeologist,GWD,Jaipur
6. Sh.Waseem Ahmed,Senior Hydrogeologist,CGWB,WR,Jaipur

The Chairman welcomed the members of the committee and directed the Member Secretary to present the salient points of the reports of Dynamic Resources of Ground Water as on March 2011 and Total Resources as on March 2009. The Regional Director, Central Ground Water Board, Western Region & Member Secretary, SLC briefed the committee about the methodology adopted in computation of ground water resources. He informed that as per the estimates as on 31/03/2011 Rajasthan has Net Groundwater availability to the tune of 10828.97 MCM and the Stage of Ground Water Development in the state is 137.07%. Allocation for domestic & industrial purpose is 2049.94 MCM and for irrigation is 654.18 MCM.

As per the previous estimation as on 31/03/2009 out of 239 Blocks in 33 Districts, 166 had been categorized as Over-exploited while 25 blocks fall in Critical Category and only 31 Blocks are under Safe Category. He also informed that during the assessment as on 31/03/2004 the No. of Over-exploited Blocks were 140 while 50 Blocks were under Critical

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Category and the stage of Ground Water Development in the State had increased from 125% in 2004 to 135% in 2009.

As per the estimates on March, 2011 out of 243 blocks, only 25 blocks are in Safe category, 20 blocks are in Semi critical and 24 blocks are in Critical category, 172 (71%) blocks are Over Exploited and remaining two blocks are saline which have not been assessed.

Members of SLC inquired about R.I.F. & W.L.F. approach for calculation of recharge to ground water bodies and desired to know the names of blocks for which R.I.F. method had been used and those for which W.L.F. method had been used.

Chairman desired a table giving details of methodology adopted for each block may be incorporated in the report.

The Chairman suggested that in view of over-exploitation of ground water in the major part of the state, the management options for augmenting the ground water resources may also be suggested by CGWB and GWD.

In the last both the reports i.e. Total Availability of Groundwater Resources as on 31/03/2009 and Dynamic Groundwater Resources as on 31/03/2011 were approved by the committee.

The meeting concluded with vote of thanks to the chair and committee by the Regional Director, CGWB, WR, Jaipur. These minutes been the approval of the Principal Secretary, PHED & GWD Chairman, SLC on Ground Water Resource Estimation Committee (GWREC) conveyed by the Dy. Secretary, GWD II, Govt. of Rajasthan vide his letter no P 12(2) Bhujal/2010 dated 15.04.2013.

11/9/13

(P.K. Parchure)
Regional Director

TS/19/GWRE/CGWB/WR/2011- 953 Dated : 11.09.2013

Copy forwarded for necessary information:-

1. PS to Principal Secretary, PHED & GWD, Rajasthan &Chairman , State Secretariat, Jaipur
2. PS to Secretary Energy, Rajasthan, State Secretariat, Jaipur
3. The Member (SAM), CGWB, Bhujal Bhawan, NH-IV, Faridabad – 121001

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4. Commissioner, Industries,Rajasthan, Udyog Bhawan,Tilak Marg,Jaipur
5. Commissioner, Agriculture, Rajasthan,Pant Krishi Bhawan,Janpat,C-Scheme,Jaipur
6. Chief Engineer, SWRPD, Rajasthan,Sinchai Bhawan,Ambedkar Circle,Jaipur
7. Chief Engineer, Water Résources,Rajasthan,J.L.N.Marg,OTS Circle,Jaipur
8. Chief Engineer, (HQ) PHED, Rajasthan,2,Jal Bhawan,Civil Lines,Jaipur
9. Chief Engineer (Rural) PHED, Rajasthan,2,Jal Bhawan,Civil Lines,Jaipur
10. Chief Engineer, GWD, Rajasthan,New Power House Road, Shastri Circle, Jodhpur
11. General Manager, NABARD, Jaipur 3. Nehru Place. Tonk Road. Jaipur
12. Regional Director, CGWB, WR, Jaipur

11/9/12

(P.K. Parchure)
Regional Director

TAMIL NADU

Approved Minutes of the Meeting of the "State Level Committee for Reestimation of Ground Water Assessment"

The State Level Committee meeting for approval of the report of Dynamics Groundwater Resources Assessment as on March 2011; total Groundwater Resources Assessment as on March 2011 as block wise, total Groundwater Resources Assessment as on March 2011as Firka wise, Dynamics and total Groundwater Resources Assessment as on March 2011as basin wise prepared by State Ground and Surface water Resources Data Centre(SG&SWRDC), Water Resources Department (WRD), Government of Tamilnadu and Central Ground Water Board (CGWB), South Eastern Coastal Region, Chennai using GEC - 97 Methodology was convened by the Secretary, Public Works Department, Government of Tamil Nadu & the Chairman of the State Level Committee on 28.03.2013 at Conference Hall, Secretariat. The meeting was attended by the members of the Committee/ representatives and the list of members who had attended the meeting is enclosed.

The Chief Engineer State Ground and Surface Water Resources Data Centre & the Member Secretary proposed and requested the Engineer-in-Chief, Water Resources Department, Chennai to preside and conduct the meeting.

The Chief Engineer, SG&SWRDC and the Member Secretary welcomed the gathering and informed that the unit of assessment is taken as Firka on Micro Level Basis and this is the first attempt on micro basis level and total resourses, jointly carried out by SG&SWRDC, Government of Tamil Nadu & CGWB, SECR, MoWR, Chennai for computing the dynamic groundwater resources for the State of Tamil Nadu (as on March 2011). The computed Dynamic Ground Water Resources as on March 2011 has been approved by the State Level Working Group convened on 26.03.2013. The same is placed before the State Level Committee for approval.

In the inaugural address, the Engineer-in-Chief, Water Resources Department appreciated the efforts taken by both the departments on Groundwater resources Estimation. He then highlighted that Ground Water Assessment carried out on Firka wise would be more beneficial to the state.

The Chief Engineer and Member Secretary, then invited the Regional Director, CGWB to brief the gathering on the Groundwater Resources Estimation Methodology. The Regional Director informed that the Dynamic Ground Water Resources Estimation is being carried out in the entire country. Earlier, the resources estimation was carried out once in 4 years and

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presently it is carried out once in 2 years. Also he informed that instorage groundwater resources estimation is equally important. On the request of the Regional Director, CGWB, the GEC – 97 methodolgy was presented by the Sr. Scientist from CGWB.

The Member Secretary of the Committee requested the Deputy Director, Geology, SG&SWRDC Chennai to present the findings of the Groundwater Resources Assessment as on March, 2011.

The Deputy Director, SG&SWRDC presented the findings of the Dynamics Groundwater Resources Assessment as on March 2011, total Groundwater Resources Assessment as on March 2019 as block wise, total Groundwater Resources Assessment as on March 2011as Firka wise, Dynamics and total Groundwater Resources Assessment as on March 2011as basin wise. The Salient features of the presentation are as follows:-

Sl. No	Categorisation	Total Nos.
1	Safe Firkas	437
2	Semi-critical firkas	235
3	Critical Firkas	48
4	Over Exploited	374
5	Poor quality	35
6	Total nos of firkas	1129

The Deputy Director, SG&SWRDC informed the committee that firka wise estimation has got greater advantage than the block wise estimation by citing the case of Walajahbad of Kancheepuram district. In 2009, the entire block was categorized as Over Exploited. In 2011 estimation, of five firkas, two firkas are categorised as Over Exploited, one critical and two safe. He then presented the Instorage resources computation of 2009 and 2011. He further informed the committee that assessment is to be carried out on Basin wise in the State of Tamil nadu.

The following points were discussed by the members of the committee.

The Engineer – in – Chief enquired whether firka wise assessment was done for 2009. The Deputy Director, SG & SWRDC informed that though assessment was done in Block wise in 2009, with the available data, for better analysis and for comparison with 2011, firka wise assessment was also done for 2009,of course ,with the available representative observation wells. The Chief Engineer, SG & SWRDC has also opined the same. The Engineer- in- Chief

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then expressed that regarding migration of firkas from one category to the other can be better analysed between 2011 and 2013 assessments. The Engineer – in- chief also enquired that where assessment on basin wise would be more appropriate since the basin boundary and the aquifer boundary are not similar. The Deputy Director informed that this point would be taken care in the estimation.

The Regional Director, CGWB informed the members of that aquifer mapping is being carried out by CGWB in the State as well as in the entire country and shall be completed in the next 10 years. This shall provide more information on the aquifer boundary including the inter basin trans-boundary aquifers.

The representative from SIPCOT, Chennai more efforts should be done to augment groundwater through water conservation methods.

The Regional Director, CGWB informed that, the numerous artificial recharge schemes implemented by the various state ground water have led to improving the groundwater resources in many places.

The Engineering Director, TWAD opined that more monitoring wells are required in the saline firkas also. The Chief Engineer, SG& SWRDC and The Regional Director, CGWB informed that it is much important to have representative monitoring wells in the saline area also. They also informed that efforts are taken to establish more representative monitoring wells in the State, particularly in the saline Firkas.

The Senior Hydro Geologist, TWAD informed that as groundwater resources estimation is actually a water budget, an attempt may be made to forecast the available groundwater resources as it shall be of more benefit to the administration and public.

The Executive Engineer, Gauging Division, informed that in Vaippar, Agniyar and Tamaraparani basin, forecast model studies is currently carried out where both surface and groundwater components are involved and the output of the study shall be hosted in the web based public domain, under Decision Support System.

Regarding groundwater management, the Engineering Director, TWAD informed that optimum requirement of groundwater for crops should always be considered. All the members of the committee expressed the same view.

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The Chief Engineer/The Director (WSSO), TWAD suggested that efforts to be made to collect the sub-surface lithology data generated in the state by the drilling agencies and individuals.

The Joint Director, TNPCB has suggested that in firkas categorized as over exploited, groundwater clearance can be permitted for industries with less groundwater consumption.

All the members of the committee appreciated the efforts taken by SG & SWRDC and CGWB in bring out the groundwater assessment (as on March 2011) on firka wise , total Ground water resources (by adding Instorage) computations and basin wise computations.. Also, the members expressed that firka wise estimation had more advantage than the block wise resources estimation.

All the member of the State Level Committee unanimously approved the reports.

Finally, the Chief Engineer, SG & SWRDC and the Regional Director, CGWB expressed their gratitude to all the members of the committee for their valuable contribution during the deliberations. The meeting ended with the thanks to the Chair and the members by the Regional Director, SECR, CGWB Chennai..

M. SAI KUMAR,
SECRETARY TO GOVERNMENT.

/TRUE COPY/

8.4.13

SECTION OFFICER.

8/4/2013

TRIPURA

NUTES OF THE STATE LEVEL STANDING COMMITTEE (SLSC) MEETING HELD ON 2nd VEMBER, 2012 IN THE CONFERENCE HALL OF OFFICE OF THE CHIEF ENGINEER, 'D(W.R), KUNJABAN, AGARTALA FOR SCRUTINY /ASSESSMENT OF THE DYNAMIC (2011) D TOTAL GROUND WATER RESOURCES (2009) OF THE STATE OF TRIPURA.

The Regional Director & Member Secretary, State Level Standing Committee (SLSC) for ound Water Assessment had convened a meeting of the committee for scrutiny and re-iciliation of the dynamic ground water resources, 2011 and total ground water resources, 2009 the state of Tripura. The meeting was held on 2nd NOVEMBER, 2012 in the conference Hall, ice of the Chief Engineer, PWD (WR), Kunjaban, Agartala. The Chief Engineer, PWD (WR), vt of Tripura has chaired the meeting with the consent of Principal Secretary, PWD (WR) as he s pre occupied with the other meeting. On behalf of the Regional Director, CGWBNER, The icer Incharge, CGWB, SUO has invited the members and briefed about the ground water ources of Tripura State and difficulties faced during the resource estimation and data lection.

One draft assessment was prepared by the Office of the Regional Director and circulated ong the members in advance. Under request from the members, the draft was presented in wer point by Sri. Tapan Chakraborty, Scientist-C, CGWB before the members and thorough er-action was made.

List of participants are appended here with.

The following decisions were taken in the meeting-

1. The assessment of ground water resources made on the basis of standard method given by GEC-97 and based on available field data was found methodically in order.

2. It was suggested by the members that the data break-up should be made in conformity to the 8 (eight) districts with effect from 2012.

3. For some blocks, zero data were shown at few instances due to non-availability of data. It was suggested that data of water area and irrigation installations may be got from the PWD (W.R.) of Tripura.

4. The deduction of natural losses for 10% was felt to be much in lower side as the stream base flow appearing in the state is very high as was perceived from a representative sample of yearly hydrograph on Gumti river. Whereas total deduction for natural losses

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was made for about 23,600 ham indicative base flow is 1,50,000 ham. This was suggested to be examined for correction of the methodology suitably for the hilly state like Tripura.

5. During interaction, it was felt that information on recharge, specific yield, infiltration factor, unit draft etc. were adopted from the GEC-97 which is a general type of recommendation. Experience indicates a substantial variation in these parameters for Tripura. Here it was suggested for taking some experimental work for deciding these factors more scientifically.

This being an assessment based on 2011 (dynamic) & 2009 (total) resources, it was decided that the suggestions as made here in above may be given due attention in the next estimation.

Currently, the assessment made for Net dynamic ground water resources available is 2.36 BCM (2011), the allocation for domestic and industrial uses upto the year 2025 is 0.2 BCM, where as the ground water draft is 0.16 BCM. The net ground water resources for future irrigation uses are 2.07 BCM. The ground water resource in storage up to the depth of 300 m bgl is 12.79 BCM (2009) and total ground water resource up to 300 m bgl is 15.15 BCM. The above Ground water resources estimate for the state of Tripura is approved by the State Level Standing Committee of Tripura.

(Sri. G.Kameswara Rao)
Principal Secretary (PWD)
Chairman, SLSC

(Er.T.Lodh, Chief Engineer, PWD(W.R),Tripura)

(Er.B.K.Debbarma, CE, PWD (DWS),Tripura)

(Er. T.K.Debnath, CE, Rural Development, Tripura)

(Er. D.C.Das, CE, Agriculture, Tripura)

(Sri. N. Ramesh, GM, NABARD, Agartala)

(Mrs. S.Debnath, Addl.Director, Industry, Tripura)

(Dr. B.U.Rao, Officer Incharge, CGWBSUO, Agartala)

UTTAR PRADESH

Phone (Office) 0522-2287068
(Office) 0522-2286471
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Email: upgwd.in@gmail.com
Website: http://gwd.up.nic.in

From,

The Director,
Ground Water Department, U.P.,
9th Floor, Indira Bhawan, Lucknow.

To,

The Regional Director,
Central Ground Water Board (N.R.),
Bhujal Bhawan, Sector-B
Sitapur Road Yojana, Lucknow.

Letter No. 4115 /GWD/A-7(CGWB), Dated/Lucknow/Oct 14, 2013

Sub: Ground Water Resources Assessment (as on 31-03-2011): Modifications in the report.

Sir,

In reference to your letter dated 10-09-2012 & dated 17-09-2013 and subsequent meeting of Central Level Expert Group held on 25-09-2013, reassessment of block-Bisrakh (district-G.B. Nagar), Kalyanpur (district-Kanpur Nagar), Chinhat (district-Lucknow), Chaka (district-Allahabad) & Razapur (district-Ghaziabad) has been carried-out in context of the urban data and due to the changes in the stage of development, the category of these 05 blocks has been modified as over-exploited.

Apart from these blocks, the water level trends of various blocks have also been rechecked and some changes have been found. Accordingly, the category of certain blocks has also changed. These blocks are- Jagner (Agra), Gajraula (Amroha), Palahani (Azamgarh), Baraut (Baghpat), Ram Nagar (Bareilly), B.B. Nagar, Danpur & Shikarpur (Bulandshahar), Bhawarkol, Ghazipur & Muhammadabad (Ghazipur), Deoband, Muzafarabad & Rampur (Saharanpur), Kairana, Shamli & Thana Bhawan (Shamli) and Robertsganj (Sonbhadra). As a result of these modifications, the overall situation has also changed in the state and 111 blocks are now categorised as over-exploited, 68 blocks as critical, 82 blocks as semi-critical, while 559 blocks are safe. Therefore, the final complete blockwise report of Dynamic Ground Water Resource Estimation of U.P. as on 31st March, 2011 is being submitted for approval.

Encl.- As above (soft copy)

Your faithfully

(P.R. Chaurasiya)
Director.

Letter No. /GWD/A-7(CGWB)/Dated.

Copy of the above is forwarded to the following for information & necessary action-

1. Principal Secretary, M.I. & Ground Water, Govt. of U.P.
2. The Chairman, Central Ground Water Board, Bhujal Bhawan, NH-IV, Faridabad (Haryana).

(P.R. Chaurasiya)
Director

UTTARAKHAND

No 4 (17) /CGWB/UR/Tech-12
Ministry of water Resources
Central Ground Water Board
Uttaranchal Region Dehradun

Dated: 29.01.2013

Minutes of the State Level Technical Co-ordination Committee (SLTCC) for approval of Dynamic Groundwater Resources as on 31.03.2011 in Uttarakhand.

The meeting was held in the chamber of Secretary (Minor irrigation) and Chairman of the State Level Technical Co-ordination Committee (SLTCC) on 29th January, 2013 at 11:00 hrs for finalization and approval of Dynamic Groundwater Resources of Uttarakhand as on 31.03.2011. List of participants is given in Annexure-I.

At the outset, Member Secretary welcomed all the members of the committee. The committee members were appraised on the estimation of Dynamic Groundwater Resources of Uttarakhand State as on 31.03.2011. A detailed presentation on the assessment methodology and outcomes of the resource estimation was made.

1. Total Annual Replenishable Ground Water Resources of the State – 204034.42 ha m/yr, Net Ground Water Availability – 196705.30 ha m/yr, Gross Groundwater Draft for all uses – 113284.68 ha m/yr and Stage of Groundwater Development for the state – 57.59% was approved. The details of Block wise assessment of groundwater resources and Stage of development given in Annexure II and Annexure-III were also approved.
2. Secretary Minor irrigation, opined that regulation of ground water withdrawal is to be done in blocks having semi-critical and /or Critical stage of development.
3. Assistant General Manager, NABARD opined that restriction should be made on financing of ground water abstraction structures by the state Government in Semi-Critical / Critical Blocks.

The Meeting ended with vote of thanks to the Chair.

This issues with the approval of Secretary, Minor Irrigation and Chairman of SLTCC.

R.C.Jain
(Dr. R.C.Jain) 29/1/2013
Regional Director

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LIST OF PARTICIPANTS ANNEXURE-I

1. Sh. Arjun Singh, Additional Secretary, Drinking Water, Government of Uttarakhand, Dehradun.
2. Er. Ram Singh, General Manager, Uttarakhand Peyjal Nigam, Dehradun.
3. Er. S.K.Gupta, General Manager, Uttarakhand Jal Sansthan, Dehradun.
4. Deputy Director, Agriculture Department, Dehradun.
5. Er. S.K.Bhaskar, Minor Irrigation, Dehradun.
6. Sh. A.K. Kapoor. Additional General Manager, NABARD, Dehradun.
7. Dr. R.C.Jain, Regional Director, CGWB and Member Secretary, SLTCC.

Minutes of the meeting of the State Level Ground Water Resource Estimation Committee (SLGWREC) held on 4th February, 2013 at 15:00 hrs in the Chamber of Secretary, WRI&DD, Writers' Building, Kolkata-700 001.

The meeting was chaired by **Sri Atri Bhattacharya, IAS, Secretary, WRIDD, Govt. of West Bengal** and the following members were present:

i) Sh. P. K. Sarkar, Engineer in Chief & EO Secretary, WRIDD, Govt. of West Bengal

ii) Sh. S. N. Sen, Joint Secretary, WRIDD, Govt of West Bengal

iii) Sh. S. K. Bhattacharya, Director, SWID, Govt. of West Bengal

iv) Sh. R. P. Biswas, Chief Engineer-I, WRIDD, Govt. of West Bengal

v) Sh. K. Das, Chief Engineer, Municipal Engineering Department, Govt. of West Bengal

vi) Sh. A. Bhattacharya, Chief Engineer, I&WD, Govt. of West Bengal

vii) Sh. K. C. Adak, Chief Engineer, P&WQM, PHE Department, Govt. of West Bengal

viii) Sh. N. Naha, Addl. Director (EW), SWID, Govt. of West Bengal

ix) Sh. S. K. Samanta, Sc-'D' and TS to Regional Director, CGWB, ER, Kolkata

x) Dr. I. Roy Sc-'C', CGWB, ER, Kolkata

xi) Dr. S. Biswas, Sr. Geophysicist, SWID, Govt. of West Bengal

xii) Sh D. Bakshi, Geologist, SWID, Govt. of West Bengal

The Chairman welcomed the members of the committee and apprised them of the work undertaken by the committee in estimation of **Total Ground Water Resources of West Bengal (as on 31st March, 2009)** and **Dynamic Ground Water Resources of West Bengal (as on 31st March, 2011)**.

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As desired by Chairman, Dr. I. Roy Sc-'C', CGWB, ER, briefed the house about the concepts, historical background, methodology and salient features of the results of the assessment. It was conveyed to the Chairman that all the members were informed regarding the methodology and protocol of the assessment works and the present exercise was completed as a joint collaboration between CGWB, ER and SWID, Govt. of West Bengal.

Chairman and the other members discussed the increase in number of semi-critical blocks in West Bengal and it was explained that gradual lessening of rainfall and decrease in number of rainy days has significantly affected the resource position. Additionally, incorporation of final figures of 4th MI census data and tubewell registration data in computation has resulted in refinement of resource estimation over earlier estimations. The committee also discussed how to tackle the situation and the mitigation measures to be taken. Committee also enquired for resource position in coastal confined aquifer covered areas. A suggestion about devising a new methodology for resource estimation in confined aquifer covered areas also came up.

After a detailed discussion among the members the Reports on **"Total Ground Water Resources of West Bengal (as on 31st March, 2009)"** has been accepted and approved by the Committee. However, **"Dynamic Ground Water Resources of West Bengal (as on 31st March, 2011)"** has been provisionally approved by the Committee and certain portions of this report would be put to an expert committee for examination and final approval.

The meeting ended with the vote of thanks to the chair.

(Atri Bhattacharya, I.A.S)
Chairman State Level Ground Water Resource Estimation Committee
Secretary, WRIDD
Government of West Bengal

CHANDIGARH

Minutes of the meeting held under the Chairmanship of Finance Secretary-cum-Secretary Engineering,Engineering Department,U.T.Chandigarh held on 19.2.2013 on the Assessment of Total Ground Water Resources Availability of Chandigarh(U.T.)as on 31st March,2009 as per revised guidelines and Dynamic Ground Water Assessment of Chandigarh as on 31st March 2011 reg.

The following were present:-

1.	Sh.V.K.Singh, Finance Secretary-cum-Secretary Engineering, U.T., Chandigarh	(In Chair)
2	Sh. V.P.Singh, Commissioner Municipal Corporation, Chandigarh	(Special Invitee)
3.	Sh. S.K. Chadha, Chief Engineer Union Territory, Chandigarh	(Member)
4.	Sh. S.S.Bidda, Chief Engineer, Municipal Corporation, Chandigarh	(Member)
5.	Sh.A.K.Bhatia Regional Director Central Ground Water Board, Chandigarh	(Member Secretary)
6.	Sh.Tirlochan Singh Superintending Engineer, Project P.H.Circle, Chandigarh	(Member)
7.	Sh.Balbir Singh Director Industries,U.T.	(Member)
8.	Sh. R.C.Diwan, Superintending Engineer M.C.P.H.Circle, Chandigarh	
9.	Sh.S.K.Setia, Joint Secretary (Estate) Chandigarh Administration, Chandigarh	(special invitee)
10.	Sh.S.C.Behera,Scientist 'D' CGWB,Chandigarh	
11.	Sh. Dinesh Tewari,Scientist 'C' CGWB,Chandigarh.	

The presentation on Ground Water Assessment was given by the Regional Director, Central Ground Water Board, Chandigarh for Chandigarh,U.T. It was emphasized by the Regional Director, CGWB, Chandigarh that the

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Engineering Department to draw the water from unconfined aquifer availability upto the depth of 50 to 60 meters. It was recommended by the Board that water bearing strata 10 to 20 meters is available in this aquifer. This is dynamic resources having fluctuation in water table before and after the monsoon means thereby aquifer is subjected to replenishment. It was also explained by the officers of CGWB that presently in Chandigarh,Engineering Department/Urban Local bodies are drawing water from confined aquifer below the depth of 100 meter, which is having slow rate of replenishment. This is the main reason for lowering water table to the tune of 1.00 to 1.5 meter annually.,

It was also discussed that northern area of City Chandigarh falls in kandi area in Ghaggar basin having coarse sand, gravel and boulders collected in form of alluvial fans brought by rivers, the construction in this area would lead to slow down the recharging of ground water. The habitation in this belt should be avoided to preserve and recharging from ground water.

At the end, it was disclosed by the Regional Director that annual replenchment of ground water source in 1940 HAM in Chandigarh which can yield about 20 MGD Water.

In view of above discussions, the following decisions were taken:-

(i) Municipal Corporation, Chandigarh and Engineering Department would prepare a proposal to tap the water from unconfined aquifer upto 60 metre depth.

(ii) The water drawn from unconfined aquifer would be got tested to check the potability.

(iii) The Central Ground water Board was requested to study regarding availability of water for installing shallow tuabewells in Indl.Area,Phase-I & II,Chandigarh. It was requested to the Central Ground Water Board to study for maintaining the minimum distance between the tubewells so as to avoid any affect to the yield,keeping in view the permission to be granted to the Private Plot owners from time to time.

(iv) The reports as "Total Ground Water Resources Availability of Chandigarh U.T as on 31st March 2009" and "Dynamic Ground Water

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Assessment of Chandigarh U.T. as on 31st March 2011" were approved by the Committee.

Meeting ended with a Vote of Thanks to the Chair.

DAMAN&DIU

Minutes of the Union Territory Level meeting on Dynamic Ground Water Resources as on 31st March 2011, held on 22-11-2012 at 12.30 Hrs in the Conference Hall of Secretariat Building, Moti-Daman, UT of Daman & Diu.

The UT level meeting for the approval of Dynamic Ground Water Resources Estimation of UT of Daman and Diu as on March 2011 was held under the Chairmanship of Secretary (Finance) UT of Daman & Diu (Incharge Secretary PWD) on 22/11/2012 at 12.30 hours in the conference room, Secretariat, Moti Daman.

Following members of the UT Level Committee attended the meeting.

1	Shri Gyanesh Bharti,	Secretary (Finance), UT of Daman & Diu	**Chairman (I/C) & Member**
2	Shri P S Reddy, Collector	UT of Daman.	**Member**
3	Shri Kamal Dutta,	Director (Agriculture), UT of Daman & Diu	**Member**
4	Shri Sudhir Chawada,	Chief Engineer (PWD), UT of Daman & Diu	**Member**
5	Shri P S Jani,	Director (Dept of Industries), UT of Daman & Diu	**Member**
6	Shri C A Somani,	Executive Engineer, PWD, UT of Daman	**Member**
7	Shri V H Jethwa,	Executive Member, PWD, SD No II, Diu	**Member**
8	Dr E Sampath Kumar,	Regional Director, CGWB, WCR, Ahmedabad	**Member Secretary**

1. Dr. E Sampath Kumar, Member Secretary & Regional Director, West Central Region, Ahmedabad welcomed all members and briefed them about the groundwater scenario of the area, previous assessment of the ground water resources carried out during the year 2009 and present assessment of ground water resources as on 31st March 2011 for UT of Daman and Diu.
2. The presentation on Dynamic Ground Water Resources was made by the officer of CGWB. During the course of presentation, the Chairman enquired about the status of 'Notification issued in respect of Diu District' and instructed their Executive Engineers to prepare the status report thereon.
3. During course of presentation, it was brought to the notice of the committee that due to insufficient data on water table fluctuation in Diu area, the monsoon recharge has been computed based on the 'Rainfall Infiltration Method', as per the GEC-97 norms and expressed that few more piezometers needs to be constructed in Diu area exclusively for groundwater monitoring purpose.
4. The Chairman also enquired about the data sources of groundwater draft by the domestic and industrial units of Daman & Diu area. The information about present surface water resources of Daman & Diu was given to the committee and norms adopted for computation of water resources required for present domestic and industrial uses and projected demand for year 2025 were also discussed. It was also pointed out that the data on quantum of water used by the industries is not reliably computed due to insufficient data base on industries using groundwater resources. The Chairman instructed UT Officers to have surveys of all the industries using water resources as per CGWA guideline and to coordinate with CGWB officers.
5. After discussion on hydrogeological disposition of limited thickness of fresh quality aquifers of UT of Daman & Diu and stage of high development of groundwater resources leading to Semi Critical and Overexploited situation in Daman and Diu district respectively, the Secretary emphasized to have cautious approach while sanctioning new connections in Diu area. He also instructed their officials for taking necessary actions on artificial recharge and groundwater conservation measures as per the various recommendations submitted by CGWB in their report on 'Status of Groundwater Condition in UT of Daman & Diu & Water Conservation'.
6. After above deliberation the Chairman conveyed the approval for the report on "Dynamic Groundwater Resources of UT of Daman and Diu as on 31st March 2011".
7. The meeting ended with Vote of thanks by Dr E Sampath Kumar, Member Secretary & Regional Director, WCR, Ahmedabad.

PUDUCHERRY

MINUTES OF THE STATE LEVEL COMMITTEE ON DYNAMIC GROUND WATER RESOURCE ESTIMATION OF UNION TERRITORY OF PUDUCHERRY HELD ON 19.02.2013 IN THE CHAMBER OF SECRETARY (AGRI), CHIEF SECRETARIAT, PUDUCHERRY.

Following were present :

1. Thiru.Vivek Pandey, I.A.S., Secretary (Agri)., - Chairman
2. Dr.E.Sampathkumar, Regional Director, Central Ground Water Board. - Member
3. Thiru.S.Manohar, Chief Engineer, P.W.D., - Member
4. Dr. R.Sathiyaseelan, Director of Agriculture. - Member
5. Dr. Sagaya Alfred, Sr.Scientific Officer, Dept.of Science, Technology & Environment. Represented Member Secretary, Pondicherry Pollution Controll Committee. - Member
6. Thiru.C.Mady @ Ramamourty, Member Secretary, Pondicherry Ground Water Authority. - Member
7. Thiru.S.Sekar, Jt.Director (Agrl.Engg.)., Dept.of Agriculture, Puducherry. - Member Secretary
8. Dr. D.Gnanasundar, Scientist 'C', Central Ground Water Board. - Special Invitee
9. Thiru.V.Radhakrishnan, Hydrogeologist-II, State Ground Water Unit & Soil Conservation, Puducherry. - Special Invitee

At the outset, the Secretary (Agri.) welcomed the members of State Level Committee on estimation of dynamic groundwater resources of Union Territory of Puducherry. In his address, he expressed a great concern on the over extraction of groundwater in Puducherry region. He emphasized that this should be attended to on priority basis to improve the groundwater regime. The Regional Director, Central Ground Water Board also felt that Puducherry Region is categorized as "Over Exploited" block and sincere efforts should be taken to improve

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the groundwater potential. However, he lauded the efforts taken by the Department of Agriculture to conserve water. Secretary (Agri.) stressed that it is a collective responsibility of service providing departments to take stringent measures to reduce the extraction of groundwater and improve groundwater level.

2. Then, with the permission of Secretary (Agri.), power point presentation was made jointly by Thiru S.Sekar, Jt.Director(Agrl.Engg.) and Dr.D.Gnanasundar, Scientist `C ', Central Ground Water Board on the computation of estimation of dynamic resources of groundwater, jointly exercised by the Department of Agriculture, Government of Puducherry and Central Ground Water Board, South Eastern Coastal Region, Chennai. The results of estimation were explained to members. It was informed that in Yanam, groundwater is saline in both shallow and deeper aquifers and hence there is no groundwater development.

3. It was informed that in the current potential re-assessment of groundwater for the period ending 31st March 2011, the stage of groundwater development is 139% in Puducherry region, 14% in Karaikal region and 63% in Mahe region. This is less when compared to the previous estimation, carried out for the period 2004-2008. The reasons for this were attributed due to reduction in extraction of water from agriculture tubewells due to urbanization, recharge measures taken up by this administration, promoting water conservation techniques in agriculture and increasing water spread area in rivers for effective recharge. It was further informed that as per estimation of dynamic resources of groundwater, Puducherry is to be categorized as "Over Exploited" block and Karaikal and Mahe as "Safe" blocks.

4. The power point presentation was followed by the discussion. The Secretary (Agri.)-cum-Chairman of State Level Committee opined that desalination project can be studied to meet the demand atleast for domestic purpose which will

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reduce the load on groundwater. He also invited valuable suggestions from the members of State Level Committee, who are service providers for improving groundwater condition, now categorized Puducherry region as "Over Exploited" to "Safe" block. In response to this,

(a) **The Regional Director, Central Ground Water Board** said that

(i) Central Ground Water Board, now organizes "Farmers Participation Programme" to educate farmers about groundwater conditions, measures to be adopted to conserve water and harvest rain water.

(ii) aquifer mapping at micro level survey through out the country has been taken up by Central Ground Water Board to delineate the aquifer systems vertically and horizontally and also to assess the quantity and quality of groundwater.

(b) **The Chief Engineer, Public Works Department** informed that;-

(i) a proposal has been submitted to Government to augment domestic water supply of about 20 MLD from Ossudu tank after treating, which will reduce the usage of groundwater by 25% for drinking purpose. This may be materialized next year.

(ii) domestic tariff can be enhanced, which will ultimately bring down the usage of groundwater.

(iii) more bed dams shall be constructed across the rivers to recharge groundwater and revive shallow tubewells.

(iv) action has to be taken to curtail water supply time by two hours, especially in the afternoon.

(c) **The Director of Agriculture** narrated various measures, taken up for judicious use of groundwater, namely

(i) encouraging farmer to adopt water conservation techniques namely micro irrigation system, laying underground pipelines and precision farming.

(ii) more unused dug-wells will be converted as recharge structures.

(iii) village ponds are desilted to increase water holding capacity and recharge tubewells are constructed.

(iv) the farmers of Karaikal region are encouraged for constructing farm ponds for water harvesting and reuse them when critically needed to safe standing crops, by extending attractive subsidy assistance.

(v) roof top rain water harvesting structures will be constructed at Government cost in more Government buildings and recharged.

(d) **The member Secretary, Pondicherry Ground Water Authority** said that

(i) the tubewells can be constructed only with prior permission of Pondicherry Ground Water Authority as per the provision of the Act in Puducherry and Karaikal regions which will reduce abstraction of groundwater.

(ii) industries are periodically monitored to check a whether their consumption/extraction of groundwater is within the permitted/ sanctioned quantity.

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(e) **The Sr.Scientific Officer represented the Member Secretary, Pondicherry Pollution Control Committee** said that

(i) While issuing Pondicherry Pollution Control Committee clearance, the views / opinion of Director of Agriculture, being a member of the Pondicherry Pollution Control Committee on groundwater angle will be taken note of.

(ii) discharge from the industries are constantly monitored to prevent groundwater pollution.

(iii) industries are issued licence with one of the conditions to reuse of recycled water for gardening and toilet purposes.

5. After a detailed discussion, the Secretary (Agri.) informed that the water level data collected at intervals should be incorporated with other data and monitored the groundwater availability. He emphasized that sincere and serious efforts should be taken by the service providing Departments with an aim to bring down Puducherry region from the "Over Exploited" block to "Safe" in the next estimation.

6. The State Level Committee approved the dynamic groundwater resources estimation of Union Territory of Puducherry as on 31st March 2011, jointly computed by the Department of Agriculture, Government of Puducherry and Central Ground Water Board, South Eastern Coastal Region, Chennai.

7. The Joint Director (Agrl.Engg.) thanked the Chairman, Members and Special invitees. With this, the meeting was concluded.

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Appendix-D

Minutes of the Second meeting of the Central Level Expert Group for Over-all re-Assessment of Ground Water Resources of Country held on 25.09.2013 at CGWB, New Delhi office.

The second meeting of Central Level Expert Group for Over-all re-assessment of Ground Water Resources of the country was held of 25th September 2013 at Central Ground Water Board office, Jamnagar House, New Delhi. The meeting was chaired by Shri Sushil Gupta, Chairman, Central Ground Water Board. The meeting was attended by the Members of Central Level Expert Group, State representatives from State government and Regional Directors, CGWB where the reports are yet to be approved by State Level Committee. List of the delegates is enclosed as annexure-I. At the onset, Shri R.P. Mathur , Member (TT&WQ) welcomed the delegates and explained in brief the necessity of compilation of the report on Dynamic Ground Water Resources of country (As on 31st March 2011) and Assessment of Total Ground Water Availability (As on 31st March 2009). After this point, Chairman, Central Level Expert Group, Shri Sushil Gupta took over the reins of conducting the meeting.

Hereafter the meeting proceeded as per the agenda.

Assessment of Total Ground Water Availability (As on 31st March 2009)

Chairman apprised the Group that Assessment of Total ground water resources of the country (As on 31st March 2009) has been done as per revised guidelines by State Ground Water Departments and CGWB except Uttar Pradesh, Maharashtra and Punjab where approval of State Level Committee is awaited.

Uttar Pradesh:

Chairman enquired as to why the state ground water department was not submitting the approved report. Shri R.S. Sinha, Senior Hydrogeologist, Ground Water department of Uttar Pradesh expressed reservation of state in Assessment of Total Ground Water Availability of the state.

The committee opined that any resources, if available, needs to be estimated, it cannot be hidden. However, the resources can be judiciously regulated.

The Regional Director, CGWB, Northern Region, Lucknow Shri K.B. Biswas stated that inspite of repeated requests, State Level Committee has not approved the report on Assessment of Total Ground Water Availability.

After extensive deliberation on the matter, Central Level Expert Group (CLEG) took a decision that the approved report must be submitted by 15th October, 2013 failing which the report in its present form prepared by CGWB will be taken as final and will be included in the National Level report.

Maharashtra:

Referring to the minutes of the meeting that was held on 5th March, 2013 Chairman said that the report on Assessment of Total Ground Water Availability (As on 31st March 2009) was to be submitted by 20th March 2013. Though much time has elapsed still State Level Committee, was not submitting the approved report. Shri Rupinder Singh, Director, Groundwater Survey and Development Agency, Government of Maharashtra stated that report has not been approved due to frequent change of Principal Secretary, Water Supply and Sanitation Department who is Chairman of State Level Committee.

Finally it was decided by Central Level Expert Group that approved report must be submitted by 15th October, 2013 by State Level Committee failing which the report in its present form prepared jointly by CGWB and state ground water department will be taken as final and will be included in the National Level report.

Punjab:

There was extensive discussion pertaining to Assessment of Total Ground Water Availability (As on 31st March 2009). A sub-committee was constituted by State Level Committee to approve the report for assessment carried out up to 450 m depth. Shri Bimal Jeet Bhandari, Agronomist (Executive Engineer) Water Resources and Environment Directorate, Government of Punjab who is Chair man of the subcommittee informed that the report has been approved by the sub-committee. Dr. Poonam

Sharma, Scientist D & HOO, CGWB, NWR, Chandigarh indicated that the approval of sub-committee has not been received.

Finally it was decided by Central Level Expert Group that by 15th October 2013 approved report must be submitted by State Level Committee failing which the report in its present form prepared jointly by CGWB & State ground water taken as final and will included in the National level report.

Dr. N.C. Ghosh, Scientist-F & Head, Ground Water Hydrology Division, NIH, Roorkee was of the opinion that while bringing out the report on Assessment of Total Ground Water Availability, a line may be added that this is a rough estimation. Smt. Anita Gupta, Regional Director, CGWB clarified that this estimation is the first approximation meant for preparation of contingent plan to combat the situation like natural disasters.

Dynamic Ground Water Resources (As on 31st March 2011)

Chairman, Central Level Expert Group said that Ministry of Water Resources, Government of India is pressing hard for submission of report on Dynamic Ground Water Resources of country (As on 31st March 2011). He also gave an over-all picture of status of preparation of state reports. All states except Uttar Pradesh and West Bengal have prepared and approved the reports. State Level Committee of Uttar Pradesh and West Bengal have provisionally approved the report.

The representatives of various states expressed concern that the report on Dynamic Ground Water Resources is not issued even though then individual state reports are final and approved. They were informed that delay was due to same states which had not approved the reports so far.

Uttar Pradesh:

During the discussion Regional Director, CGWB, Northern Region, Lucknow stated that provisionally approved report received from State Ground Water Department has been examined and returned with suggestions and comments. It was suggested that CGWB's and observations may used and final report be modified accordingly.

Shri R.S. Sinha, Senior Hydrogeologist, Ground Water department of Uttar Pradesh stated that correction and validation of data is under process. He also briefed about administrative problems.

After extensive discussion on the issues pertaining to Dynamic Ground Water Resources (As on 31st March 2011) **it was decided by Central Level Expert Group that 15th October will be the deadline for submission of report after modification and approval. After that CGWB will modify the report prepared by the state as per its data and observations and the same will be treated as final and report included in the National report.**

West Bengal:

Regional Director, Eastern Region, Kolkata, Shri G.C. Pati said that report on Dynamic Ground Water Resources (As on 31st March 2011) has been provisionally approved by State Level Committee except the part pertaining to categorization. State Level Committee was advised to constitute an expert Committee to review the report.

Since the categorization is as per Government of India norms **it was decided by Central Level Expert Group that 15th October will be the deadline for submission of approved report. Otherwise the provisionally approved report will be taken as final and it will be included in the National Level Report.**

Other Issues

The issue of Dynamic Ground Water Resource estimation of Tamil Nadu firkka wise came up for discussion. The Central Level Expert Group approved this method stating that this estimation was more micro level and hence more reliable.

Shri B.M. Murali Krishna Rao, Director, Ground Water Department, Government of Andhra Pradesh, raised concern regarding non issuance of the report on Dynamic Ground Water Resource (As on 31st March 2011) and initiation of work for the report on Dynamic Ground Water Resource (As on 31st March 2013).

Central Level Expert Group opined that work on the report on Dynamic Ground Water Resource (As on 31st March 2013) cannot be started unless the report of 2011 is approved.

Smt. Sudha Midha, ADG, MI (Stat.), Ministry of Water Resources stated that fourth minor irrigation census figures have been published for which the data was collected village wise and consolidated up to state level. She enquired whether some improvement can be done for authenticity of data on minor irrigation structure and potential created. Member (TT&WQ) clarified that detailed data (MI) is maintained at Patwari/ Khasara level. This data can be used for MI census.

The reports on 'Dynamic Groundwater Resources of India (as on 31st march,2011)' have been approved by the respective State Level committees with the exception of Uttar Pradesh and West Bengal .The reports on 'Assessment of Total Ground water Availability (as on 31st march,2009)' have been approved by the respective State Level committees except Maharashtra, Punjab and Uttar Pradesh. The Central Level Expert Group approved the above said two draft National Level reports except for those states where State Level Committees have not approved the reports. Finally it was decided by Central Level Expert Group that the states have to submit the approved report by 15th October 2013 otherwise the draft reports prepared by CGWB and state Ground Water Departments will be taken as final and no further meeting of Central Level Expert Group is required. There will be no further reference to the states. The National Level report on Dynamic Ground Water Resources of Country (As on 31st March 2011) and Assessment of Total Ground Water Resources (As on 31st March 2009) will be compiled by 31st October 2013.

The meeting ended with the Vote of Thanks to the Chair and dignitaries by Smt. Anita Gupta, Regional Director, CGWB, Faridabad.

Appendix E

List of the Members of the Central Level Expert Group for overall re-assessment of ground water resources of the country and Special Invitees in the meetings of the CLEG held between 16-07-2012 and 25.09.13

Sl. No.	Name	Designation & Address
1.	Dr. S.C. Dhiman	Ex-Chairman, CGWB, Bhujal Bhawan, Faridabad
2.	Sushil Gupta	Chairman, CGWB, Bhujal Bhawan, Faridabad
3.	S. Kunar	Ex-Member, CGWB, Bhujal Bhawan, Faridabad
4.	Dr. N. V. Varadaraj,	Ex-Member, CGWB, Bhujal Bhawan, Faridabad
5.	R.P. Mathur	Ex-Member, CGWB, Bhujal Bhawan, Faridabad
6.	Dr. R.C.Jain	Member, CGWB, Bhujal Bhawan, Faridabad
7.	Ashis Chakraborty	Member, CGWB, Bhujal Bhawan, Faridabad
8.	Anita Gupta	Member, CGWB, Bhujal Bhawan, Faridabad
9.	Arun Kumar	Member, CGWB, Bhujal Bhawan, Faridabad
10.	Dr. A.K. Jain	Special Secretary (Irrigation), Andhra Pradesh, 6th Floor, J. Block, Secretariat, Hyderabad
11.	B.M. Murali Krishna Rao,	Director, Andhra Pradesh, State Ground Water Department Hyderabad
12.	B.B.Barman	Director, National National River Council,Room No 123 , I Floor, Pariavaran Bhavan, New Delhi
13.	Navin Kumar	Director(BP), Central water Commission, 901 (S), Sewa Bhawan, R.K.Puram, New Delhi -66
14.	Ms. Sudha Midha	Additional Director General, MI (Stat.) Wing, Lok Nayak Bhawan, MOWR, New Delhi
15.	Rupinder Singh, IAS	Director, GSDA, Shivaji Nagar, Pune (Maharashtra) 411 505
16.	Er. Brajmohan	National Rainfed Area Authority, Dev Prakash Shastri Marg,Pusa, New Delhi – 110012
17.	Desh Raj Meena	Additional Chief Engineer , SWRPD, Jaipur
18.	C.M. Pandey	Additional Commissioner(NRM) Ministry of Agriculture, Department of Agriculture & Co-operation, Krishi Bhawan, New Delhi
19.	Dr. Dinesh Chandra	Additional Advisor, Department of Drinking Water Supply, 9th Floor, Paryavaran Bhawan, CGO Complex, Lodhi Road, New Delhi - 110003
20.	Dr. N.C.Ghosh,	Scientist-F, Ground Water Hydrology Div., NIH. Roorkee -241 667
21.	S.B. Tyagi	Scientist E, Hydromet Division, Mausam Bhawan, Lodhi Road, New Delhi – 110003.
22.	N. K. Vaishnav	Suptdg. Hydrogeologist, office of the Chief Engineer, Ground Water Department, Jodhpur Rajasthan
23.	Dr. N.B.Singh	National Rainfed Area Authority, Planning Commission, Government of India, NASC complex, Todapur Road, Pusa Planning Commission, New Delhi
24.	Dr. Dinesh Chand,	Additional Advisor(PHE), Ministry of Drinking Water & Sanitation, 9th Floor Paryavaran Bhawan, CGO Comlex, New Delhi.
25.	Bimal Jeet Bhandari	Agronomist, Water Resources and Environment Directorate,

Sl. No.	Name	Designation & Address
		Government of Punjab , SCO-32-34, Sector 17-C, Chandigarh
26.	Sh. J.B.Ravinder	Dy. Advisor (PHE) CPHEEO, Ministry of Urban Development
27.	Prof. A.K.Keshari,	Professor, Deptt. of Civil Engineering, IIT Delhi, Hauz Khas, New Delhi 110 076
28.	Sh. Dinesh Singh	DS, DOLR, Block No. 11, 6th Floor, CGO Complex, New Delhi.
29.	K.B. Biswas	Regional Director, CGWB, Northern Region-Lucknow
30.	G.C.Pati	Regional Director, CGWB, ER-Kolkata
31.	A.D. Rao	Suptd. Hydrogelogist, CGWB, Jamnagar House, New Delhi
32.	R.S. Sinha	Senior Hydrogelogist, Ground Water Department 9th Floor, Indira Bhawan, Lucknow (U.P)
33.	Sh. Kiran Pramanik	Dy. Director (RO), CWC, 901 (S),Sewa Bhawan, R.K.Puram, New Delhi.-66
34.	Sh. Sanjiv Sharma	Dy Director General, Geological Survey of India, NH-5P, NIT, Faridabad 121 001
35.	G. Sudarshan	Suptdg. Hydrogeologist,, CGWB, Jamnagar House New Delhi
36.	A.K.Madhukar	Suptdg. Geophysicist, CGWB, CHQ, Bhujal Bhawan, NH-IV, Faridabad
37.	S.C.Awasthi	National Water Development Agency (NWDA), Palika Bhawan, R.K.Puram, New Delhi
38.	S.K. Jain	Suptdg. Hydrogeologist, CGWB, CHQ, Bhujal Bhawan, NH-IV, Faridabad
39.	S.K. Sinha,	Scientist-D, CGWB, Bhujal Bhawan, NH-IV, Faridabad,Haryana
40.	Dr. S. Suresh	Scientist-D, CGWB, Bhujal Bhawan, NH-IV, Faridabad, Haryana
41.	Dr. Poonam Sharma,	Scientist-D, CGWB, NWR-Chandigarh
42.	Rana Chatterjee	Scientist 'D', CGWB, Western Region, Jaipur
43.	Sanjay G.Bhartariya	Scientist-C, CGWB, Northern Region-Lucknow
44.	Rumi Mukherjee	Scientist-C, CGWB, Bhujal Bhawan, NH-IV, Faridabad, Haryana
45.	Ravi Kant Singh	Hydrologist, 9th Floor, Indra Bhawan, Director UP Ground Water ,Lucknow, U.P
46.	Dr. Prahlad Ram	Asstt. Hydrogeologist, CGWB, Bhujal Bhawan, NH-IV,Faridabad, Haryana
47.	Dr. Anil Kumar	STA(Ch.), CGWB, Bhujal Bhawan, NH-IV,Faridabad, Haryana

Appendix F

ESTIMATION REPORT

Assessment of Dynamic Ground Water Resources in respect of Nilokheri block, Karnal District, Haryana

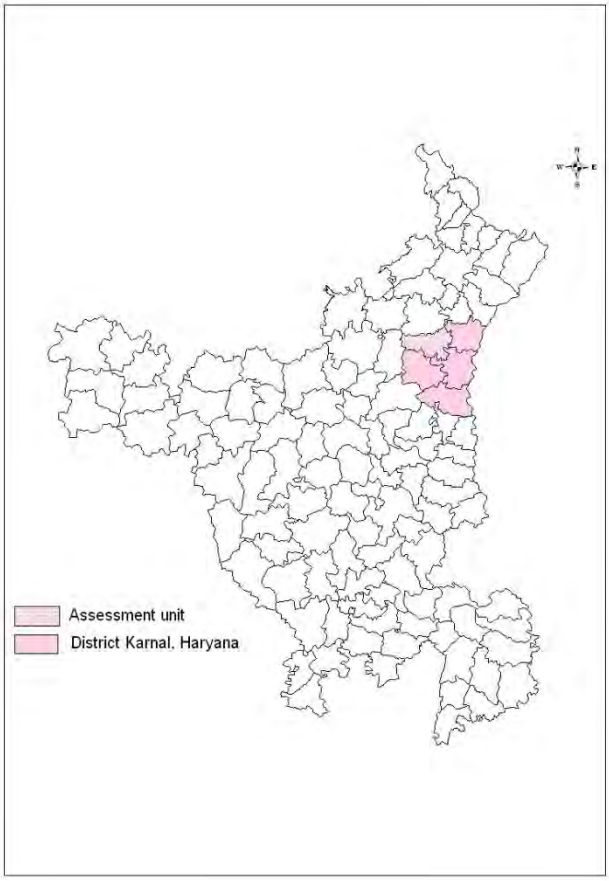
Name of the Assessment unit: **Nilokheri**

Type (Watershed/Mandal): Administrative Development Block

Salient Features:

Total Geographical Area(ha)	:	39491
Hilly Area (>20% slope) (ha)	:	0
Total Area (Command/ non-command Area, ha)	:	39491
Saline Area (ha)	:	0

Location of Watershed:



Parameter		Normal	Assessment year
Annual Rainfall (mm)	:	674	674
Monsoon Rainfall(mm)	:	577	577
Non-monsoon Rainfall (mm)	:	97	97

Parameter		Total (Command/Non-command)
Net Irrigated area (ha)	:	29068

Soil Type	:	Sandy to sandy loams Soil
Crops (season-wise)	:	Khariff – Paddy; Rabi– Wheat, Sun flower
Aquifer	:	Alluvium

Assessment of Dynamic Ground Water Resources in respect of Nilokheri Block, Karnal District, Haryana.

Ground water draft:

Irrigation

Type of Structure	Monsoon Season			Non-Monsoon Season			Data Source
	Number of Structures	Unit draft	Total Draft (2*3)	Number of Structures	Unit draft	Total Draft (5*6)	
1	2	3	4	5	6	7	8
Shallow Tubewell with PS	9422	0.543	5116.14	9422	1.267	11937.67	MI Census &GWC

Annual Irrigation Draft (monsoon + non-monsoon) **5116.14 + 11937.67 = 17053.81 ham**

Domestic & Industrial Draft

Type of Structure	Monsoon Season			Non-Monsoon Season			Data Source
	Number of Structures	Unit draft	Total Draft (2*3)	Number of Structures	Unit draft	Total Draft (5*6)	
1	2	3	4	5	6	7	8
Deep Tubewell of PHED	44	0.597	26.281	44	1.212	53.358	PHED Office
Shallow Tubewell	70	0.597	41.811	70	1.212	84.889	Industry Deptt
Total	114		68.092	114		138.247	

Annual Domestic & Industrial Draft (monsoon + non-monsoon) = **68.09 + 138.24 = 206.33 ham**

Annual Ground Water Draft = Annual Irrigation Draft + Annual Domestic & Industrial Draft
= 17053.81 + 206.33 = 17260.14 ham

Recharge from Other Sources:

Recharge from Canals:

Name of canal segment	Lined or unlined	Length of canal (m)	Wetted perimeter (m)	Wetted area (m.sqm)	Seepage factor (ham per day per million square meters of wetted area)	No of running days		Seepage(ham)		Data Source
						Mon-soon	Non-monsoon	Mon-soon	Non-monsoon	
Chautang fd.	Unlined	10594	12.95	0.137192	20	75	9	205.79	24.69	Irrigation Department
Rakshi Dy.	Unlined	8765	7.68	0.067315	20	75	9	100.97	12.12	
Taraori Mr.	Unlined	3064	6.4	0.01961	20	75	9	29.41	3.53	
Kurak Mr.	Unlined	2743	4.23	0.011603	20	75	9	17.40	2.09	
Bhaini Mr.	Unlined	3677	3.79	0.013936	20	75	9	20.90	2.51	
Sambhi Mr.	Unlined	2957	3.45	0.010202	20	75	9	15.30	1.84	
Sadiq Pur Mr.	Unlined	229	1.62	0.000371	20	75	9	0.56	0.07	
Padana Dy.	Unlined	4237	8.67	0.036735	20	75	9	55.10	6.61	
Sagga Mr.	Unlined	229	1.62	0.000371	20	75	9	0.56	0.07	
Shadi Pur Mr.	Unlined	329	4.44	0.001461	20	75	9	2.19	0.26	
Gital Pur Mr.	Unlined	1829	3.57	0.00653	20	75	9	9.79	1.18	
Barthal Dy.	Unlined	12805	9.92	0.127026	20	75	9	190.54	22.86	
Gholpura Mr.	Unlined	10674	5.24	0.055932	20	75	9	83.90	10.07	
Sambhli Mr.	Unlined	8451	6.96	0.058819	20	75	9	88.23	10.59	
Karsa Mr.	Unlined	6158	3.19	0.019644	20	75	9	29.47	3.54	
I.R. Mr.	Lined	8704	3.7	0.032205	4	75	9	9.66	1.16	
I.R. Mr.	Lined	10331	3.15	0.032543	4	75	9	9.76	1.17	
Bala Mr.	Lined	2021	4.9	0.009903	4	75	9	2.97	0.36	
N.B.K.Link	Lined	20152	42.38	0.854042	4	122	223	416.77	761.81	
Nardak Dy.	Lined	11250	15.85	0.178313	4	63	102	44.93	72.75	
Kheri Dy.	Lined	2113	3.62	0.007649	4	52	5	1.59	0.15	
Total Recharge from Canal Seepage								**1335.81**	**939.41**	

Annual Recharge from Canal Seepage = Monsoon Recharge + Non-monsoon Recharge
= 1336 + 939 = 2275 ham

Recharge from Surface water Irrigation:

Monsoon

Name of (canal) Outlet	Irrigation Water Applied (ham)	Return Flow Factor (Command area)						Recharge from Surface Water Irrigation (ham)
		Average Depth to Water Level (m bgl)	Irrigated Area (Paddy) (ha)	Return flow factor	Irrigated Area (non-Paddy) (ha)	Return flow factor	Weighted Return flow factor (4*5+6*7)/(4+6)	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Total Command Area	119.52	16.54	2700	0.50	105	0.30	0.49	58.86
Total Recharge from Surface Water Irrigation (Monsoon season)								**58.86**

Non-Monsoon

Name of (canal) Outlet	Irrigation Water Applied (ham)	Return Flow Factor (Command area)						Recharge from Surface Water Irrigation (ham)
		Average Depth to Water Level (m bgl)	Irrigated Area (Paddy) (ha)	Return flow factor	Irrigated Area (non-Paddy) (ha)	Return flow factor	Weighted Return flow factor (4*5+6*7)/(4+6)	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Total Command Area	203.77	17.04	0	0.50	29948	0.30	0.30	61.13
Total Recharge from Surface Water Irrigation (Non-monsoon season)								**61.13**

Annual Recharge from Surface Water Irrigation= Monsoon Recharge + Non-monsoon Recharge
= 58.86 + 61.13 = 119.99 ham

Recharge from Groundwater Irrigation:

Monsoon

Irrigation Water Applied (GW Draft) (ham)	Return Flow Factor (Command area)						Recharge from Ground Water Irrigation (ham)
	Average Depth to Water Level (m bgl)	Irrigated Area (Paddy) (ha)	Return flow factor	Irrigated Area (non-Paddy) (ha)	Return flow factor	Weighted Return flow factor (3*4+5*6)/ (3+5)	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
5116	16.54	27279	0.45	1789	0.25	0.43	2239.29
Total Recharge from Ground Water Irrigation (Monsoon season)							**2239.29**

Non-Monsoon

Irrigation Water Applied (GW Draft) (ham)	Return Flow Factor (Command area)						Recharge from Ground Water Irrigation (ham)
	Average Depth to Water Level (m bgl)	Irrigated Area (Paddy) (ha)	Return flow factor	Irrigated Area (non-Paddy) (ha)	Return flow factor	Weighted Return flow factor (3*4+5*6)/ (3+5)	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
11938	17.04	0	0.45	30363	0.25	0.25	2984.41
Total Recharge from Ground Water Irrigation (Non-Monsoon season)							**2984.41**

Annual Recharge from Ground Water Irrigation= Monsoon Recharge + Non-monsoon Recharge

= 2239.29 + 2984.41 = 5223.70 ham

Recharge from Tanks and Ponds:

Monsoon

Name of Tanks/ Ponds	Average Water Spread Area (ha)	No. of days water is available	Recharge from Tanks and Ponds (0.00144 *2*3)	Data Source
1	**2**	**3**	**4**	**5**
132	149	135	28.9656	Irrigation Department & Agriculture Deptt.
Total Recharge from Tanks & Ponds (Monsoon season)			28.9656	

Non-Monsoon

Name of Tanks/ Ponds	Average Water Spread Area (ha)	No. of days water is available	Recharge from Tanks and Ponds (0.00144 *2*3)	Data Source
1	2	3	4	
132	149	165	35.4024	Irrigation Department &

				Agriculture Deptt.
Total Recharge from Tanks & Ponds (Non-Monsoon season)			35.4024	

Annual Recharge from Tanks and Ponds = Monsoon Recharge + Non-monsoon Recharge
= 28.96 + 35.40 = 64.36 ham

Recharge from Water Conservation Structures:

Sr. No	Name of the Structure	No. of structures	Gross Storage [ha.m]	Recharge (ham)		
				Monsoon	Non - Monsoon	Total
1	**2**	**3**	**4**	**5**	**6**	**7**
1	NIL					

Recharge from Other Sources (Monsoon) =

[Recharge (Canal Seepage)+Return flow (SW)+ Return flow (GW) + Recharge (Tanks/Ponds) + Recharge (Water Conservation Structure)]= 1336.00**+58.86+2239.29+28.96+0.0 = 3663.11 ham**

Recharge from Other Sources (Non-Monsoon)

[Recharge (Canal Seepage)+Return flow (SW)+ Return flow (GW) + Recharge (Tanks/Ponds) + Recharge (Water Conservation Structure)]= 939.00**+61.13+2984.41+35.40+0.0 = 4019.94**

Annual Recharge from Other Sources =

[Monsoon Other Sources Recharge + Non-monsoon Other Sources Recharge]
=3663.11+4019.94=7683.05

Rainfall Recharge

Method I*: Rainfall Recharge (using Rainfall Infiltration Factor method):*

Monsoon

Normal Rainfall (m)	Rainfall Infiltration Factor	Assessment Area (ha)	Rainfall Recharge (ham) (1*2*3)	Data Source
1	**2**	**3**	**4**	**5**
0.577	0.22	39491	5012.98	IMD & District Authorities
Recharge from Rainfall (Monsoon season)			**5012.98**	

Non-Monsoon

Normal Rainfall (m)	Rainfall Infiltration Factor	Assessment Area (ha)	Rainfall Recharge (ham) (1*2*3)	Data Source
1	**2**	**3**	**4**	**5**
0.097	0.22	39491	842.73	IMD & District Authorities
Recharge from Rainfall (Non-Monsoon season)			**842.73**	

Method II*: Rainfall Recharge during Monsoon (using Water Level Fluctuation method):*

Water Level Fluctuation

Average pre-monsoon Depth to Water level (m bgl)	Average post-monsoon Depth to Water level (m bgl)	Water Level Fluctuation (m) (1-2)	Data Source
1	**2**	**3**	**4**
16.54	17.04	-0.496	GWC & CGWB

Rainfall Recharge during Monsoon Season

Assessment Area (ha)	Rock Type	Specific Yield	Average Water Level Fluctuation (m)	Change in Storage (ham)	Ground Water Draft (ham)	Ground Water Recharge (ham) (5+6)	Recharge from Other Sources (ham)	Rainfall Recharge (ham) (8-7)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
39491	Alluvium	0.12	-0.49	-2350.50	5184	2833.5	3662.93	829.43
Total Rainfall Recharge(Monsoon season)								**829.43**

Normalization of Rainfall Recharge during monsoon season (WLF Method)

Assessment Year	Rainfall Recharge	Rainfall for the corresponding Year	Recharge corresponding to Normal Rainfall (Normal Monsoon Rainfall *[2]/[3])
1	**2**	**3**	**4**
2011 (2006-10)	829.43	377.11	1269.07
Normal Rainfall Recharge during Monsoon Season (Average of Col. 4)			**1269.07**

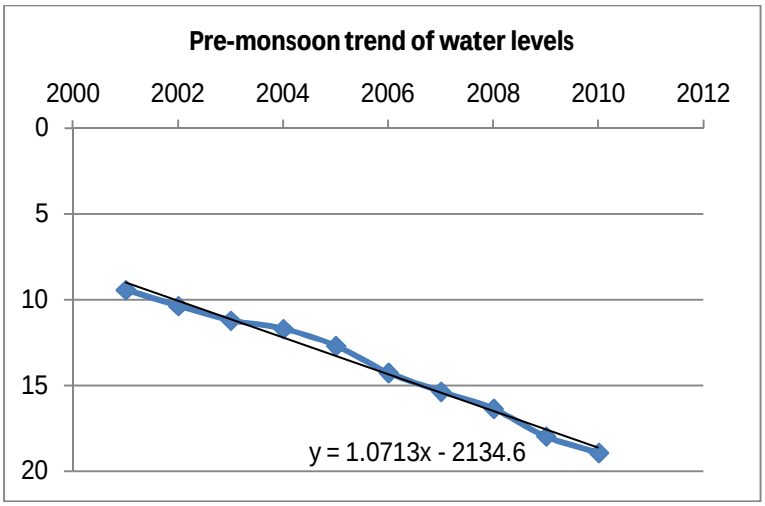
Normal Rainfall Recharge

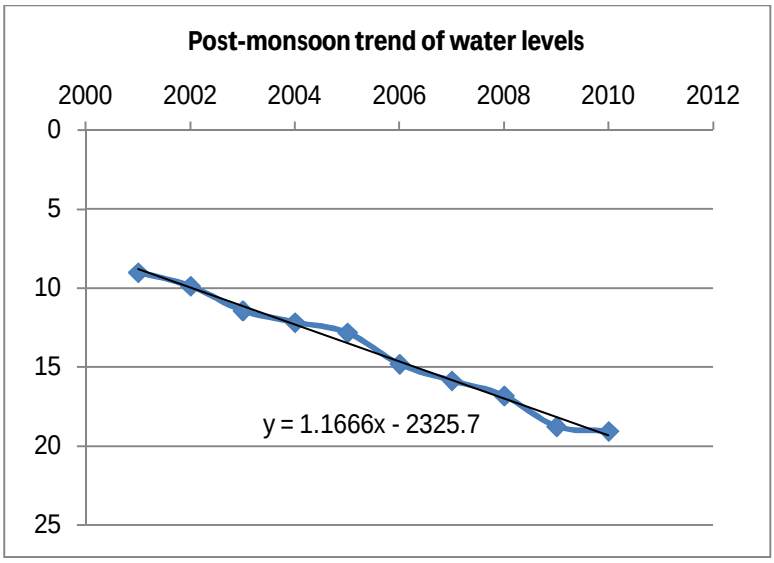
Normal Rainfall Recharge (RIF method)	Normal Rainfall Recharge (WLF method)	Percentage Difference [(2)-(1)/(1)]*100	Normal Rainfall Recharge
1	2	3	4
5012.98	**1269.07**	(-3743.91/5012.98)*100 = -74.68	4010.39

SUMMARY OF RECHARGE ESTIMATION

Monsoon Recharge		Non-monsoon Recharge		Annual Replenishable Ground Water Resources ([1]+[2]+[3]+[4])	Natural discharges (provision)	Net Annual Ground Water Availability [[1]-[2]]	Gross Annual Ground Water Draft For All Uses	Stage of Ground Water Development [[8]/[7]]*100
Rainfall Recharge	Recharge from Other Sources	Rainfall Recharge	Recharge from Other Sources					
1	2	3	4	5	6	7	8	9
4010.39 (4010)	**3663.11 (3663)**	**842.73 (843)**	**4019.94 (4020)**	12536.17 (12536)	1253.61 (1254)	11283.56 (11283)	**17260.14 (17260)**	152.97 (153)

Long Term Water Level Trend





Stage of ground Water Development = 153%

Average Long Term Water level Trend (Pre-monsoon): 107.13 cm/year declining

Average Long Term Water level Trend (Post-monsoon): 116.66 cm/year declining

Category: Over-exploited

Allocation of ground water resources for utilization

Projected population density at year 2025	Domestic & Industrial Water Supply Requirement (lpcd)	Extend of Dependence on Ground Water	Annual Allocation of ground water resources for domestic and Industrial water requirement upto 2025 (mm) [(22/60000)*(1)*(2)*(3)]	Area	Annual Allocation of ground water resources for domestic and Industrial water requirement upto 2025 (ham) [(5)*(4)/1000]
1	**2**	**3**	**4**	**5**	**6**
0.6	60	0.75	Detail is given below	39491	206

The projected demand for domestic and industrial water supply is kept based on projected population for the year 2025 and present dependency on ground water. In order to rationalize the projected demand of ground water resources, following procedure is adopted:

¾ Case I, when GWav ~ Dgi+ Alld

In such cases projected demand for future domestic and industrial uses = Alld

¾ Case II, when GWav < Dgi+ Alld

In such cases, projected demand for future domestic and industrial uses = (GWav – Dgi) or Dgd, whichever is more.

Where,

GWav = Net Annual Ground Water Availability

Dgi = Existing Ground Water draft for Irrigation

Dgd = Existing Ground Water draft for Domestic use

Dg = Existing Ground water draft for all uses

Alld = Computed value of allocation for domestic use

Net Ground Water Availability For future Irrigation:

Net Annual Ground Water Availability (ham)	Annual Ground Water Draft for Irrigation use (ham)	Annual Allocation of ground water resources for domestic and Industrial water requirement upto 2025 (ham)	Net Ground Water Availability for future Irrigation (ham) [(1)-(2)-(3)]
1	**2**	**3**	**4**
11283	17054	206	- 5978

SUMMARY REPORT OF DYNAMIC GROUND WATER RESOURCES ESTIMATION (as on 2011) IN RESPECT OF BLOCK NILOKHERI, DISTRICT KARNAL, HARYANA

(in ham)

Annual Replenishable Ground Water Resources					Natural Discharge during monsoon season	Net Annual Ground Water Availability	Annual Ground Water Draft		
Monsoon Recharge		Non-monsoon Recharge		Total					
Rainfall Recharge	Recharge from Other sources	Rainfall Recharge	Recharge from Other sources				Irrigation Use	Domestic & Industrial water Use	Total
1	2	3	4	5	6	7	8	9	10
4010	3663	843	4020	12536	1254	11283	17054	206	**17260**

Annual Allocation of ground water resources for domestic and Industrial water requirement upto 2025 (ham)	Net Ground Water Availability for future Irrigation (ham)	Stage of Ground Water Development (%)
11	12	13
206	-5978	153

APPENDIX G

REASONS FOR SIGNIFICANT CHANGE IN PARAMETERS OF ASSESSMENT UNITS (from 2009 to 2011 ASSESSMENT)

Sr No.	State/UT	Parameter	Reasons
1	**Andhra Pradesh**	(i)Recharge due to rainfall increased by 14% in 2011 computation (ii) Domestic and industrial draft is reduced by 13%. (iii) Change in categorization of assessment units(critical units declined by 11 no.(42%)	· Andhra Pradesh experienced excess rainfall during the period 2010-11. · Due to excess rainfall in this period, in some of the districts more surface water was used for domestic and industrial needs thereby the stress on ground water for domestic and industrial use was reduced. · The water levels became shallower due to excess rainfall in monsoon season of 2010. This in turn influenced some of the water level trends thus affecting categorization of ground water development
2	**Assam**	(i) Overall reduction in draft by 42% (ii) Stage of ground water development has changed from 22% (2009)to 14%(2011)	· Due to changes in census figures-No. of Shallow Tubewell (STW) for 2009 was based on projected figures as per 2004 census, where as no. of S.T.W. for 2011 was taken based on projected figure of 2006-07 census.
3	**Bihar**	Increase in semicritical units - 7No(175%) and corresponding decrease in the number (7) of safe units.	The districts such as Begusarai (2 no.), Muzaffarpur (1no.), Patna (2 no.) and Arwal(1no.) exhibit semi-critical blocks due to growth in groundwater abstraction structures and not so significant rise in net groundwater availability. The district Samastipur (1 no.) shows one block as semi-critical owing to less rainfall in the year 2009-10 with simultaneous rise in groundwater abstraction structures**.**
4	**Chhattisgarh**	(i)Increase in semicritical units - 4No (29%) (ii)New critical units(2No.) (iii)1 new OE unit (1No)	· The increase in semicritical blocks is due to increase in draft for all uses. · The increase in critical blocks is due to declining trend in premonsoon · 1 block (Gurur) in Durg district became OE Net ground water availability is reduced as

Sr No.	State/UT	Parameter	Reasons
			the normal rainfall figure was corrected & wells were showing declining trend in pre & post monsoon
5	**Goa**	(i)Decrease in the overall stage of ground water development from 33% (2009) to 28%(2011**)** (ii)Change in number of assessment units-20 in 2011 as against 11 units in 2009	· The ground water draft figures during 2009 was based on percentage increase from that of 2004 figures. During 2011 assessment, the number of ground water structures have been arrived at based on limited field checks as informed by Water Resources Department, Govt. of Goa. There is a drastic reduction in number of Dugwells with reference to that of 2009. Hence, there is a change of stage of development by about 5% . · During 2011, the assessment units were subdivided into sub assessment units-11 Non command, 9 commands**.**
6	**Gujarat**	(i) Stage of Groundwater Development decreased to 67 % in 2011 compared 75 % in 2009. (ii) Overall decrease in categorization of assessment units - critical units declined by 1no. (17%), OE units declined by 3 no (11%), semicritical units declined by7 no.(35%),safe units increased by 15 no. (17) & saline units decreased by 4 no.(29%)	·The quantum of groundwater resources in 2011 increased by 1 % whereas draft (development) decreased by 9 %. ·The overall improvement in groundwater resource is mainly attributed to good rainfall of last five years. In addition, implementation of extensive &wide spread artificial recharge activities and adopting water conservation measures, by micro irrigation (drip & sprinkler system), in many overdeveloped talukas of the State has resulted in stabilisation of falling water levels. ·The relative lowering of groundwater draft can be attributed to start of Narmada Irrigation Command (surface water resources based irrigation) in Central & North Gujarat and as domestic water source, by piped water supply, in major urban as well as rural areas of Gujarat Main land and Saurashtra ·With identification of fresh groundwater pockets for 4 units, which were previously categorised 'saline' have been re-categorised as safe in 2011 as per GEC norm.

Sr No.	State/UT	Parameter	Reasons
7	**Haryana**	(i) Categorisation of assessment units show some changes in 2011.Critical blocks reduced by 6 no.(29 %), ,semi critical blocks reduced by 2 (22%) and safe blocks increased by 5 (28%) (ii) There is an overall increase in the stage of ground water development to 133% (2011) from 127%(2009)	· 8 blocks have shown change from critical/semicritical to semicritical/safe due to increased replenishable resource, reduction in draft of tubewells, rise in water level trends or change in the land use. · 5 blocks under safe category has increased due to increased recharge and rising water levels trends. In the cases where stage of ground water development and change in ground water levels do not match, ground water level trends have been given emphasis for categorization.
8	**Himachal Pradesh**	The overall stage of ground water development has increased to 71% (2011) from 58% (2009) Categorisation of assessment units show some change. The no. of safe units declined by 1(17%) & critical units increased by 1 no.	Strengthening of data base particularly additional data received during 2011 as for Kala Amb valley, district Sirmaur and Hum valley, district Una resulted in increase in stage of ground water development
9	**Jharkhand**	The draft in the 2010-11 computation is more by about 16%	This is due to population growth, increase in irrigation and industries.
10	**Karnataka**	A total of 49 taluks is showing variation in 2011as compared to 2009 *(i) Change from OE/ critical /semicritical to critical /semicritical /safe* 12 OE blocks became critical/semicritical 3critical blocks became semicritical 11 semicritical became safe *(ii) Change from critical /semicritical/safe to OE/ critical*	·The improvement in categorization is mainly due to reduced draft due to drying / non usage of the wells in the OE taluk and reduced draft in Critical and Semicritical taluks due to change is Landuse pattern and partly due to water conservation measures. ·The deterioration in categorization is due to increase in draft.

Sr No.	State/UT	Parameter	Reasons
		/semicritical *2 critical became OE* *7 semicritical became critical* *1 semicritical became OE* *12 safe became semicritical* *1safe became OE* (iii) The overall stage of ground water development has decreased from 68 %(2009) to 64% (2011)	
11	**Maharashtra**	(i) Reduced recharge in Akola, Amravati, Aurangabad, Dhule, Gadchiroli, Hingoli, Jalna ,Latur, Nanded, Nanddurbar, Nashik, Osmanabad, Wardha, Yeotmal (ii) Increased recharge in Pune, Thane, Kolhapur, Solapur (iii) Reduced draft in Yeotmal, Nanddurbar, Latur, Amravati, (iv)Increased draft in Jalgaon	·Recharge from water conservation structures reduced based on field studies. · Increased recharge due to addition of surface irrigation recharge through lift irrigation schemes taken into account for the first time in the assessment ·reduced draft due to reduction in area under Rabi crops and proportionate reduction in no of irrigation days ·Draft increased due to increase in no. of irrigation wells
12	**Rajasthan**	(i)Change in number of assessment units from 239 to 243 (ii)Categorisation of assessment units have changed. - Decrease(19%) in safe blocks from 31 no.(2009) to 25 no.(2011) - semi critical blocks has increased by 4 No.(25 %). - OE blocks increased by 4% from 166(2009) to 172(2011). (iii)1 more block became saline in 2011	· Due to redefining the boundaries of districts and formulation of new blocks the number of assessment units changed · Increase in Total Annual Draft resulted in change of categorization of blocks. · One new block named as Khajuwala in Bikaner district has been categorised as Saline due to availability of brackish to saline ground water
13	**Tamil Nadu**	Significant change in number of assessment units from 386 (2009) to 1129 (2011)	Assessment unit type changed from block to firka
14	**Uttar Pradesh**	Categorisation of assessment units have changed. - Semicritical units decreased from	· Decrease in the Semi-critical and Safe blocks in Uttar Pradesh because of more exploitation of ground water in these blocks

Sr No.	State/UT	Parameter	Reasons
		107 (2009) to 82 (2011) by 23% -Critical units increased from 32 (2009) to 68 (2011) by 113% -OE units increased from 76 (2009) to 111 (2011) by 46%	· Increase in O.E. and critical blocks is due to more number of Minor Irrigation works and less rainfall, therefore more stress on ground water resources
17	**Uttarakhand**	The overall stage of ground water development has increased from 51%(2009) to 57% (2011). In Haridwar district, the total replenishable resource has significantly decreased as compared to 2009 In Udham Singh Nagar district, the ground water draft has significantly decreased as compared to 2009	· Decrease in total Replenishible groundwater resource because of the reduced average water level fluctuation in 2011. · The change in Draft (reduction) by 48235 Ham is due to the changes in number of wells. The ground water draft for 2011 was calculated based on data given by Minor Irrigation Department, Uttarakhand.
18	**West Bengal**	Significant increase (71%) in the number of semicritical blocks from 38 (in 2009) to 65 (in 2011). 1 block has become critical	· Declining pattern in rain fall is the major contributor. The majority of semi-critical blocks show a major decline in post-monsoon water level after 2007. · Population figures from Census 2011 has been used in which varies significantly from the projected population used earlier · In 2009 Estimation, only Ground water Structure data of 4th MI Census has been used. However in present estimation, Minor Irrigation Potential Created data of 4th MI Census is also utilized. New Tubewells constructed during this period is accounted for using Tubewell Registration data
	Union Territories		
	Daman & Diu	Stage of Groundwater Development decreased from 99% in 2009 to 97% in 2011	The change in stage of ground water development is attributed to rationalisation of norms for recharge and groundwater draft figures
	Lakshdweep	Stage of ground water development reduced from 74% (2009) to 67% (2011) Semicritical units decreased by	The domestic draft has decreased by about 10% for the group of islands as a whole because the actual population during 2011 was less than the projected population

Sr No.	State/UT	Parameter	Reasons
		25% (1No.)	considered for the 2009 estimation. Other components have remained the same. This has resulted in improved ground water balance and reduction in the number of semi critical blocks.

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Data Elements used in Assessment of Dynamic Ground Water Resources (As on 31st March, 2011)

Sl. No.	Data Type	Agency
i	Rainfall data	IMD, State Revenue Departments, AP Chief Planning Officer (DES), Statistical Abstract of Punjab (2011)
ii	Water level data	CGWB and SGWDs
iii	Canal Data	State Irrigation Departments, Irrigation & Flood Control Departments
iv	Cropping Pattern Data	Agriculture Departments, Chief Planning Officer, IV M.I. Census 2006-07
v	Abstraction structures Data	M.I. Census, 2006-07, AP MRO Offices, RWS Department, AP Chief Planning Officer (DES), Gujarat Electricity Board, Revenue/Agriculture Departments, State Statistical Booklets, Revenue Departments
vi	Tanks and Ponds data	State Minor Irrigation Departments, TAPAS (Delhi based NGO)
vii	Water Conservation Structures Data	Rural Development Department, Irrigation Department, RWS Department, Directorate of Soil Conservation and Watershed Development Department (Kerala), various other State Agencies involved in watershed management
viii	Population data	Population Census, 2001, AP Chief Planning Officer (DES)
ix	Spatial Data of assessment units	Geological Survey of India, National Soil Survey and Land Use Planning Department, State Irrigation Department, State Ground Water Departments and CGWB

ABBREVIATIONS

bcm	Billion cubic metre
C	Command
CGWB	Central Ground Water Board
CLEG	Central Level Expert Group for overall reassessment of ground water resource of the country
cm	Centimetre
DES	Department of Economics & Statistics
GEC-1984	Ground Water Estimation Committee, 1984
GEC-1997	Ground Water Resources Estimation Committee, 1997
GSDA	Ground Water Survey and Development Agency, Maharashtra
ham	Hectare metre
IMD	India Meteorological Department
lps	Litres per second
m	Meter
m bgl	Meter below ground level
m ham	Million hectare metre
M.I.	Minor Irrigation
mm	Millimeter
MOWR	Ministry of Water Resources, Govt. of India
MRO	Mandal Revenue Officer
NABARD	National Bank for Agricultural and Rural Development
NC	Non-command
SGWD	State Ground Water Departments
sq.m.	Square meter
UT	Union Territory

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