COMPARISONS IN GROUNDWATER LEVEL SCENARIO (PRIOR TO REASSESSMENT AND POST ASSESSMENT PERIOD OF GEC) IN OVER-EXPLOITED MANDALS, TELANGANA STATE

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Abstract

Out of 464 mandals, 42 mandals from Telangana State (~7% of area) have been declared as over-exploited (OE) as per 2011 year of reassessment of Dynamic Groundwater Resources and 1128 villages are notified as per WALTA Act. Geologically the state is underlain by granite/gneisses, limestone, sandstone and basalt and receives annual rainfall between 730 mm to 1120 mm (average 944 mm) and drained mainly by rivers, the Godavari and the Krishna and their tributaries. CGWB monitors about 58 observation wells out of 738 wells in these OE blocks four times a year (January, May, August and November) for water levels and one time for groundwater quality (May). Comparison in groundwater level scenario during the year 2010 (prior to reassessment period) and during 2014 is made as they were the year of excess rainfall of 26% and deficient year of rainfall of 29%.

From the study it is concluded that shallow water levels (2.1-21.5 m bgl) are observed during pre-monsoon season (May) of 2014 as compared to pre-monsoon of 2010 (4.3 to 22.3 mbgl). Due to less rainfall in 2014, deeper water levels are observed during post-monsoon season (November) of 2014 (2.1 to 25.8 m bgl) as compared to 2010 season (0.86 to 11.92 mbgl) and number of wells showing deeper water levels increased during this period. Decadal mean of water levels during pre and post-monsoon season of 2004-2014 (4.04 to 26.07 & 1.95-17.7 mbgl), is at deeper levels as compared to the 2001-2010 (4.96 to 18.71 mbgl and 1.98-9.11 mbgl) and there is increase in number of wells showing deeper water levels during the period.

Keywords: *Groundwater, Over-exploited, Pre-monsoon, Post-monsoon, Decadal, Scenario.*

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1. INTRODUCTION

Groundwater is an important resource for meeting the water requirement for irrigation, drinking and industrial purposes in India. It contributes ~70 % of irrigation and ~85 % domestic needs and it is estimated that it contributes ~9 % in its Gross Domestic Product (GDP) (Burjia and Romani, 2003; CGWB, 2014). Hence, any ill effects on groundwater resource will have far reaching consequences on economy of India. In order to have a regional picture of depth to water levels in time and space, Central Ground Water Board (CGWB) monitors groundwater levels 4 times a year (January, May, August and November) and groundwater quality one time (May) through a network of ~20,000 observation well (dug wells and piezometers) all over India and about 738 in the state of Telangana (361 dug wells and 377 piezometers). Apart from CGWB, State Groundwater Department of Telangana State (SGWDTS) also monitors water levels (monthly) and water quality (twice a year) from its 1327 monitoring network stations. The combine data of CGWB and SGWD is used in preparation of various thematic maps, monthly water level bulletins, and periodic assessment of dynamic groundwater resources.

The rapid expansion in agriculture, industrial and urbanization triggered unplanned and uneven groundwater development leading to severe stress on groundwater resources, particularly from hard rock areas of the country. The reassessment of Dynamic Ground Water Resources as on March 2011 has been carried out using GEC-1997 methodology (CGWB 1999). Out of 6607 assessed administrative units (blocks/taluk/mandals) of India, 1071 units falls under over-exploited category (> 100 % groundwater utilization), 217 are critical (90-100 %), 697 are semi-critical (70-90 % and showing significant decline in long term water level trends) and 4530 are safe (< 90 %) and 92 falls under saline category (CGWB 2014).

In order to compare groundwater level scenario during the year 2010 (prior to reassessment period) and during 2014 is made as they were the year of excess rainfall of 26% and deficient year of rainfall of 29%. In the present study monitoring data of CGWB wells is used (CGWB 2014).

2. STUDY AREA

The Telangana state having a geographical area of ~1.15 Lakh Km^2 with a population of 3.52 lakhs (2011 Census) is governed administratively by 10 districts and 464 mandals. The state receives average annual rainfall from 730-1120 mm and mainly drained by The Godavari and the Krishna rivers and geologically is underlain by Granite/gneisses, Limestone, Sandstone, Shale and Basalts rocks. The net GW avialability in the state is 1368446 hectometer (hm), net GW Draft is 750228 hm, provision for drinking and industrial use for the year 2025 is 102293 hm with overall stage of GW development is 57.44 % (CGWB and SGWD, 2012). Out of 448 mandals assessed, 42 mandals have been caregorised as over-exploited, where groundwater development (GWD) is more than 100 % covering about 8136 km^2 area (**Fig.1**), 8 are critical (GWD 90-100%), 55 are semi-critical and 343 are safe. In the state total 1128 villages are notified as per APWALTA Act (2002).

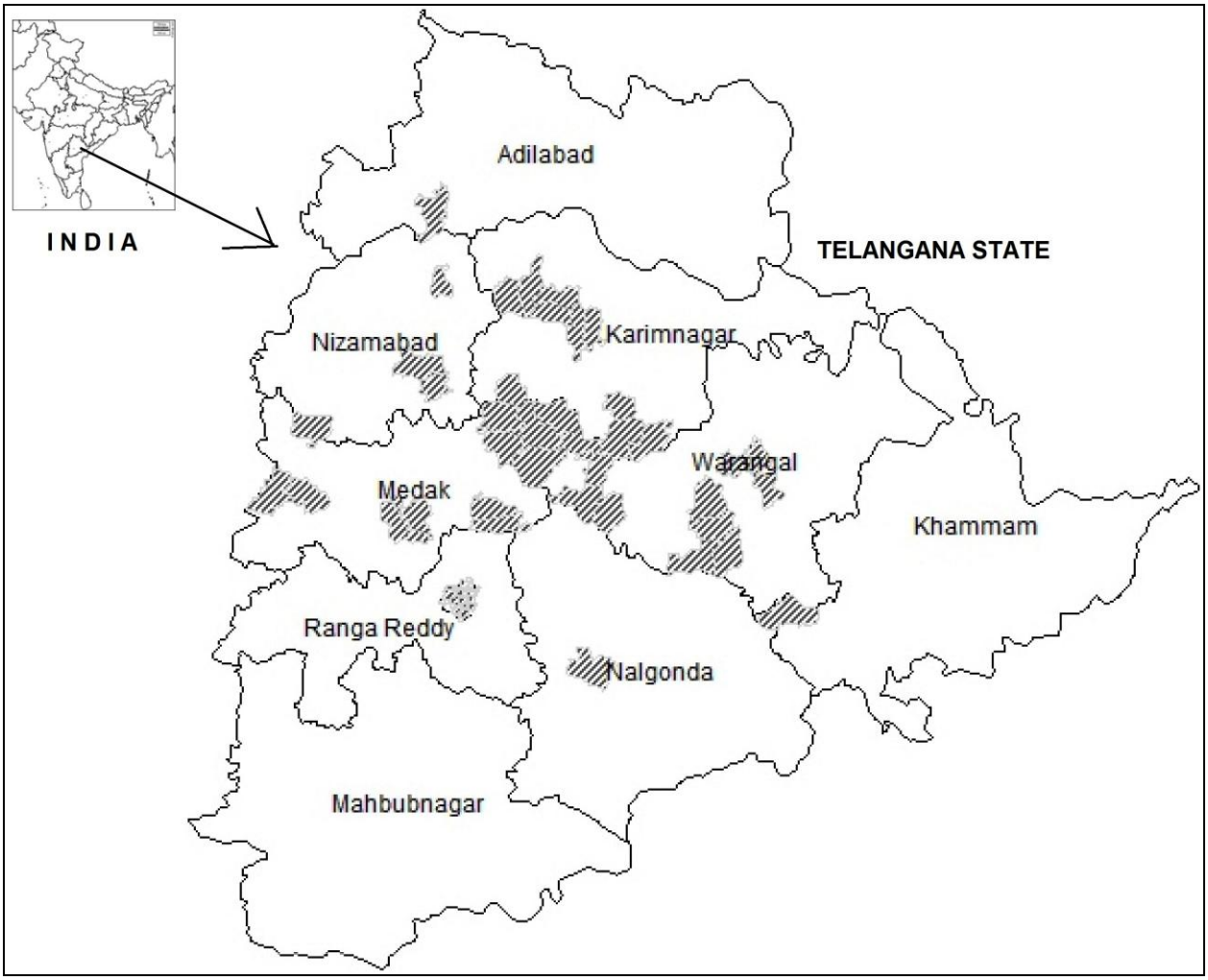

Fig.1: Over-exploited mandals, Telangana State.

3. DEPTH TO WATER LEVEL (DTW) SCENARIO-PRE-MONSOON (MAY)

3.1 Pre-assessment Year (2010)

In order to have the clear picture on distribution of water levels during the pre assessment period of 2011, the depth to water level (DTW) from 58 monitoring wells from 42 OE mandals has been analyzed for the year 2010. The DTW, during pre-monsoon period (May) varies from 4.3-22.3 meter below ground level (mbgl) (**Fig.2**). In majority of wells (33 nos), water levels are in the range of 5-10 mbgl, followed by 10-20 mbgl (15 wells), 5 wells each shows the water levels in the range of 2-5 mbgl and > 20 mbgl.

3.2 Post-assessment Year (2014)

The DTW during pre-monsoon season of 2014, varies from 2.1-21.15 mbgl (**Fig.3**) and in majority of wells (32 nos), water levels are in the range of 5-10 mbgl, followed by 2-5 mbgl and 10-20 mbgl (12 wells each), in 2 wells water levels are > 20 mbgl.

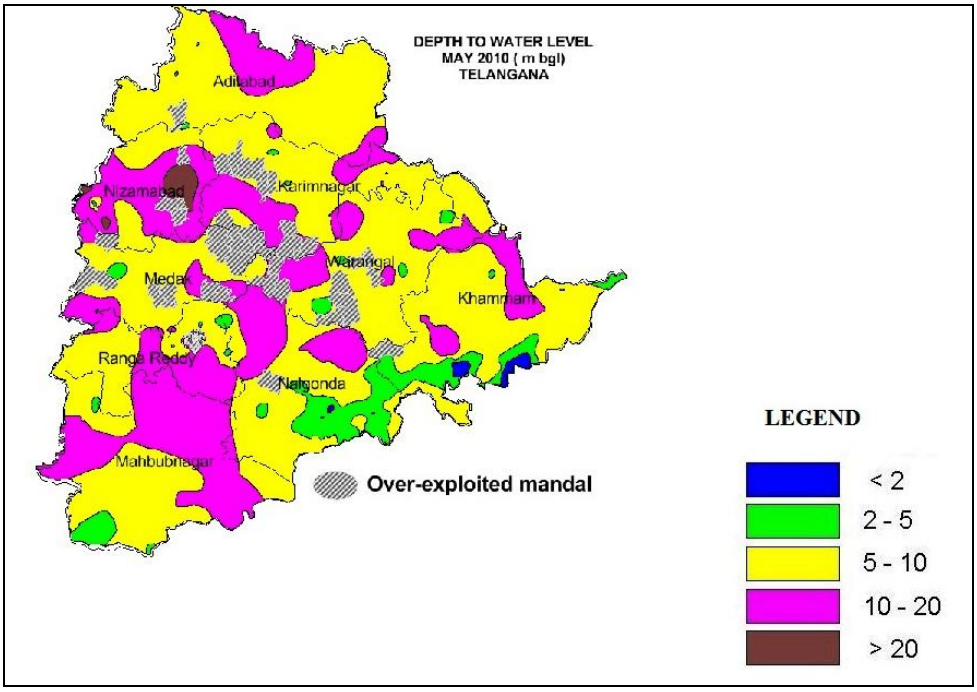

Fig.2: Depth to Water Levels (May-2010).

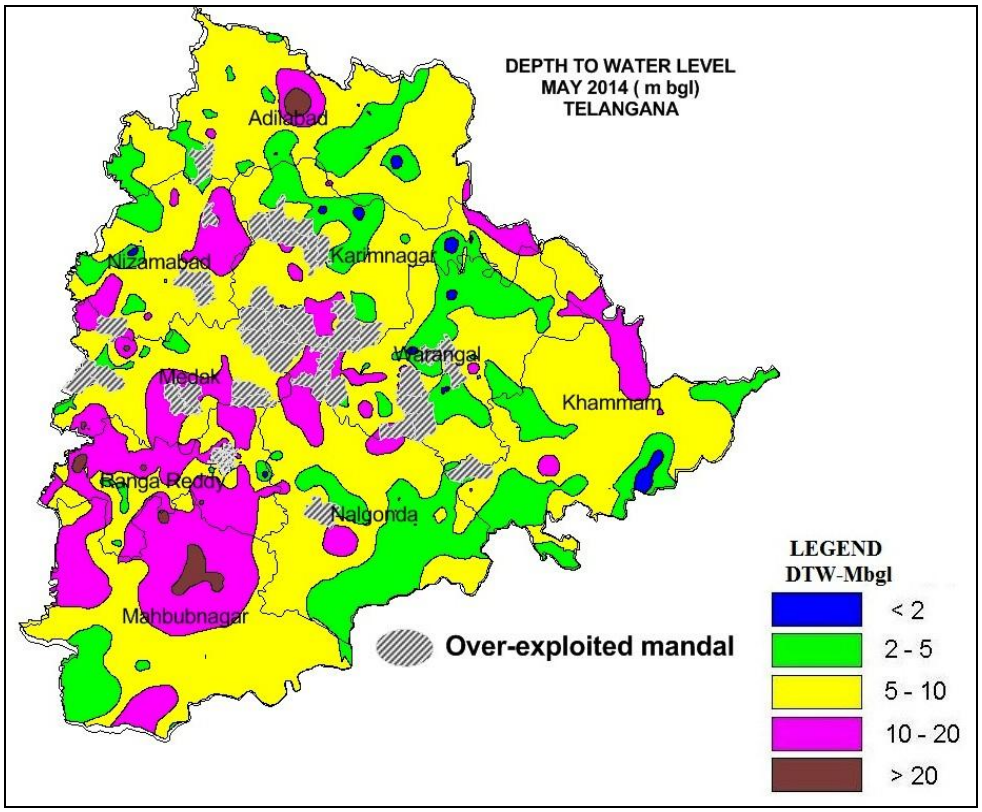

Fig.3: Depth to Water Levels (May-2014).

4. DEPTH TO WATER LEVEL (DTW) SCENARIO-POST-MONSOON (NOVEMBER):

The year 2010 has been a year of excess rainfall throughout the state. The average annual rainfall was 1190 mm against the normal annual rainfall of 944 mm which is 26 percent excess.

4.1 Pre-Assessment Year 2010

The DTW during post-monsoon period varies from 0.86-11.92 mbgl (**Fig.4**). Majority of wells (28 nos), shows water

levels in the range of 2-5 mbgl, followed by 0-2 mbgl (15 wells),5-10 mbgl, 10 wells and 10-20 mbgl, 5 wells.

4.2 Post-Assessment Year (2014)

The DTW during post-monsoon season of 2014, varies from 2.12.1-25.8 mbgl (**Fig.5**) and in majority of wells (25 nos), water levels are in the range of 5-10 mbgl, followed by 2-5 mbgl (17 wells), 10-20 mbgl (14 wells each), in 2 wells water levels are > 20 mbgl. Deep water levels during this period as compared to pre assessment period are due to deficit rainfall of -29% than normal rainfall.

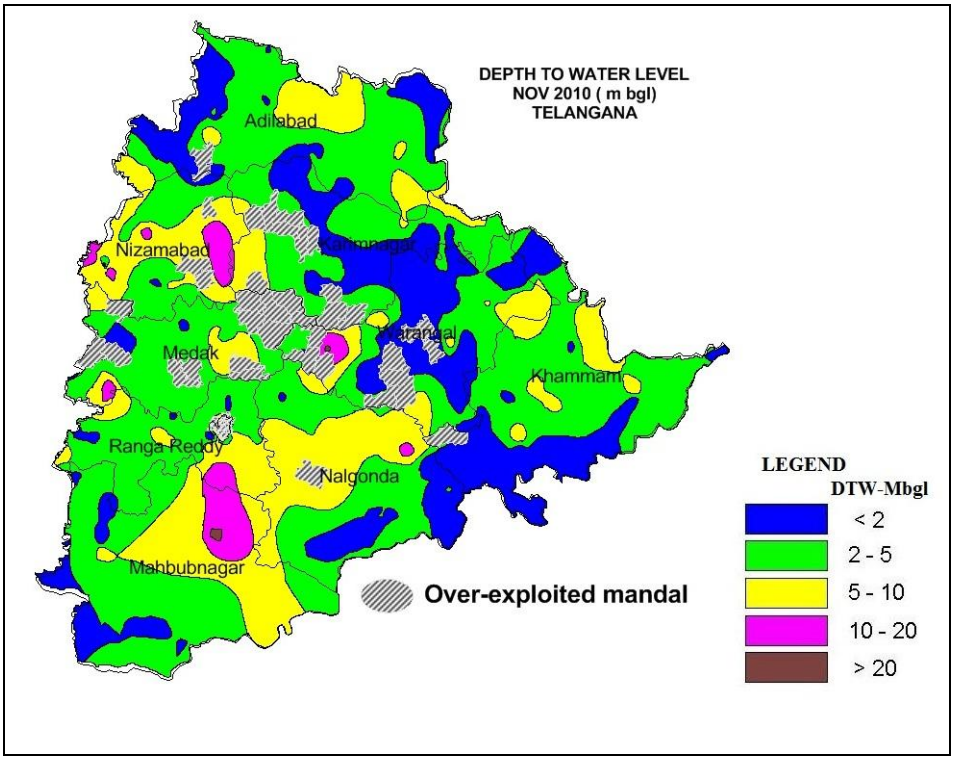

Fig.4: Depth to Water Levels (November-2010).

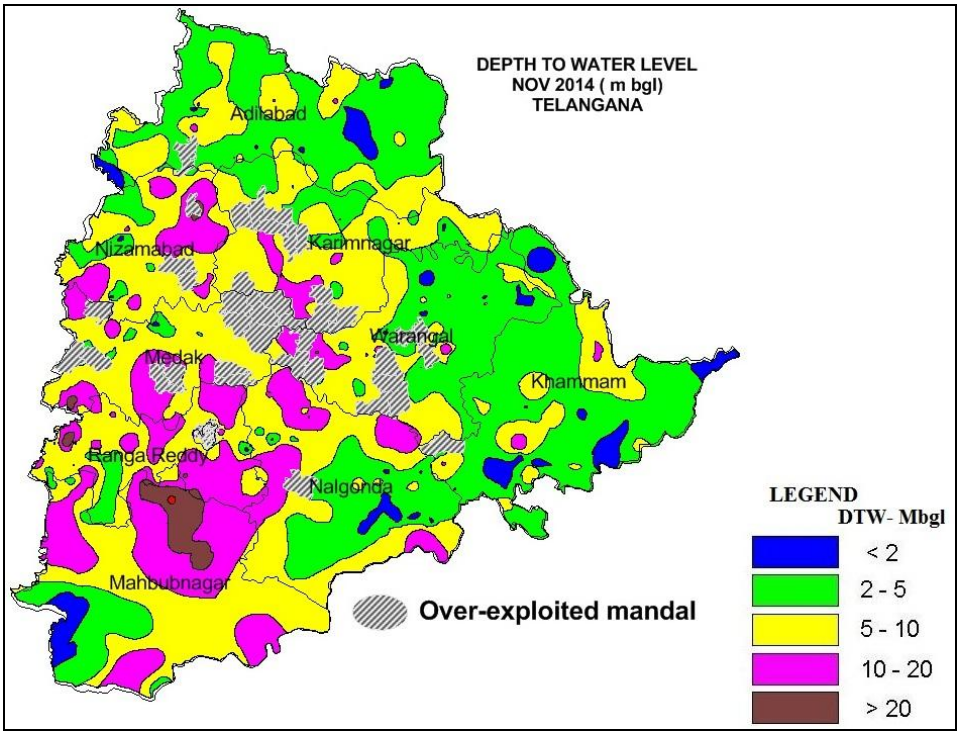

Fig.5: Depth to Water Levels (November-2014).

5. CHANGE IN DTW OVER A PERIOD OF TIME

5.1 Pre-monsoon Season (May 2010 to May 2014)

It is observed that the number of wells falling in DTW range of 2-5 mbgl increased from 5 to 12 and in other categories they decreased

5.2 Post-Monsoon Season (Nov 2010 To Nov 2014)

It is observed that the number of wells falling in DTW range of 5-10 m bgl increased from 10 to 25, 10-20 m bgl from 5 to 14, > 20 from 0 to 2 and in other categories they decreased.

Deeper water levels are observed during post-monsoon season of 2014 as compared to 2010 season due to less rainfall in 2014(-26% of normal), and due to this number of wells showing deeper water levels increased during this period.

6. DECADAL MEAN OF DEPTH TO WATER LEVELS

6.1 Pre-Monsoon (May)

The mean of decadal water levels of 10 year (2001-2010) during pre-monsoon season varies from 4.96 m to 18.7 m bgl and during 2005-2014 varies from 4.04 m to 26.07 m bgl.

6.2 Post-Monsoon (November)

The mean of decadal water levels of 10 year (2001-2010) during post-monsoon season varies from 1.98 m to 9.11 m bgl and during 2005-2014 varies from 1.95 m to 17.7 m bgl.

Decadal mean of water levels during pre and post-monsoon season of 2004-2014 (4.04 to 26.07 & 1.95-17.7 mbgl), is at deeper levels as compared to the 2001-2010 (4.96 to 18.71 mbgl and 1.98-9.11 mbgl) and there is increase in number of wells showing deeper water levels during the period.

7. CONCLUSION

1. The year 2010 was an year of excess rainfall throughout the state (More than 26% excess than long term normal rainfall) and the year 2014 was a year of deficient rainfall (29% less than the long term normal rainfall).
2. The depth to water level during pre-monsoon of 2014 are at shallower level (2.1 to 21.5 mbgl) as compared to pre-monsoon of 2010 (4.3 to 22.3 mbgl).
3. The depth to water level during post-monsoon of 2014 are at deeper level (2.1 to 25.8 mbgl) as compared to post-monsoon of 2010 (0.86 to 11.92 mbgl) and this is due to less rainfall during 2014 as compared to 2010. Due to this low rainfall, the number of wells showing DTW in the range of 5-10 m increased from 10 (Nov 2010) to 25 (Nov. 2014),10-20 m increased from 5 to 14 and in the range of > 20 mbgl increased from 0 to 2.
4. Decadal mean of DTW during pre-monsoon period of 2004 to 14 (4.04 to 26.07 mbgl) are at deeper levels as compared to decadal mean of pre-monsoon of 2001 to 2010 (4.96 to 18.71 mbgl). There is increase in number of wells (from 0 to 5) showing deeper water levels (> 20 mbgl).
5. Decadal mean of DTW during post-monsoon period of 2004-14 (1.95 to 17.7 mbgl) are at deeper levels as compared to decadal mean of post-monsoon of 2001-2010 (1.98 to 9.11 mbgl). There is increase in number of wells (from 0 to 8) showing deeper water levels (10 to 20 mbgl).

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