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Spatial Analysis of Ground Water Level of Sirsa District (Haryana) using GIS

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Abstract: ***The study was conducted to found the ground water potentials in Sirsa district of Haryana with an aerial extent of 4276 sq.km. The study has analyzed the spatial-temporal changes in groundwater depth in Sirsa district to understand the hydrological behaviour and status of the area. Various thematic maps were prepared such as (Groundwater and its fluctuation of pre-monsoon and monsoon in two decades (1996-2017). The main objective of the study was to investigate the temporal trends in annual and monthly groundwater level with the help of central ground water board data. The result indicated a mix of negative and positive trends in the ground water level series.***
Keywords: Ground water, thematic maps, Temporal Trends, GIS etc.

I. INTRODUCTION

Water has emerged as a resource of strategic importance because of its increasing demand in agriculture, domestic and industrial uses. Its adequate and continuous supply is essential to provide stability in food production and self sufficiency to societies. Increased demand for water has stimulated development of groundwater supply. Groundwater has emerged as one of the principal source of water for irrigation in area where surface (canal) irrigation is either insufficient or prohibitively expensive. Groundwater is a replenishable finite source. It is common pool and termed as a heritage for all to manage.

Intensive withdrawals of groundwater in excess of natural recharge over the year have affected the environment causing a continuous fluctuation in water table levels. More than half of the world's population is dependent on the groundwater for its survival. Water storage is a serious problem in many parts of India including semi-arid region of Southern Haryana. The usable groundwater resource is essentially a dynamic resource which is recharged annually and periodically from rainfall, irrigation returns flow, canal seepage, influent seepage etc. (Central Ground Water Board).

Oscillatory water-level fluctuations are reversible changes in water levels around a long-term mean (Arnold G. & Valk V.D., 2005). Groundwater is a dynamic and replenishing natural resource. But in hard rock terrains, availability of groundwater is of limited extent. Occurrence of groundwater in such rocks is essentially confined to fractured and weathered horizons. Poor knowledge about this resource, because of its hidden in nature and its occurrence in complex subsurface formations, has been and is still a big obstacle to the efficient management of this important resource. In India, 65 percent of the total geographical area is covered by hard rock formation with low porosity (less than 5 per cent) and very low permeability (Saraf & Choudhary, 1998). Therefore, efficient management and planning of groundwater in these areas is of utmost importance. An extensive hydro geological investigation is required for through understanding of the groundwater conditions. In the latest development, the central government cabinet committee on economic affairs started "Artificial Recharge of Groundwater through Dug wells" in hard rock areas. It envisaged groundwater recharge programmers in 1180 over exploited, critical and semi critical units through 4.45 million existing irrigation dug wells owned by the farmers.

The Remote Sensing and GIS tools have opened new paths in water resources studies. Remote sensing provides multi-spectral, multi-temporal and multi-sensor data of the earth surface (Choudhary, 2003). Remote Sensing and GIS in hydrological investigations and monitoring is very crucial for successful analysis, prediction and validation (Sarma & Saraf, 2002).

A. Area of The Study

Sirsa is the western district of Haryana state with a total geographical area of 4276 sq. km and is located between $29^0$13' to $29^0$59'N latitude and $74^0$30' to $75^0$07'E longitude. It is surrounded by Muktsar, Bathinda & Mansa district of Punjab in the north, Ganganagar & Hanumangarh districts of Rajasthan in west and south east respectively. The district is under control of Hisar division and administratively divided into seven development blocks namely Sirsa, Dabwali, Odhan, Baragudha, Nathusarichoupta, Rania, & Ellenabad. As per 2011 census the total population of the districts is 12, 95,114 persons. There are 321 villages and five towns in the district.

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II. METHODOLOGY

The study is analytical in nature and based on secondary sources information. Major sources of data are ground water year book published by Central Ground Water Board and Ground Water Cell, Agricultural Department, Government of Haryana and statistical abstract of Haryana. The study was carried out for a period of last 2 decades (1996-2017). Five groundwater observation wells were selected representing their respective block. The major activities involved in this process include compilation of existing data, generation of GIS database (shape files), interpolation, categorization, mapping, and interpretation.

III. RESULT AND DISCUSSION

Western Haryana, being a semi-arid region predominant agricultural economy facing a serious problem of water availability these days. In this region of Haryana rainfall is scantly and availability of surface water due to limited canal network is restricted. Water conservation practices are negligible. Annual net recharge of groundwater in this area has been much smaller than its discharge. The occurrence of groundwater generally depends upon the rainfall, topography, and the geological conditions of the area.

Ground water levels were analyzed for pre-monsoon and post-monsoon present in 2017. Long period average groundwater level during these seasons also identified by a long term water level record from 1996 – 2017 obtained as secondary data from Central Ground Water Board website (www.wrisindia.gov.in). The fluctuation of current pre and post monsoon water level was analyzed from their respective long term water level and presented as map for spatial analysis.

A. Ground Water Level In Pre-Monsoon 2017

During pre–monsoon 2017 the ground water level was found from 10 to 36 bgl in the district (fig 1). In the central parts of district ground water level was 36m bgl around sirsa city. Whereas in northern part it was about 10 m bgl around Dabwali, Panniwal mota and Rori station of Sirsa district.

B. Average Of Ground Water Level During Pre-Monsoon Period

The long term pre-monsoon data were analyzed by averaging the last 2 decades (1996-2017) water level data. During pre-monsoon ground water level in the district was ranging from 6 to 20 meters bgl (fig 2). Water table at Dabwali, Paniwala mota, Rori was higher as compared to other parts of the district. Northern part of district had higher GW level from southern parts may be due to Ghaggar river passing through this region.

C. Fluctuation In Ground Water In Pre-Monsoon With Respect Average Level

Ground water fluctuation in pre-monsoon period was found between -16 to 0.93 m. District observed mix pattern of rising as well as declining trends of ground water level of pre-monsoon 2017 from its long time average (1996 – 2017). Rise in water level was found in north western part and decline was around Sirsa station. Most of the district had rising level as shown in map. (fig 3)

D. Ground Water Level In Monsoon 2017

In monsoon period i.e. August, highest ground water level was found at 10 m bgl. In Ottu station, ground water level was 26 m bgl. In the most of Sirsa district ground water level was found between 10 to 26 meters or more. Northern part of district had slightly higher water level as compared to south parts (fig. 4)

E. Average Ground Water Level Monsoon Period

During monsoon period, average ground water. Ground water level in the district remained 5– 16 meters below ground. Minimum depth of ground water was 5.09 m around Rori block in eastern part Sirsa district. In the South part ground water level was more than 17.21 m bgl in some parts (fig. 5).

F. Fluctuation Ground Water In Monsoon 2017 With Respect Average Level

Fluctuation of current year water i.e. 2017 was compared with long period average water level in monsoon period for better estimation of fluctuation fig.6. It revealed that central area in district observed declining water level whereas north parts showed somewhat rising water table.

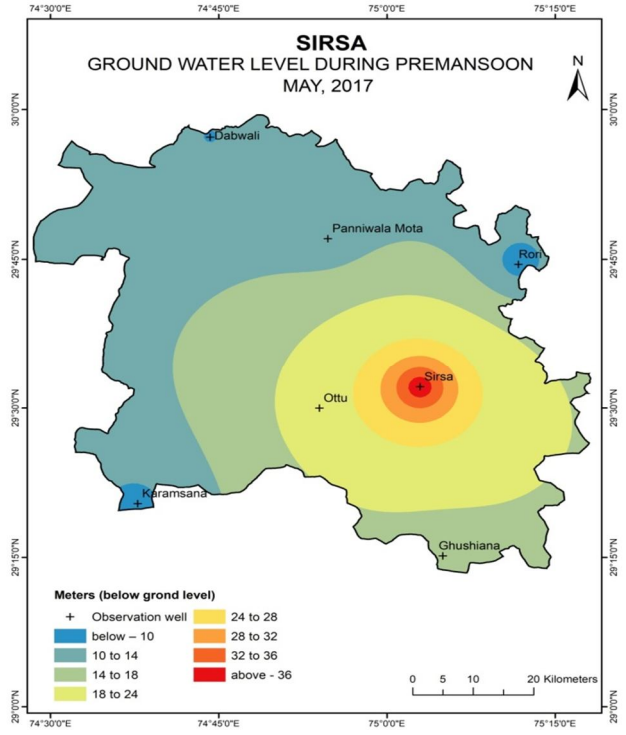


Figure 1 Ground Water Levels during pre-monsoon 2017

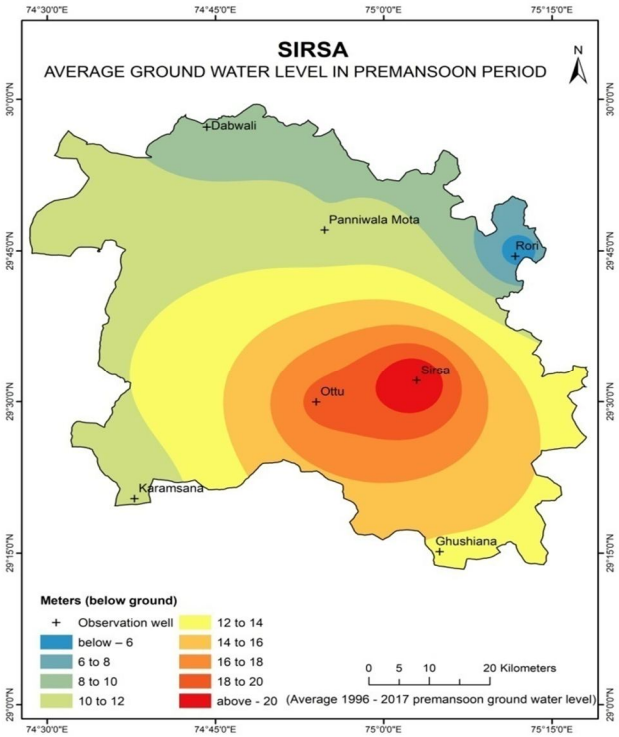


Figure 2 Average ground water levels (pre-monsoon period GW level 1996-2017)

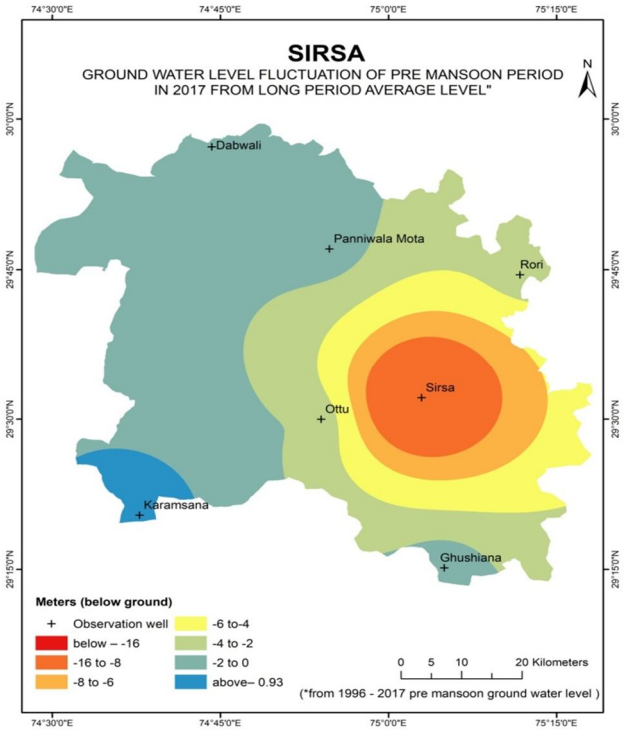


Figure 3 Fluctuations in GW levels in pre-monsoon period 2017 from average.

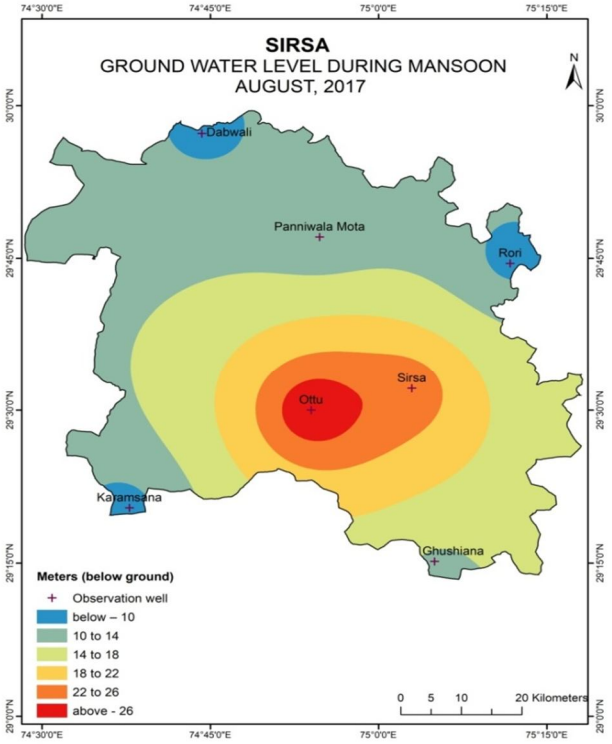


Figure 4 Ground Water levels during monsoon 2017

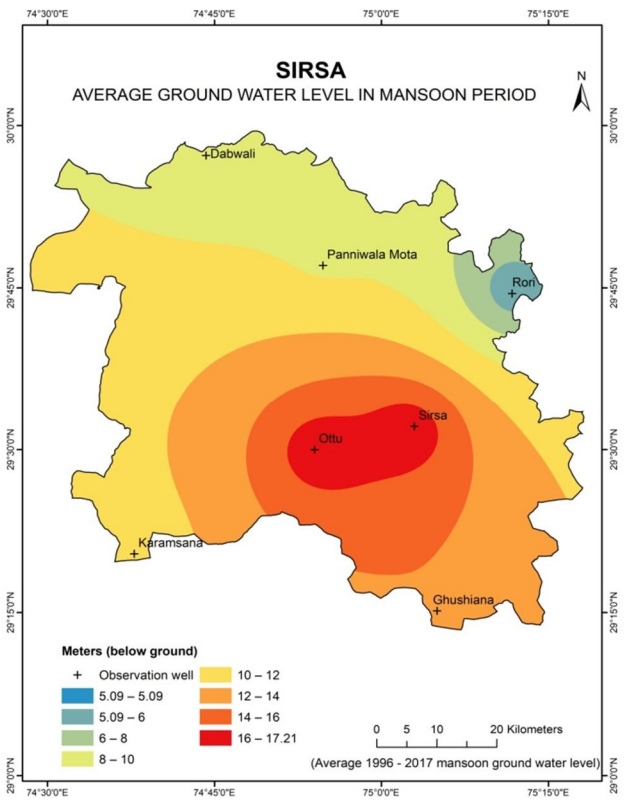


Figure 5 Ground water levels during monsoon 2017

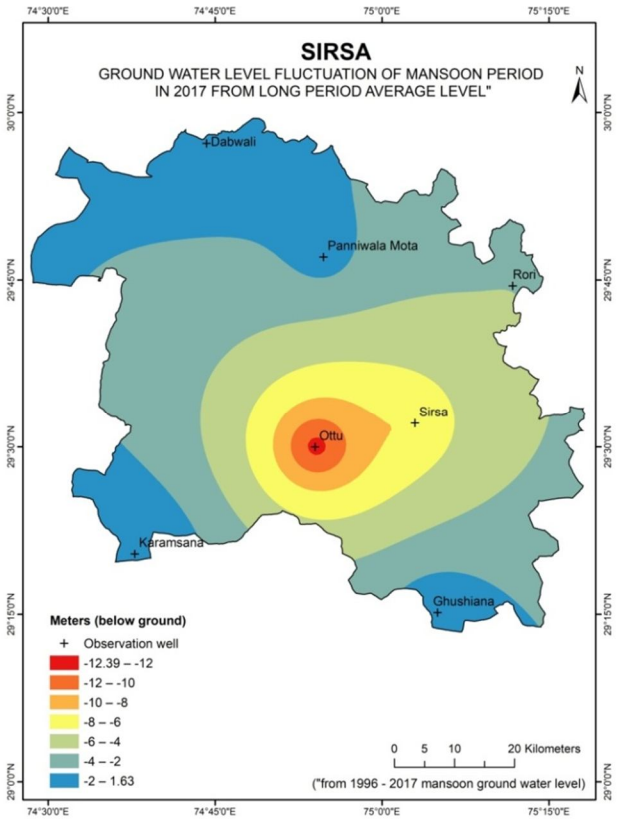


Figure 6 Fluctuations in GW level in monsoon period 2017 from average.

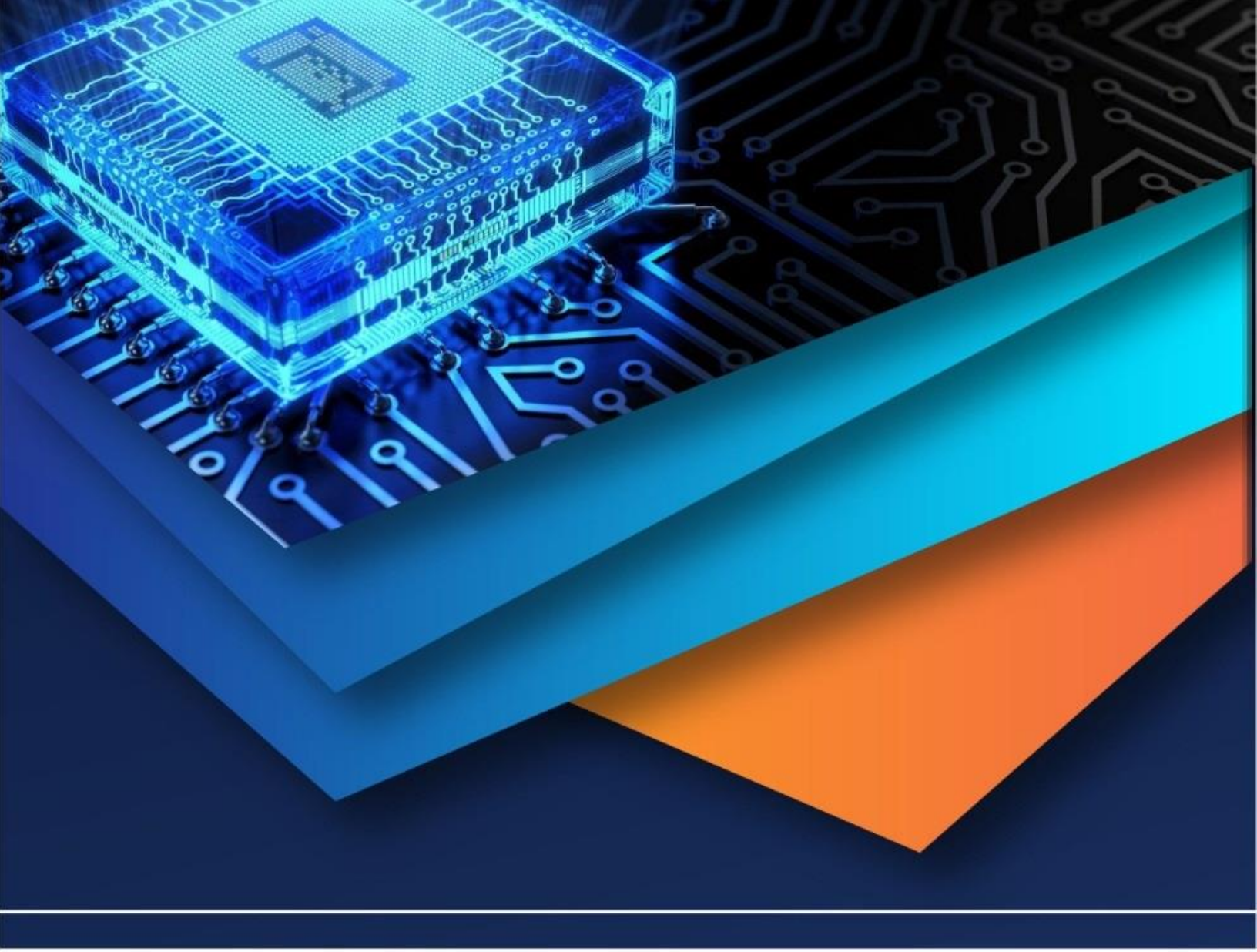
IV. CONCLUSION

Sirsa is the western districts of Haryana state with a total geographical area of 4270 sq.km.

A. Central parts of district had declining water level and need immediate recharge.
B. The depth of water level ranges from 8.46 to 38.22 m (2017) bgl during premonsoon and 9.04 to 24.9 m (2017) bgl during monsoon.
C. The minimum ground water level premonsoon were observed 8.51m bgl at Ellenabad block in 2017, and minimum ground water level monsoon were observed 2.65m bgl at Baragudha in 2017.
D. Ground water level in north has Influence of Ghaggar river and observed higher as compared to rest of district.

REFERENCES

[1] Saraf, A., Chaudhary P. R. (1998). Integrated remote sensing and GIS for Groundwater exploration andidentification of Artificial Recharge site. International journal of Remote Sensing, DOI: 10.1080/014311698215018.
[2] Chaudhary, B.S. (2003): Integrated land and water resources management in southern part of HaryanaUsing Remote Sensing and geographical information system (GIS),PH.D Thesis, University of Rajasthan, Jaipur, India. 78–79.
[3] Arnold G., Valk V.D. (2005).Water-level fluctuations in North American prairie wetlands, The International Journal of Aquatic Sciences Volume 539, Issue 1, pp 171–188.
[4] Sharma B, Saraf AK (2002) Study of landuse – groundwater relationship using an integrated remote sensing and GIS approached. Procceedings of Map Asia 2002, Asian conference on GIS, GPS, Aerial photography and Remote Sensing, organized by Asian Institute of Technology, Bangkok and CSDMS, New Delhi, held in Bangkok between 7 and 9 August, 2002.



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