Potential ground water resources: (Case study: Shahrekord plain)

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Extended abstract

1- Introduction

Water resources are studied and exploited in two divisions: surface and ground waters. Ground water recourses, due to certain characteristics such as freshness (in terms of contrast with seawater), constant chemical makeup, Constant temperature, lower pollution index and higher dependability as a water supply, are considered a reliable resource especially in arid and semi – arid areas. Ground water recourses are, excepting ice – mounds and vast ice – covered areas, the most significant freshwater resource (Sedaqat1994: p.7). 97% of the global use of fresh water is obtained from ground water resources whereas these resources with an overall volume of 37 billion cubic kilometers constitute only 22% of the world's fresh water resources (Foster 1998). Madman et al (2008), studying the role of ground water resources in the ecological potential of land, attributed a significant role to these recourses in terms of economic development, ecological variety and social well being The exploitation of ground water resources at a rate faster than their replacement and the fall of ground water level considered one of the most important enduring challenges of development worldwide.

El–Naka et al(2008) studying the role of water resource and its significance in the development of Jordan , showed that over – use, the fall in ground water quality and a lack of yearly precipitation resulted in a steep decline in water level in most water – beds and subsequently a lapse in the country's development programs. Shahid and Hazarika(2009) studying ground water drought in the Northwestern Districts of Bangladesh. In this paper, groundwater scarcity and drought in three northwestern districts of Bangladesh have been investigated. The Cumulative Deficit approach from a threshold groundwater level has been used for the computation of severity of groundwater droughts.

Iran, after the highly populated countries, china and India, is the third unrestricted exploiter of groundwater recourses and with a 75% usage of restorable resource as against the 40%

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UN standard, is in an unsuitable situation (The National Society of ground water Resources.2006). In light of the given statistics, a review of management strategies for water resources and a reconsideration of economic and social planning deem a serious necessity. The ChaharMahal&Bakhtiari province covering an approximate one percent of the country's surface and as the supplier of 10% (10. 5 billion cubic meters) of the domestic fresh water supply (M.P.O, 2005) has a significant place in relation to the enhancement of the country's water resource status.

In this province due to certain factors including severe shifts in altitude, economic underdevelopment the high cost of pumping water, the role of surface waters in water supply is approximately 15% (equivalent to 225 million cubic meters).The remaining demand for water which is approximately 85% (10275 billion cubic meters) is supplied by the ground water recourses of the province. Over – exploitation of ground water resources in conjunction with the effect of recently occurring droughts has not only lowered the water level of the provincial

water – beds with a rate of 2- 12 meters annually, but has also lowered the quality such that the electric conduction amount of some water – beds has Changed from a 300mm level to 900mm (Management and planning organization2001).

2- Methodology

In this article, Shahrekord plain is choose for reserch,that has decrease water level, the mountain–bordered Shahrekord plain in the province of ChaharMahal&Bakhtiari was chosen. This plain (water – bed) with an altitude of 2000 meters from sea level and a surface area of 125000 hectares, 21 rural settlements and one urban settlement are situated in the Shahrekord plain (Iran data center –2006). From a hydrological perspective the plain is a part of the Karoon basin (north Karoon basin) in which the Jahanbin river flows (provincial basin registration, 1998). The shahrekord plain is, geologically speaking a descended plain constituted by quarts sediments with an alluvial depth of 60 – 110 meters (M.P.O 1986).Map (1) shows the geographical standing of the Shahrekord plain.
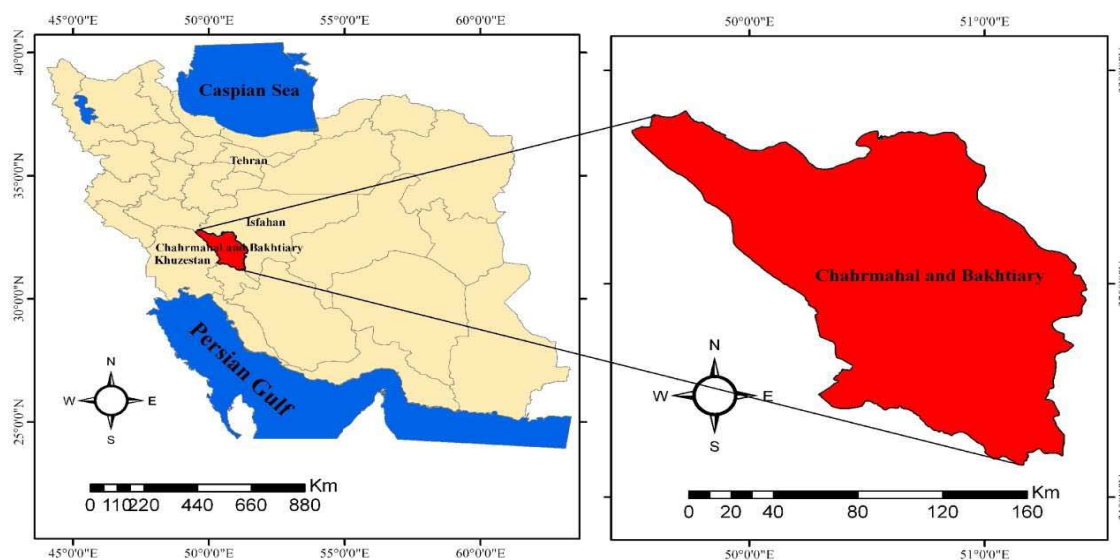

Figure 1: The location of Chaharmahal and bakhtiari Province on Iran map

Material

In this study used of geology, topography, slope, land, wells, springs and Qanaat Maps. In addition, the database was level plain water table, annual rainfall.

In this study using Delphi and Value engineering methodized to determine the value and importance of the effective potential. The binary method (method Makhdoom) and the zoning is plain surface of underground water resources by geographic information system.

3- Discussion and Conclusion

The Shahrekord plain ground water resources up to the hydro – year 2004 – 5 with 880 deep wells with an output volume of 95 million cubic meters, 244 semi – deep wells with an output volume of 37 million cubic meters, 16subterranean qanat with an output volume of approximately 9 million cubic meters and 56 springs with an output volume of 175.5 million cubic meters

which constitute an overall 316.5 million cubic meters, and with an average 35.9 cm annual drop, are considered, conservational prohibited.

According to this table the Shahrekord plain has an average drop equivalent to 0.4 m. The maximum and minimum elevation level over the data-gathering period equals 4.25 and –3.59 meters respectively.Figuer 2 shows the annual accumulative hydrograph of the plain's ground water. According to this chart the elevation level of the plain in 1985which is the first year of exploitation is higher than the average elevation level and equals one meter, But in the following years, due to the drilling of numerous wells and the occurrence of hydroclimatology phenomena, the elevation level was subject to more fluctuations, such that, excepting the two hydro– years 1994 and1999-2001 the elevation level manifests a decreasing pattern in the studied region and stands below balance level (zero level).
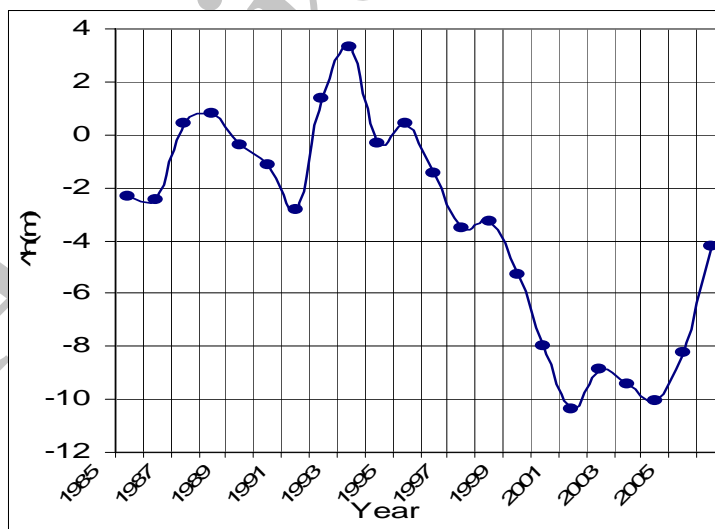

Figure 2: Accumulative changes of Shahrekord plain elevation level over 1985-2005

Changes in the storage volume of the water – bed with an average drop of 3.18 million cubic meters annually is another characteristic of the Shahrekord plain; at

the end of the year 1985 the volume decrease of the water bed storage equals 31.66×106 m3. The following is provided. Maps produced by the binary

method of drainage density, Floor   (Fig2, 3, 4 and 5).
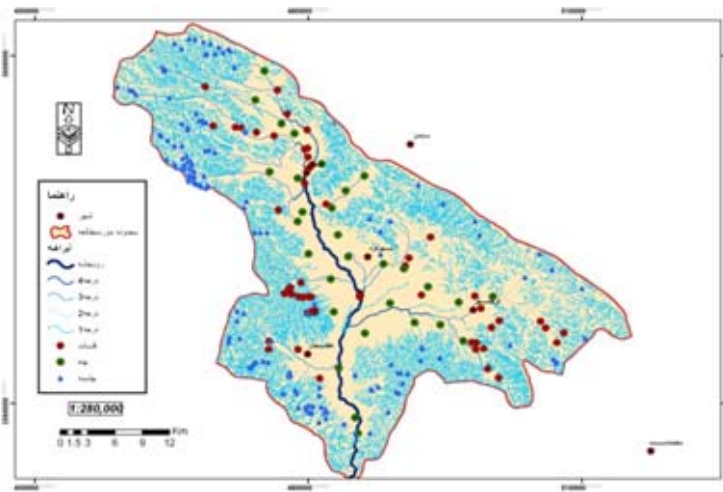elevation, slope, geology, petrology

Figure 3: Drainage networks, wells, springs and qanaat Shahrekord Plain
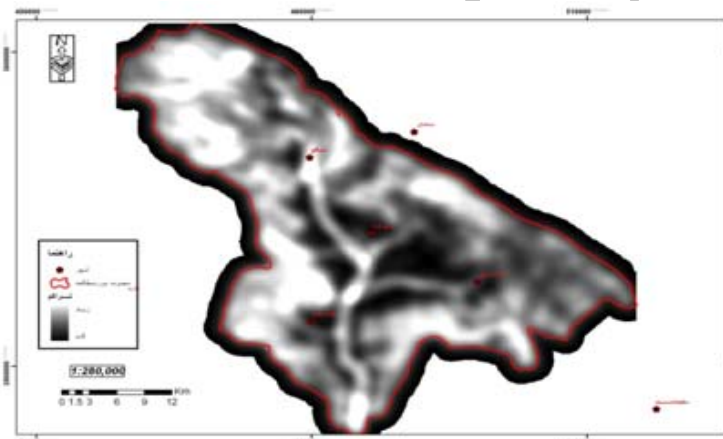

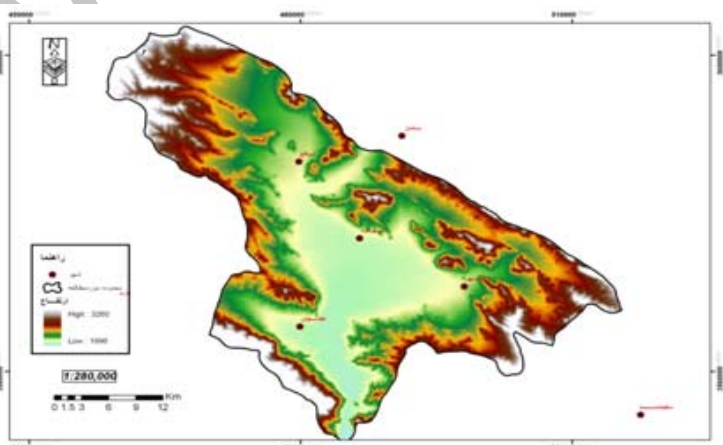**Figure 4: Drainge Dentsity in Shahrekord Plain**

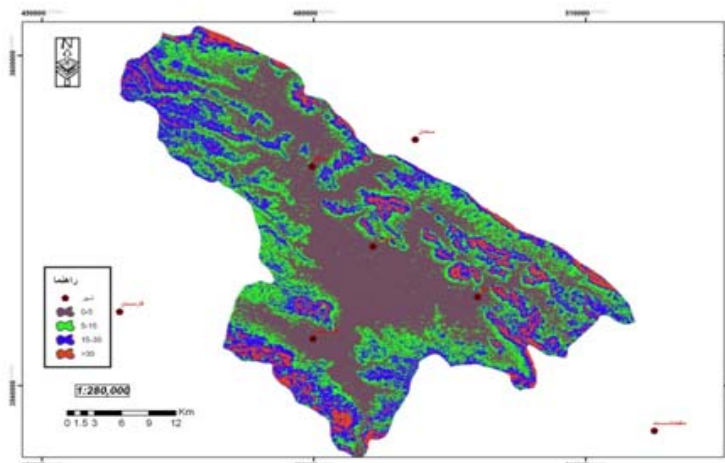**Figure 5: DEM (Topographical Map) In Shahrekord Plain**

Figure 6: Slope Map Shahrekord plain

The Delphi method to the effective potential of underground water was given a score from 1 to 9 (Tabel N.1).

Tabel 1: Layers of the potential sources of ground water by Delphi and value engineering method in Shahrekord Plain.

Weight	9	7	5	3	1
Lithology	Alluvium	Congogrmera	Limestone	Sand stone	other
Geological	Quarterner	Congogrmera	Asmari	Ilaam-Sarvak	other
Drainage density	1-2	2-3	4-5	6-7	>7
Slope	0-5	5-15	15-20	20-25	25>
Topographic	2000-2200	2200-2400	2400-2800	2800-3000	>3000

The binary model (Makhdomm Model) was determined based on the weight the more important (eq.N.1) and tabel.N (2).

$E = J (I-1) + Ji$

E: Combination Unit   J: Total Classifiction under Map   I: Over Map
Ji: Class Number Map

Tabel 2: The effective weight of the potential for underground water by Delphi and Value Engineering

Effect Layers	Lithology	Drainge	Slope	Topographi
Layers weight	9	7	4	4

This result shows that,the lithology has value 35,drainage dentsity 20,drainage distance 20,slope and topographical 15 were identified as the main factor (Equation 2).

$$mp = (\mu * 20) + (ds * 15) + (leto * 35) + (s * 15) + (t * 15)$$

MP: Potential map,

μ: Drainage dentsity, ds: drainage Distance, Leto: lithology map

S: slope map, t: Topographical map

According to equation (2) Shahrekord Plain is divided into three area high, medium and low.Table 3 and fig7 are show the area of each zone.so hight potential zone to 48% highest and low zone lowest area of total areain Shahrekord plain.Tabel 3.

Tabel 3: The area of potential grandwater in Shahrekord plain

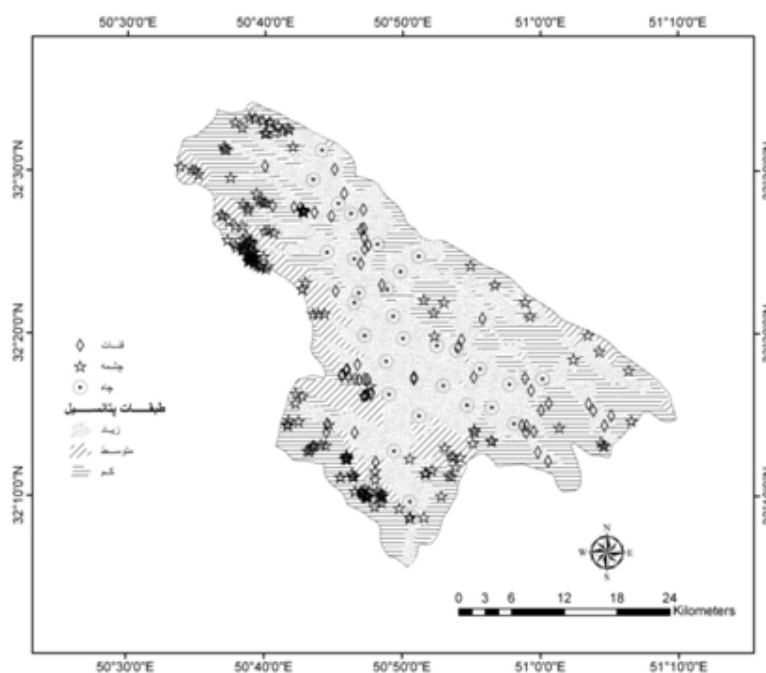| Range	Areahec	Percentage%
Hight	5900	48
Medium	4802	39
Low	1600	13

Figure 7:the area of potential gruond water in shahrekord plain

Key words: Ground water, digital data, Potential, Shahrekord plain

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