# Qualitative assessment of groundwater for agriculture and industry purposes in Sahra Bagh plain, Larestan, Iran

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## Abstract

Groundwater quality assessment and mapping quality parameters to assess the resource for different purposes is important . The purpose of th is study was to evaluate the quality of groundwater Sahra B agh plain and mapping it for different purposes. F or this purpose, the groundwater quality data (1382 to 1392) wa s used. In this study, to evaluate eff ect of wa ter scaling and corrosion from Lanzlyh saturation and stability Ryznar indexes were used and water quality parameters such as Cations (calcium, magnesium, sodium and potassium) and anions (chloride and bicarbonate), and other relevant indicators such as TDS, TH and SAR were evaluated. The results show that the mean of LSI index of this plain aquifer was 0.48, so deposition potential of this ground water is moderate. The mean of RSI index of Sahara Bagh Aquifer was 6.4, so corrosive potential of this ground water is low. L SI coefficient of variation is larger than the RSI coefficient of variation also, probably said that RSI index is sensitive compared index LSI. Average amount of EC in Sahra Bagh aquifer's is 6978μS / that it is in a class of non-quality groundwater for irrigation and amount of PH in the plain aquifer's was Alkaline and Varies from a minimum of 7 to a maximum of 7 .5. Average amount of TDS in this aquifer is 493 mg /L that it is in a class of non -quality groundwater for irrigation in Sahra bag h. As we ll as calcium, potassium and sodium we re dominant cautions of this aquifer.

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# Investigating the effects of land use on runoff generation using WetSpa model

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## Abstract

The main objective of this research was assessing the effects of land use on runoff parameters such as total runoff, surface runoff and peak discharges at the Baghsalian watershed as a case study site. At first, land use maps of 1986 and 2012 were prepared using a synthetic method and landsat images. WetSpa model was applied to simulate daily runoff for 8 years (the first 5 years as calibration and the last 3 years as validation periods) with land use maps of years 1986 and 2012. Nash-Sutcliffe efficiency and aggregation measure was used to assess the accuracy of WetSpa model. The Nash-Sutcliffe efficiency was obtained 0.61% and 0.56% for the calibration and validation periods respectively. Moreover the aggregation measure criterion had values of 64% and 62% for the calibration and validation periods respectively. These criteria showed that the WetSpa model is a suitable model to simulate runoff in the Baghsalian watershed. As a result of land use changes from 1986 to 2012, simulated total runoff, surface runoff and peak discharges rates increased, while the rate of increase in surface runoff was higher than the rate of increase in total runoff. Total runoff and surface runoff for land use 1986 was 431.62 and 158.77 million $m^3$ respectively and pick discharge was 27.45. These values for land use 2012 were 480.31, 182.86 and 30.94.

**Keyword:** Baghsalian watershed, landuse, runoff, WetSpa model.

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# Investigation of groundwater balance in Tuyserkan plain of Hamedan using MODFLOW

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## Abstract

Recent droughts and indiscriminate use of ground water for agriculture, is the main problems of the especially desert country. Water crisis has gripped all of country Plains, and Due to the reduction of surface water resources and successive droughts, illegal exploitation of ground water resources is increasing.The knowledge of the water balance plains can be helped in the water resources management. Tuyserkan plains is one of the most Lowland in the Hamedan province with widely agricultural land that is increasing every year, Consequently, the pressure on groundwater resources is creased. The aim of this study is investigation of water balance in Tuyserkan plain in wa ter year 88-87 for optimal management of wa ter resources especially for agricultural uses. For this purpose, iso potential of Plains is mapping next Attempted to identify the input and output in plain and ground water balance was calculated manually. The nex t step using of determining changes volume in plain, accuracy of water balance calculated was determined. Finally, there querying of input map and basic information is providing on Modflow numerical model and GMS softwa re was runs. Result show that plain ground water balances was negative and shortage of storage was -12.2 MM3 in 1387-88. Manually water balance and wa ter table chang es supported result of model ground water balance.

**Keyword:** GMS, ground water balance, ModFlow, Tuyserkan plain.

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# Trend assessment of changes in water quality plain Eyvanakey

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## Abstract

The trend of changes in water quality plain Eyvanakey to manage shared water resources is necessary Semnan and Tehranprovince. For this purpose after determining the study range in the Eyvanekey area, field investigation was performed to identify the geological formations and the distribution there of as well as the faults and salt domes locations using existing geological maps. Afterwards through identifying the wells location and using decomposition results of the area water samples, the concentration contour maps of chloride, sulfate, sodium, etc. were plotted. The faults' performance and the plotted maps' interpretation showed that the highest salinity concentration lied in the eastern and southern parts of the plain and their change trend occurred in highlands towards central and western parts of the study range, consistent with the main river path. The waters of bicarbonate and magnesium ions have the situation better than the other. Best and worst water quality in the western regions in eastern and southern regions that are close to eva porate mass is loca ted. Wilcox diagram was determined and show the eastern and southern are as are in the worst category Wilcox. In terms of agriculture, not suitable water has a salinity and electrical conductivity less central plains, which are more desirable for agriculture

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# An assessment of changes in groundwater table and its quality in Lake Urmia basin

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## Abstract

Groundwater quality has a direct impact on human life. The main objective of this research is to investigate changes in groundwater quality and water table in Lake Urmia basin. Tasoj and Shiramin plains are selected as a study area. The suitability of groundwater quality for drinking and agricultural purposes was assessed using Schoeller and Wilcox Diagram. According to the Wilcox classification, the groundwater of Tasoj and Shiramin plains felt into C3S1 and C2S4 Classification, respectively. Based on the Schoeller classification, the groundwater of Tasoj plain is suitable for drinking, but the concentrations of pollutants are above the permissible limits for drinking, in Shiramin. Analyzing data from 2003 to 2014, of the parameters like EC, PH, SO4, TH, TDS, Mg, Ca and Cl, showed that the concentrations of these pollutants are increased over time. The correlation of Ec and water table decrease, was computed as -0.37, which can mean that the reduction of groundwater quality had a relationship with groundwater withdrawal. Every year, groundwater table in Tasoj decreased about 18cm and the volume of its aquifer is decreased by 1.27 bcm. For Shiramin, groundwater table and volume increased by 1cm and 0.006 bcm every year, respectively. The reduction of groundwater withdrawal in recent years is a result of its poor quality. According to the results, the establishment of proper drainage systems to control soil salinity is necessary in this study area.

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# Monitoring temporal and spatial changes in land use in the Shazand Watershed

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## Abstract

The present study aimed to monitor the land use change in the Shazand Water shed with different development policies using land use net changes and exchanges in land change modeller (LCM) for period of 1973 to 2014 and in sub-watersheds scale. In the study period, rangeland area reduced about 380 Km$^2$ and ra in fed and irrig ation farm lands increased successively 100 and 150 Km$^2$ in the first and the second period and then re duced. The highest annual rate of orchard increase (0.265%) occurred in the third period. The highest increment for residential area (60%) and abandoned land (23.49%) were observed in the second and third periods, and for the third and fourth periods, respectively. The results also showed that the highest increment of land use change in the mountainous sub-watersheds i.e., Azna and Nahremian occurred before industrial development period and then tended to the plain sub-watersheds i.e., Poledoab. Generally, the maximum land use chang e was observed in the second period (32.96%). The types of land management, the pattern and the process of land use change especially the expansion of industrial activities in the study region showed that the development policies had an importan t role in the study region and spatial and temporal patterns of land use change played an important role in creating the current state of the region. Accordingly, any land management program for the study region has to be planned with regard to the spatial and temporal patterns of land use changes considering the adaptive management of the watershed resources.

**Keywords:** adaptive watershed management, industrial development, land management, land use change monitoring, management of watershed.

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# Drought monitoring with Standard Precipitation Index (SPI) and drought forecasting with Multi-layers perceptron (Case study: Tehran and Alborz Provinces)

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## Abstract

Drought is the one of the repeating phenomenon in all areas with high rainfall and low rainfall climates and is known as a natural disaster. Iran is one of the countries those involved with this phenomenon in different parts of it especially in river basins. Tehran Province due to its importance in terms of social and political faced with growing population that it would contribute to the reduction of water sources in the province. Alborz province which in the past was considered one of the cities of Tehran, in this study was investigated. Losses incurred from drought in this area are socio-economic. In this study, we monitor and forecast drought, with rainfall data from 38 synoptic stations in Tehran and Alborz provinces. By Standard Precipitation Index (SPI) during 31 hydrological years between 1983-84 to 2013-14 at 3, 6, 9, 12 and 24 months average times. Study on SPI12 index showed that about half of the stations entire the study period were normal and about a third of the stations in this period had drought conditions. According to the numerical values SPI index 1996-97 and 1998-99 were selected as years those have been faced with drought. Severe and very severe periods of drought, the most severe drought level (lowest SPI) was calculated for some of the stations in periods of 3, 6, 9, 12 and 24 months. Also forecasted with Multi-layers perceptron neural network method and the results were very close to the observed data.

**Keywords:** drought forecasting, multi-layers perceptron, standard precipitation index, Tehran Province, zoning.

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# Analysis of monthly wet and dry spell occurrence by using power laws in Golestan Province, Iran

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## Abstract

The wet and dry spells can be defined as a number of consecutive months with rain amount greater or less than the truncation level, respectively. Analysis of the wet and dry spell properties of monthly rainfall series at 40 meteorology stations in the Golestan Province is carried out for an extended period of 34 years (1974–2007). The results proved that the patterns of wet and dry spell durations can be determined using power law technique. Wet and dry spell duration characteristics, as well as the frequency of dry spells for the length of (1-9 months) are discussed. The longest dry spells are identified in North-east of the Golestan province in Tamar and Minudasht stations with 5 and 6 times occurrence respectively. Whereas longest wet spell with the 9 months length is shown over the central part of the study area. It has been observed that the longest durations of dry periods occur in the stations that located in the Northern part of the Golestan Province. The interpretations of double logarithmic plots of (frequency versus length period) can be used to compare the occurrence patterns of wet and dry spells in the stations over different precipitation regimes. Further applications of power law method are suggested to obtain a better understanding for the interpretation of wet and dry spells regions with different climatic conditions.

**Keywords:** double logarithmic graph, drought occurrence, power relations, sequence pattern, wet and dry spells.

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# Separation of the effects of climate variability and human activities on runoff of Bakhtegan Basin

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## Abstract

Arid and semi-arid ecosystems are very sensitivity to changes. Fluctuations in climate variables and increasing human activities; result in the changes in hydrological processes of these ecosystems, and consequently, their structures degradation. In this study, hydro-climatic data of the Bakhtegan basin for the period of 1972–2011, were analyzed to assess effects of climate variability and human activities on hydrology processes of the study area. A combined analysis of statistical tests for trend analysis and change pointe detection indicated that the basin runoff had a significant decreasing trend over last 40 years. The change point of runoff occurred in 1999, the annual runoff of the study basin divided into two periods. The period of 1972–1999 was used as the base period for calibration and validation, and the period of 2000-2011 as a human-induced period for the model processing. Then, the hydrologic sensitivity analysis method was the approach employed to evaluate the effects of climate variability and human activities on runoff. According to the analyses conducted, contribution of climate variability in the runoff reduction of Bakhtegan basin was estimated equal to 62.45% and contribution of human activities equal to 37.55%. These results can be very useful as a reference for regional water resources assessment; management and maintaining the integrity of regional ecosystems.

**Keywords:** Bakhtegan basin, climate variability, human activities, hydrological sensitivity based method.

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# Uncertainty of annual maximum daily rainfall under greenhouse gases emission scenarios in 2040: Khorasan-Razavi province

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## Abstract

Nowadays, increasing of greenhouse gases emission scussed by human activities is the main factor of climate change. Global warming has also changed the frequency of extreme rainfall events in many areas. This research presents an analysis of how the change in the frequency of maximum daily rainfall under three emission scenarios in 2021 -2040 periods in the Khorasan-Razavi province. The maximum daily rainfall series are projected for the future periods in the 23 weather stations by developing a nonparametric downscaling model for arid and semi-arid regions. The uncertainty of climate change scenarios is quantified using a simple parametric uncertainty estimator in the three risk levels (25%, 50% and 75%) for each of emission scenarios. The frequency analysis of maximum series shows that the daily rainfall intensities in the risk level 2 will be changed between -22.9% to +20.3% than baseline (1993-2012), that a wider range of these changes is related to the longer return periods. Generally, central and southern regions will be received slight increase than northern regions. The rainfall intensities in more areas decrease with the increase in greenhouse gases emissions that this decrease will be more for the rainfalls with lower return periods. Flooding in the high rainfall regions will be also occurred with severity while the low rainfall regions get a more decrease. Maximum daily rainfall will be increased in the future periods by reducing the level of risk; it can be warning to design hydraulic infrastructures with high emphasis.

**Keywords:** climate change, daily rainfall, downscaling, Khorasan-Razavi, uncertainty.

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# Comparing the performance of semi-distributed SWAT and lumped HEC-HMS hydrological models in simulating river discharge (Case study: Ab-Bakhsha Watershed)

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## Abstract

In many flood control projec ts, watershed management and wa ter resources development, calculation of the river flow discharge is of the para mount importance which re quires a comprehensive hydrological modeling of the region of intere st. In this re spect, lack of the existence of hy drometric and meteorolog y measuring stations in most of wa tersheds, has caused numerous problems in development and management of water resources planning. The hydrological models which are used to simulate watersheds are generally categorized into two groups of lumped and distributed models. I n this study SWAT and HEC-HMS models were used to compar e the capability of semi -distributed and lumped models in wa tershed simulation. For this, 31-year data of Abakhsha Watershed – including the whole information of hydrometer and meteorology stations in the region which are located in Bardsir County in Kerman province- have been used. The obtai ned results indicate that both models have acceptable accuracy; however, semi-distributed SWAT model is superior to HEC-HMS model. Being semi-distributed is one of the most important reasons for SWAT's superiority which gets the advantage of considering climate components and using hydrological response units.

**Keywords:** Ab-Bakhsha watershed, HEC-HMS, lumped model, semi-distributed model, SWAT.

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