

Using the Ability of Geographic Information System in Evaluation of Environmental Capability in Arid area (Case study: Birjand Auriferous Basin)

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Extended Abstract

Land use management policy and method are two important factors in usage of land by human. In this regard, Evaluation of environmental capability would serve as a valuable basis for the best use practice of soil and water resources in addition to the reduction in environment consequences of the projects. In the current study, the environmental capability of Birjand, located in the south khorasan province, has been evaluated using the delivery method. Result shows that salinity and Alkalinity, under loped soil profile, inappropriate soil texture, low and dispersed precipitations and lack of adequate plant coverage are the most remarkable limitation in agricultural usage of the land in Birjand. By combining the maps of geographical dimensions land slop, altitude suitability and plant coverage, considering ecologic – climatic, population and hydrologic characteristics.

Result also shows that a considerable portion of the plan, excluding the central parts, is not suitable agricultural use. Aquatic agricultural is only possible in the area above the aquifer in the plain area. User Dryland Farming in the range of aquifer and aquifer levels slightly higher than on the upper and plains Tras-hay range and applies in areas with deep soils and user garden area aquifer and valleys and mountainous part of the manifestation aqueduct. Results also show that only area having slopes of above 10 is suitable.

Studies Area

The studied area includes aquifer basin of Birjand plain located in Southern Khorassan state by vastness 3435 km² in geographical coordinates 58° 40' to 59° 40' eastern longitudes and 32° 40' to 33° 10' northern latitudes. Birjand plain is a part of central desert aquifer basin which prevails dry and semidry climate conditions (fig.1).

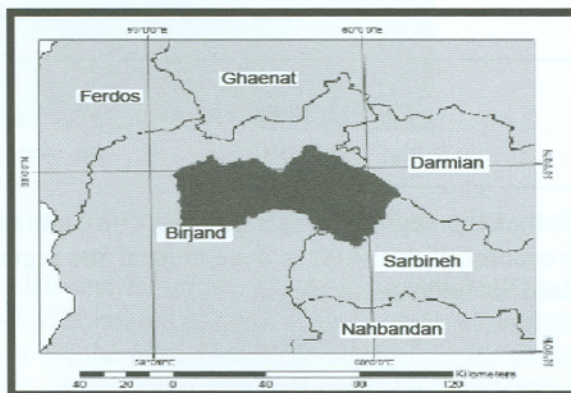


Fig. 1: Study area

Methodology

To evaluate ecosystem dominated on studied area we used geographical information site (GIS) potentials as well as layer overlap method. Thus, initially by using SRTM satellite model we produced slope directions, slope-height maps. Then by merging these three layers together final unit map of Earth shape is gained. In next step, the segmented maps of unit lands associated with existing plant coating were reviewed by using remote measurement data. By merging Earth shape unit with segmented maps of unit lands and plant coating, the map of final bioenvironmental units is produced. In final stage, by using data related to the lands functionalities, social-economical data and climate data, the bioenvironmental potential of Birjand aquifer basin for all land functionalities is evaluated.

Results and Discussion

So, data analysis is advantageous since it is possible to collect regular data groups from irregular aquifer. Birjand town with its massive population in the region is located on southern ranges of Baqran Mountains over quaternary formations, debris and alluviums. Mean rainfalls amount in studied area varies from 200mm to 205mm and based on Domartan climate, region's climate is dry. It rainfall regime is wintry and 60 percent of rainfalls happen in this season. The rainfall regime of the region is so that all agricultural products in addition to rainfall waters essentially need to be irrigated manually.

Most significant ground water sources of Birjand plain is seasonal river Shahrood which origins from eastern heights (Sesan Mountain) and by passing through the center of plain move towards west which arrives to Lut Desert. Annual water yields of Birjand aquifer is about 35mm³ per year. Since 1982 up to now Birjand plain is regarded as banned plains with negative balance. Above mentioned issues completely show the shortage and limits of water in this area.

Also we can say that increase in efficiency of limited water sources entails exact planning and schemes. Therefore, regardless of regional ecologic potential, achieving optimum efficiency for water sources is far beyond minds. Regarding available ecologic models and climatic-geographical properties of region, the evaluation for bioenvironmental potential of Birjand plain is as follow:

1. Agricultural-water functionality: as water sources are limited in the region, agricultural operations expected on irrigated lands (Faryab) around aquifer. Products genus is essential to care.
2. Agricultural-dry farming: by regarding climatic conditions in region and annual mean rainfall 200mm to 205mm and 8 months drought, this functionality is applicable around aquifer over upper traces, range plains and deep soil regions.
3. Garden functionality: this functionality is applicable around aquifer and valleys in mountains.
4. Pastureland functionality: pastures around studied area are regarded as poor regions. Plant coating density in this region is less than 30 percent. Therefore, this functionality in gradient areas with slope more than 10 percent is applicable.
5. Wildlife functionality: concerning dry regions limits, wildlife in these regions is usually focused on the areas with water sources. Therefore, gradient areas with slope more than 10 percent and mountain areas are suitable for this functionality.
6. To provide a bioenvironmental potential map for studies area we must merge and overlap several maps on each other. It is clear that doing this entails more time and high precision.

Obviously, that if the capabilities of applications in this field do not use the ArcGIS, an error and spend a lot of time is inevitable. Thus, as capabilities of Arc GIS are known to us and it is possible to overlap maps and evaluate them precisely by this software, we tried to use it in this research.

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In the end, the results of this research indicate that by considering ecological features of Birjand plain, this region is useful for limited agricultural operations around aquifer. By changing cultivation pattern, increasing irrigation efficiency, modifying irrigation methods and using drip irrigation system, it is possible to optimize economic conditions for residents. Bioenvironmental potential evaluations for Birjand plain shows that these lands are susceptible for agricultural and pastureland functionalities. It must be mentioned that information and initial maps in high precision is essential in this method (fig. 2)

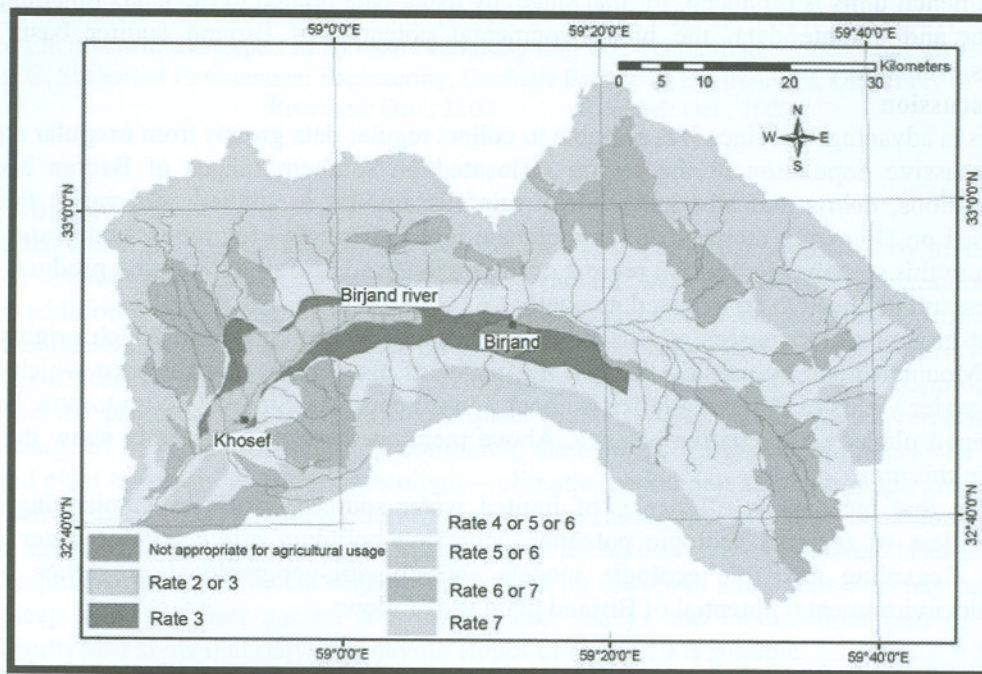


Fig.2: Environment Capability of Birjand Auriferous Basin

Key words

Land use; Geographic information system; Evaluation of environment capability Birjand