Archive of SID

Research Paper

Groundwater Resources Drawdown and Its Effect on the Physical Structure of Rural Areas: A Case Study of Rural Settlements of Lordegan

Ali Taghipoor Javi[1], *Seyed Eskandar Seydaei[2], Faramarz Barimani[3]

1. PhD Student, Department of Geography and Rural Planning, Faculty of Geographical Sciences and Planning, University of Isfahan, Isfahan, Iran.
2. Associate Professor, Department of Geography and Rural Planning, Faculty of Geographical Sciences and Planning, University of Isfahan, Isfahan, Iran.
3. Professor, Department of Geography and Urban Planning, Faculty of Human and Social Sciences, University of Mazandaran, Babolsar, Iran.

Use your device to scan and read the article online

Citation: Taghipoor Javi, A., Seydaei, S.S., & Barimani, F. (2020). [Groundwater Resources Drawdown and Its Effect on the Physical Structure of Rural Areas: A Case Study of Rural Settlements of Lordegan (Persian)]. *Journal of Rural Research*, 11(1), 170-189, http://dx.doi.org/ 10.22059/jrur.2019.287337.1392

doi: http://dx.doi.org/ 10.22059/jrur.2019.287337.1392

Received: 16 Aug. 2019
Accepted: 11 Nov. 2019

Key words:
Groundwater, Physical Structure, Exploitation, Rural Settlements, *Lordegan*

ABSTRACT

The increasing human need for water, on the one hand, and its scarcity, on the other, have increased the exploitation of this vital resource. Today, with more attention to groundwater resources and the vertical movement of these reservoirs to deeper layers, numerous problems are threatening life in rural habitats. The main purpose of the present study is to identify the causes of groundwater resource drawdown and its effect on the physical structure of rural areas. Crucially, it has doubled as population growth and demand increase to meet the needs of rural communities, excessive exploitation and pressure on these vital reserves. Documentary analysis and field study were used to collect the required data. The statistical population of the study included 89831 people in the rural population of *Lordegan*, out of which 115 were selected by purposive sampling method using the G-Power software. The data were analyzed by descriptive-analytical and causal-comparative methods on the SPSS and GIS software programs. The findings showed that increasing number of farmers, expanding irrigated areas and drilling deep wells during the period 1961-2016 are correlated with unnecessary exploitation and drop in groundwater level in the research area. The results further showed that the fragmentation of agricultural parts, granting permits for digging and breaking wells and the prevalence of aquacultural crops in interaction with population growth were the most important factors for double harvesting and reduction of groundwater levels to -22 meters in the plains. It has manifested itself in the form of the disappearance of wetlands and pastures, land subsidence of 85 cm, deep divisions in settlements and farms, changes in the appearance of plains, and, ultimately, the instability of rural settlements.

Copyright © 2020, Journal of Rural Research. This is an open-access article distributed under the terms of the Creative Commons Attribution-noncommercial 4.0 International License which permits copy and redistribute the material just in noncommercial usages, provided the original work is properly cited.

Extended Abstract

1. Introduction

Today, water, as the most essential element of life, is increasingly being considered as an indicator of development because it is inextricably linked to the sustainability of human societies, especially rural settlements; the increasing need for water, on the one hand, and its scarcity, on the other, has increased the utilization of water resources, especially groundwater resources. With the advancement of technol-

* *Corresponding Author:*
Seyed Eskandar Seydaei, PhD
Address: Department of Geography and Rural Planning, Faculty of Geographical Sciences and Planning, University of Isfahan, Isfahan, Iran.
Tel: +98 (913) 1098975
E-mail: s.seidaiy@geo.ui.ac.ir

www.SID.ir

ogy, water extraction through wells is increasing day by day, as many plains of Iran are currently facing reservoir deficits and water crisis. Population growth is one of the most important causes of over-pressure on water resources in arid and semi-arid areas; considering the fact that in the area, the dominant economy of the inhabitants relies on agriculture, continued exploitation and use of water resources is inevitable. Therefore, the following questions were raised:

1- Has the increase in population and the exploitation of groundwater resources resulted in the decline of these resources in the rural settlements of *Lordegan*?

2- Has the drop in groundwater resources caused the physical restructuring of the rural settlements of *Lordegan* County?

The main purpose of this study was to investigate the physical changes in rural settlements during the years 1961 to 2016 and its relation with the reduction of groundwater level in the *Lordegan* plains.

2. Methodology

This research is among the applied studies in which descriptive-analytical and causal- comparative methods have been used in order to describe and analyze the historical course of the subject and to find the root cause and study the cause and effect relationships between the research variables. The rural areas that were more dependent on groundwater resources and whose sustainability is related to the quantity and quality of these resources were selected as the statistical population. To estimate the sample size, G-power software was used, which included 115 questionnaires for 6 rural districts and 34 rural settlements. The data needed in the research process were obtained through field studies and from libraries. A questionnaire was developed and its validity was assessed using content validity analysis; content validity was calculated quantitatively. Cranach's alpha was also used to measure the reliability of the questionnaire, which was estimated to be 0.83.

3. Results

Rural population of *Lordegan* has significantly increased compared to the previous censuses, so that the population density has increased from 14.8 persons per square kilometer in 1966 to 46 persons per square kilometer in 2016. The historical study shows that after the land reform program, the sale and transfer of land to the peasant farmers, the number of farmers significantly increased and independent peasant production was considered the most common way of production in the agricultural system of the town. With the increase in the number of independent peasants, the number of pumpers for groundwater extraction and irrigation increased, but by technological level, the relative balance between feeding and discharging the aqueducts of *Lordegan* had been maintained until this time. Following the victory of the Islamic Revolution and emphasis on agricultural development policies, along with rapid population growth, development of irrigated crops, drilling of deep and semi-deep wells, destruction and transfer of natural wetlands and rangelands to the government, special attention was given to cultivation, which reached 62,000 hectares 2017 from about 30,000 hectares at the beginning of the revolutionin.

4. Discussion

Drilling deep and semi-deep wells to irrigate the lands is inevitable; statistics show that by the time of land reform in 1962, 52 rings, 294 rains, and from 1981 to 2015, 1143 rings. Deep and semi-deep wells were drilled in the plain and aqueducts of *Lordegan*, out of which 1354 wells with a discharge of 122/8 million cubic meters were used exclusively for agricultural purposes and only 135 wells with a discharge of 13.6 million cubic meters per year were used for drinking and industrial purposes. 136.4 million cubic-meters of water from the depths of electric, diesel and floor wells in the plain of the town negative balance has had groundwater resources.

5. Conclusion

An examination of the long-term data of 40 observational wells during the statistical period (1364 to 1394) shows that the groundwater level of Khanmirza plain is -22 meters, that of *Lordegan* plain is -21/9 meters. It is -13/3 meters in Jamal plain and it has declined to -6/7 meters in Flard plain. It also resulted in land subsidence and piping of agricultural wells, desertification of lands and settlements, creation of deep seams and cracks in houses, facilities and, finally, instability of rural areas. It must be acknowledged that the government, after land reform and especially from 1981 onwards, has been the main cause of improper and unauthorized excavation, untapped exploitation, drainage of aquifers and, ultimately, the decline of groundwater resources and its consequences in rural settlements in *Lordegan* town.

Acknowledgments

This article is obtained from a PhD dissertation by Dr. Ali Taghipour Javi in the field of Geography and Rural

www.SID.ir

Planning, Faculty of Geographical Sciences and Planning, University of Isfahan, which was completed in July 2019 with the guidance of Dr. Seyed Eskandar Sidayi and Dr. Faramarz Brimani.

Conflict of Interest

The authors declared no conflicts of interest

www.SID.ir