NANGARHAR UNIVERSITY
INTERNATIONAL JOURNAL OF BIOSCIENCES
ORIGINAL ARTICLE
e-ISSN: 2957-9988
NUIJB Special Issue, 2024

Received: 20-Dec-2023 Accepted After Revision: 22 Jan 2024 Published Online: 10 Feb 2024

Excessive Water Usage, and Its Impact on Underground Water Depletion in Jalalabad City Zone

Fazly Mohammad Ismail[1*]
Department of Finance, Faculty of Economics, Alfalah University, Nangarhar, Afghanistan
[*]Coresponding author: ismailfazly4@gmail.com

ABSTRACT

I have conducted a research study on the Underground Water Depletion (UGWD) over Excessive Water Usage in Nangarhar City Zone. Groundwater Depletion (GW) is a pressing concern in Afghanistan as well as in other countries around the world. However, in some places such as Kabul, water depletion rate is much more than its In-charge rate, which is already a serious concern. In this paper the data have been analyzed with the help of a theoretical framework. The data have been collected through normal dialog (Interview), and questionnaires distributed to the related entities including in sample frames in Nangarhar City-Zone. This research type was quantitative, and due to the large size of population, I have opted for the random sampling, and estimation method. In this research study, I have found that there is a Positive relationship between GW & In-charge rate, and Negative relationship with Discharge rate. The specific result for this research study is theoretical framework analysis. With the help of decision science tools, we examined that, due to percent change in In-charge rate upon percentage change in GW is positively changing the Groundwater in Nangarhar city zone case. Yearly based, the Groundwater Depletion Rate is 0.75 and the amount of water collectively decreased by 19.195%. The significant rate depends upon my theoretical framework, which can show reliability of our conducted research work.

Keywords: Underground Water Sinkage, Environmental Pollution

INTRODUCTION

Water Depletion is a pressing concern in Afghanistan as well as in other countries around the world. Somehow in all the countries lake of water is one of the inherent and serious problems (IGM, 2016). We all are well aware that the capital of the country, Kabul is facing increasingly groundwater depletion, and the residents are not having drinking water and water for sanitation (NEPA, June 2010). If the current scenery leads us to several upcoming years, the people of Kabul may experience massive migration from the capital of the country Kabul to that of the area where they could find water. Nangarhar is also one of the largest cities in Afghanistan, where the groundwater is going down consequently. If we do not take clever steps for preventing the water depletion in the Nangarhar City zone, we will also be facing the scenery of Kabul. In this paper I have plotted a theoretical framework and I will be trying to find out the cause and effect of the groundwater and underground water depletion, with respect to In-charge and Discharge factors.

LITERATURE REVIEW

Most approaches for quantifying groundwater recharge measure recharge directly or indirectly over a limited area (point or small-basin scale) and for short periods of time. Estimation of recharge, by any method is normally subject to large uncertainties and errors. In this paper, various methods of estimating ground water recharge are outlined and critically reviewed with regard to their limitations (Saiful Islam, 2015).

The growth in CWU from 1999 to 2018 for cash crops and grain crops was 145.4 Gm3 and 74.4 Gm3, respectively. DI of all crops was 0.281 over the study period in China, with grain crops being 2.6 times more dependent on blue water resources than cash crops. Xinjiang, with annual average BDI of 0.716, 0.805, and 0.620 for all, grain and cash crops, respectively, has the highest irrigation demand. The PLS-SEM results showed a significant causal relationship between the economy and BDI, with obvious regional differences in structural path analysis. Based on the analysis of agricultural water use, the regions can adjust the structure of crop cultivation, optimize the allocation of water and soil resources, expand the cultivation of fodder grains and

promote steady economic growth, to achieve a "win-win" situation of ensuring food security and sustainable use of agricultural water resources (Nan Wu, 2023).

In Weishan Lake, anthropogenic and industrial sources were the primary contributors to water pollution, whereas in Luoma Lake, anthropogenic and natural sources were the primary pollution source, followed by agricultural sources. In general, the WQI and PEI values indicated that the water quality in Weishan Lake and Luoma Lake was classified as “good” during the study period, despite the deterioration of water quality in both lakes. Overall, implementing a robust management plan for maintaining the aquatic environment in these two lake areas is necessary (Jingbang Wang, 2023).

RESEARCH METHODOLOGY

A. Research Design and Research Strategy

This research has been conducted based on a quantitative research approach. There is a strong relationship between Excessive water usage by entities/individuals and Underground Water depletion (UGWD) in Nangarhar City Zone. Researchers will be interacting with maximum respondents to obtain data. As we know population is very important in any research study, but in case the population size is large and not possible to cover the parameters, we are going for a sampling method for research study. In this research I have seen that the UGWD is increasingly harming the environment with its adverse effect. I preferred to analyses the mechanism of drilling water from ground and its effect on groundwater depletion, in Nangarhar City Zone. In this research, data have been collected by sampling techniques. Questionnaire was developed which held the complete information relating to this research study. Before the entire research study, the researcher has to design and plan the research strategy. Therefore, the current study has also been made on a strategy-based plan. The population for this study is the Nangarhar province. To be more specific, the targeted population for this research is the Nangarhar city zone area. As I mentioned in the research design part, the respondents for this research study included all the entities and enterprises who are drilling water from underground for a reason in the Nangarhar city zone.

B. Population and Sample

Population is the entire area from where the researcher is going to conduct the research. The population for this research study will include, all the entities and individuals who are drilling water from underground, in Nangarhar city zone. It is not easy to take the data from the entire population, so we will be using random sampling, an estimation method, and collecting the data from all the elements of the sample frame.

Data Collection & Model Specification

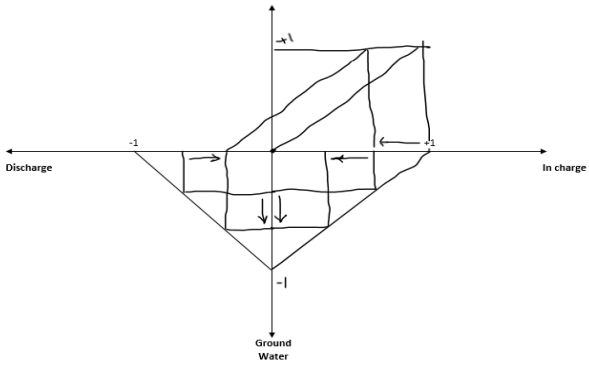
For gathering the data, the researcher will visit the respondents (entities and individuals), and he will discuss the quantity demanded rate, and the amount of Groundwater drilling included in our sample frame and also eligible for being in sample size, until it could represent the characteristic of the entire population size. At the same time, alternatively, we will be distributing questionnaires, but due to cultural manners, usually the entities and individuals in the city are not ready to answer the written questionnaire, anyway the conducted research would be quantitative, based on primary data. Particularly, we can say that most of the data will be collected by normal dialogs and kind of friendly interviews with the respondents. For analysis of the relationship between Underground Water Depletion (UGWD) over Excessive Water Usage in Nangarhar City Zone, various statistical tools and techniques will be used for data analysis. To evaluate the relationship between UGWD and EWU, with respect to drilling water entities, we will use the statistical package. Our study model is based on true propositions, in this model we will use decision science tools and techniques for data analysis. To investigate the relationship between Excessive water usage and Underground Water depletion. we plot the following theoretical framework for this research study:

|Discharge rate| - |In charge rate| = 0 Equilibrium Level
|Discharge rate| - |In charge rate| > 0 Groundwater Surplus

|Discharge rate| - |In charge rate| < 0 Groundwater Deficit

|In charge rate| - |Discharge rate| = 1 Surface Water

⇨ **While, Discharge rate is [-1,0] & In charge rate is [0,1]**



(% Δ Discharge rate) (% Δ GWD) = (% Δ In-charge rate) (% Δ GWD) this equation can keep the level of Groundwater in at Equilibrium point, which is clearly shown in the framework. Despite that, we have two other situations for surplus and deficit, while surplus will increase the groundwater level and deficit oppositely will lead us to higher rate of underground water depletion.

CONCLUSION AND RECOMMENDATION

A. Conclusion

I have found that there is a Positive relationship between GW & In-charge rate, and Negative relationship with Discharge rate. The specific result for this research study is theoretical framework analysis. With the help of decision science tools, we examined that, due to percent change in In-charge rate upon percentage change in GW is positively changing the Groundwater in Nangarhar city zone case. Yearly based, the Groundwater Depletion Rate is 0.75 and the amount of water collectively decreased by 19.195%. The significant rate depends upon my theoretical framework, which can show reliability of our conducted research work.

B. Recommendation

As we all know that we do not have a water supply system in Nangarhar city zone, so if we reuse water wastage and use it instead for plantations and trees. Particularly, we can install a system for plants irrigation with used or wastage water in Nangarhar city zone. It is clear that deforestation as an independent variable has its vital part in reducing environmental pollution, it will slow down the negative impact of environmental pollution. To put restrictions on water pumps and control them not to drill water from underground but very limited, only for drinking and cleaning. For implementation of this way, we may plot a scheme, for example a Meter can work out for implementing such a scheme. From another hand deforestation is one of the most important factors which affect Underground water depletion. If we reduce drilling water, people of the city may need water for drinking, cleaning and also for other purposes. As an alternative, the water supply system for the city zone can help people to meet their problem. Underground water should only be used carefully for drinking and cleaning purposes only, not to irrigate plantations. Otherwise, we can install a system for water purification then for irrigation of plants.

References

Bierkens, M. F., & Wada, Y. (2019). Non-renewable groundwater use and groundwater depletion: a review. *Environmental Research Letters*, *14*(6), 063002.

Coelho, V. H. R., Montenegro, S., Almeida, C. N., Silva, B. B., Oliveira, L. M., Gusmao, A. C. V., ... & Montenegro, A. A. (2017). Alluvial groundwater recharge estimation in semi-arid environment using remotely sensed data. *Journal of Hydrology*, *548*, 1-15.

Hasnat, G. T., Kabir, M. A., & Hossain, M. A. (2018). Major environmental issues and problems of South Asia, particularly Bangladesh. *Handbook of environmental materials management*, 1-40.

Krishnamoorthy, N., Thirumalai, R., Sundar, M. L., Anusuya, M., Kumar, P. M., Hemalatha, E., ... & Munjal, N. (2023). Assessment of underground water quality and water quality index across the Noyyal River basin of Tirupur District in South India. *Urban Climate*, *49*, 101436.

Laraichi, S., Hammani, A., & Bouignane, A. (2016). Data integration as the key to building a decision support system for groundwater management: Case of Saiss aquifers, Morocco. *Groundwater for Sustainable Development*, *2*, 7-15.

Oduor, J., Macharia, E. W., & Mbassana, M. (2015). Assessing Sustainability of Rural Water projects in Naivasha, Kenya. *European Journal of Business and Social Sciences*, *4*(07), 52-83.

Qablawi, B. (2016). *A comparison of four methods to estimate groundwater recharge for Northeastern South Dakota*. South Dakota State University.

Wada, Y., Van Beek, L. P., Van Kempen, C. M., Reckman, J. W., Vasak, S., & Bierkens, M. F. (2010). Global depletion of groundwater resources. *Geophysical research letters*, *37*(20).

Wu, N., Zhang, J., Gao, X., Wang, X., Wu, M., & Cao, X. (2023). Distribution and drivers for blue water dependence in crop production in China, 1999–2018. *Agricultural Water Management*, *290*, 108593.