# EVALUATION OF GROUNDWATER ON A BASIS OF PH VALUES & ANALYSIS OF CORRELATION COEFFICIENTS

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**Abstract:** *The quality of groundwater is assessed on a basis of changeable parameters. The correlation coefficient, regression analysises and their statistical status of water hydrogen indicator (pH and pOH) could be done for making water quality monitoring.*

**Key words:** *groundwater, correlation coefficient, hydrogen indicator (pH values), variation series.*

**Introduction:** The pH values of groundwater might be a little higher during rainy seasons than dry periods. However, in the confined aquifers than unconfined aquifers the average pH values of groundwater are lower slightly [1;2]. On a basis of the lack of alkaline substances in the groundwater system, the acidity of groundwater increases and becomes unusable [3].

We know that, the acidic water which contains a lot of hydrogen ions, accelerates corrosion. According to the criteria of the US Environmental Protection Agency (EPA), the pH value of water used for domestic purposes have to be between 5.5 and 9 [1;4].

**The aim of the research:** The scientific work consists in assessing the water quality on a basis of the comparison of the results obtained by determining the hydrogen index of underground water, the hydrogen indices of tap water and their statistical correlation coefficient.

**Methods and Result:** Groundwater distributed in the Amudarya district of the Republic of Karakalpakstan, which is underground water taken from a depth of 13-17 meters, the general parameters for quality assessment are described in the correlation matrix and on a basis of hydrogen readings and comparing the pH values with the pH values of tap water and using the variance method to obtain a statistical average, the results of which we depicted in diagrams (Table 1).

*Table 1*

*Variation series of groundwater and tap water hydrogen indicators (according to 2022 statistical data)*

| № | $X_i$ | $Y_i$ | $(X_i - X)$ | $(Y_i - Y)$ | $(X_i - X)^2$ | $(Y_i - Y)^2$ | $(X_i - X)(Y_i - Y)$ |
|---|---|---|---|---|---|---|---|
| 1 | 7,6 | 7,95 | 0,47 | 0,48 | 0.22 | 0,23 | 0,22 |
| 2 | 7,5 | 8,0 | 0,37 | 0,53 | 0,14 | 0,28 | 0,20 |
| 3 | 7,0 | 8,0 | -0,13 | 0,53 | 0,02 | 0,28 | -0,07 |
| 4 | 6,95 | 7,95 | -0,18 | 0,48 | 0,03 | 0,23 | 0,09 |
| 5 | 7,05 | 7,3 | -0,08 | -0,17 | 0,01 | 0,03 | 0,01 |
| 6 | 7,05 | 7,2 | -0,08 | -0,47 | 0,01 | 0,22 | -0,005 |
| 7 | 6,9 | 8,0 | -0,23 | 0,53 | 0,28 | 0,28 | -0,12 |
| 8 | 7,0 | 7,1 | -0,13 | -0,37 | 0,02 | 0,14 | 0,05 |
| 9 | 6,9 | 7,05 | -0,23 | -0,42 | 0,05 | 0,18 | 0,10 |
| 10 | 6,9 | 7,05 | -0,23 | -0,42 | 0,05 | 0,18 | 0,10 |
| 11 | 7,2 | 7,05 | -0,07 | -0,42 | 0,005 | 0,18 | 0,03 |
| 12 | 7,5 | 7,05 | 0,37 | -0,42 | 0,14 | 0,18 | 0,15 |
| N | E=7,13 | E= 7,47 | | | E=0,97 | E=2,41 | E=0,75 |

Xi - the pH values of underground water, Yi - the pH values of tap water

$$R_{xy} = \frac{\sum(X_i - X)(Y_i - Y)}{\sqrt{(X_i - X)^2(Y_i - Y)^2}} = \frac{0,75}{\sqrt{2,34}} = 0,5$$

*Table 2*

*STATISTICAL ERROR*

| № | $X_i$ | $Y_i$ | $X^2$ | $Y^2$ | $X_iX$ | $Y_iY$ |
|---|---|---|---|---|---|---|
| 1 | 7,6 | 7,95 | 57,76 | 63,20 | **54,19** | **59,39** |
| 2 | 7,5 | 8,0 | 56,25 | 64,0 | **53,47** | **52,29** |
| 3 | 7,0 | 8,0 | 49,0 | 64,0 | **49,91** | **52,29** |
| 4 | 6,95 | 7,95 | 48,30 | 63,20 | **49,55** | **59,39** |
| 5 | 7,05 | 7,3 | 49,70 | 53,29 | **50,27** | **54,53** |
| 6 | 7,05 | 7,2 | 49,70 | 51,84 | **50,27** | **53,78** |
| 7 | 6,9 | 8,0 | 47,61 | 64,0 | **49,20** | **52,29** |
| 8 | 7,0 | 7,1 | 49,0 | 50,41 | **49,91** | **53,04** |
| 9 | 6,9 | 7,05 | 47,61 | 49,70 | **49,20** | **52,66** |
| 10 | 6,9 | 7,05 | 47,61 | 49,70 | **49,20** | **52,66** |
| 11 | 7,2 | 7,05 | 51,84 | 49,70 | **51,34** | **52,66** |
| 12 | 7,5 | 7,05 | 56,25 | 49,70 | **53,47** | **52,66** |
| N | E= 7,13 | E= 7,47 | E= 612,91 | E= 672,74 | E= 609,98 | E= 647,64 |

Xi - the pH values of underground water, Yi - the pH values of tap water

$$\partial 1 = \frac{\sqrt{\sum X^2 - X_i X}}{n-1} = \frac{\sqrt{2{,}93}}{11} = 0{,}15$$

$$\partial 2 = \frac{\sqrt{\sum Y^2 - Y_i Y}}{n-1} = \frac{\sqrt{25{,}1}}{11} = 0{,}45$$

$$S(\partial 1^2 - \partial 2^2) = \sum \frac{\sqrt{\partial 1^2 + \partial 2^2}}{n^2} = \frac{\sqrt{(0{,}15)^2 + (0{,}45)^2}}{144} = 0{,}003\ (3 \times 10^{-3})$$

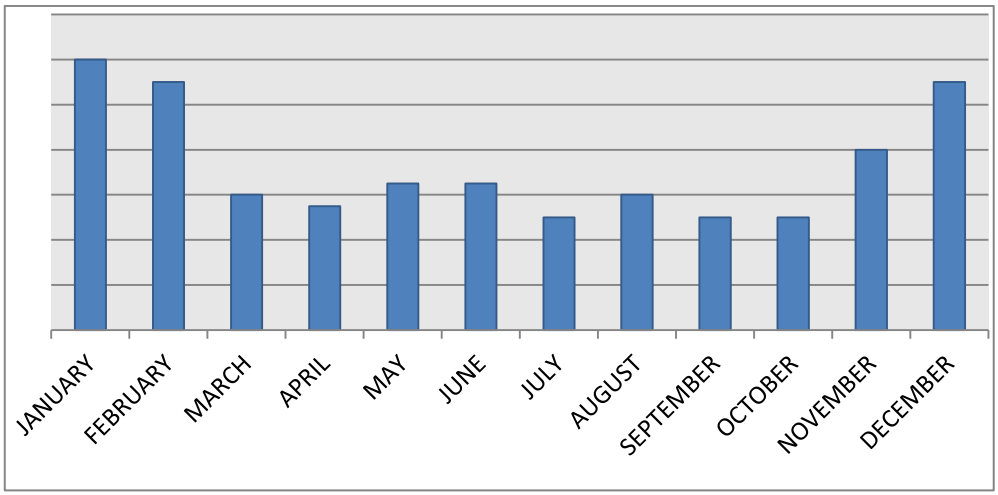


*Diagram 1. The pH values of groundwater in Amudarya district in 2022*

**Conclusion:** the statistical correlation coefficients of acidic, neutral and alkaline indicators of underground water (water impermeable layer, it is taken from the depth of 13-17 meters in the Amudarya district) wewre compared of the hydrogen indicators of drinking water delivered through pipelines in the district and it was found that there is a negative correlation.

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