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Research About the Sources of Drinking Water for Kabul City using GIS

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Abstract - *Currently, one of the main problems in Kabul city is the provision of drinking water and water for irrigation. The researchers and concerned authorities are seeking the sources of provision to introduce for investment. In this research, the water sources were surveyed around Kabul city and fortunately multiple sources are available such as Kabul river, Shahtoot dam, Shakardara dam (Shah & Arus), Ghorband river, Logar river, Barikab river, Helmand river and Panjshir river. The mentioned rivers were studied as per their water sources. As a result, having the natural refrigerators in its headwaters, Panjshir river is the best option for the provision of required water for Kabul city. Therefore, the priority should be given to Panjsher river and it is suggested for investment. In this case, considering that our country may face drought due to the world climate change, the Kabul city may have sufficient water for long-term.*

Key Words: water resources, drinking water, Kabul city, GIS

1. INTRODUCTION

One of the most important issues in our country is the provision of water for Kabul city. This issue has been discussed since Shah Amanullah Khan era and multiple solutions have been proposed but unfortunately none of them were executed.

The population of Kabul city has increased since the residents of other provinces have moved to Kabul due to civil war in the last four decades. The population of Kabul city has risen from 1.4 million to more than 5 million. Therefore, the city services such as water supply and greenness have quadrupled and this has created a water crisis in Kabul city.

This research has studied the water sources for Kabul city as multiple sources are available beside the Qargha Dam such as Kabul river, Shahtoot Dam, Shakardara Dam (Shah & Arus), Ghorband river, Logar river, Barikab river, Helmand river and Panjshir river [1].

2. INVESTIGATION

The provision of drinking water for Kabul city was declared for the first time by Amir Abdul Rahman Khan and clean water was provided for Ibn-e-Sina hospital. The drinking water was supplied from natural pool of Paghman to Kabul city in Shah Amanullah's era. During Zahir Shah's era, the water reservoirs were created to supply water to Kabul residents and canalizations were built around the city. In some projects that were applied by Russians such as Macroyan, the clean water was distributed 24/7. Currently, the clean water for Kabul residences is provided from 42 wells, 3 large water supply projects and 30,000 to 35,000 private wells which are not sufficient. That is because Kabul City's underground water level has decreased in average from zero in 1980 down to deep 40 to 50 Meters.

Now that population of Kabul city has increased without planning due to civil war in the last four decades and the population of Kabul city has increased from 1.4 million to more than 5 million. Therefore, the city services such as water supply and greenness have quadrupled and this has created the water crisis in Kabul city. Besides, due to the world climate change, our country's rainfall as well as the natural refrigerators of Hindokush mountain have decreased. Therefore, to avoid the lack of water in Kabul, we need to investigate all the potential water sources around the city and invest on the most reliable source to ensure the provision of water in Kabul in the long term.[2]

The water sources around Kabul city which can supply the sufficient water for Kabul are as follow: Qargha Reservoir Dam, Kabul river, Shahtoot Dam, Shakardara Dam (Shah & Arus), Ghorband river, Logar river, Barikab river, Helmand river and Panjshir river. This research will study and investigate all the mentioned rivers and waters sources in order to find the most reliable source and introduce for investment. [1]

2.1 Kabul river:

This river is emanated from Helmand river where it is separated from it around the Sanglakh of paghman Mountain (Hundukosh Mountain) in Owni valley and goes to North and then to Northeast and East. This river is one of the sources which has to be considered. There is no suitable place for water supplying storage where the Kabul river flows, unless a dam is built in Dahna Owni valley to store the water. There is another valley in Paghman that is called Pashyee valley which can be used to make a dam. With these plans, a remarkable amount of Paghman mountains' water which is a result snow and rain, can be stored. [3],[4]

This source is relying on snow and rain during the winter season which is not stable when there is drought. It has to be mentioned that the average raining and snowing level in this region is 250 Meters annually. Paghman mountains heights are more than 2600 Meters and its snows melt gradually in spring and summer and feeds the Kabul river. One of the advantages of this river is that the obtained water is being stored in its own place which is near to the Kabul City and will not get dirty. Figure 1

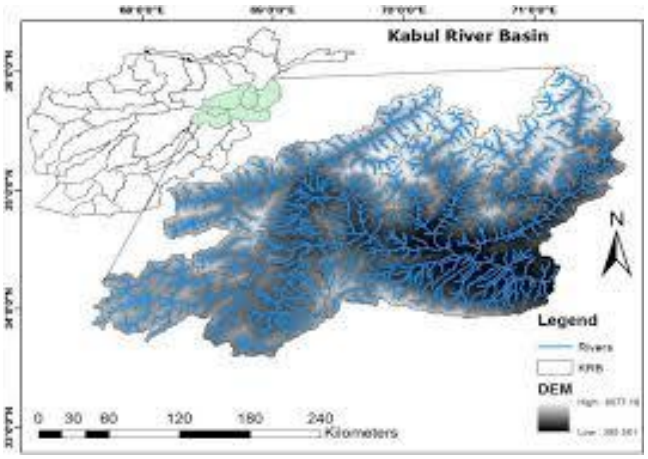

Figure 1. Kabul river basin

2.2 Shahtoot Dam:

This reservoir dam is being built with the cooperation of India on one of the sub-rivers of Kabul named Maidan river which is emanated from Owni Valley, Paghman Mountain. This source is also relying on snow and rain during the winter season which is not stable when there is drought. It has to be mentioned that the average raining and snowing level was calculated 250 Meters annually based on Maidan Hydro-methodology on 2015 [3]. This river has 136 Million M^3 water per year and this Reservoir dam can store 130 Million M^3. Besides, the Kabul residents can use this place as a park just like Qargha dam.

2.3 Shakar Darah (Shah & Arus) Dam:

It is another source of water which is built on Shakardara river, located in Northern area of Kabul in a distance of 22 Km from Kabul. Its water settling capacity is 30.4 million M^3 and having the storage capacity of 9.3 million M^3 that is emanated from Hindukosh mountain and flows towards Paghman mountains and its water sources are snow and rain. Its sources are more consistent than Shahtoot reservoir dam and Kabul river as its water flows from Takht Turkman peak with the height of 4672 Meters from the sea surface and its loaded with snow during the year. [3]

In order to store the water for Kabul city, the Reservoir dams have to be built on other rivers which are around Kabul City such as Logar river, Ghorband river (that flows to Mir Canal) and Barik Aab river.

2.4 Helmand River:

This river is separated from Kabul river from Hindukosh Mountain in Sanglakh area, Paghman mountain, Owni valley and flows from North to south. The water of this river is storable in Hisa Awal behsood area and its water can be moved through a creek or a large pipe line up to Paghman and convey to Hisa Awal Behsood district- Jalriz-Maidan Shahr – Paghman and the length of this route is calculated 80 KM. Other characteristic of this river is like Kabul river. Figure 4

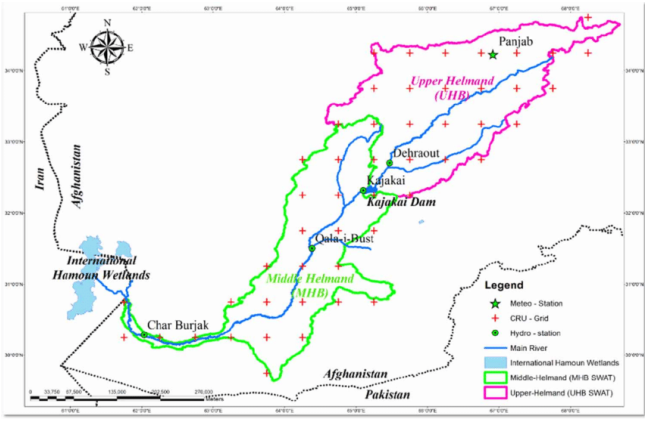

Figure 4.Helmand river basin

2.5 Panjshir River:

Panjshir river flows from the heights of Hindukosh Mountain, 3000 to 6000 Meters from the Sea level, from Guzargah e Anjuman, Chamar and Kotal e Khawak. Its source is the snow which is stored in heights of this mountain during the winter and gradually melts during the spring and summer and also the seasonal rainfall during spring and fall. The average raining level in Wadi Punjsher was calculated 250-450 Mile Meters. Its water storage is Wadi Punjsher and its length is 125 KM having 126 big valleys and having 19 sub-rivers. The main Advantage of this river is that in the heights of Punjsher mountains, only in Paryan district there are natural refrigerators with a total area of 19.37 KM ^{3} (at the year 2000) which supply this river's water permanently. In addition, there are natural pools which store a remarkable amount of water and that is why this river has attracted more attention. Figure 5, [3]

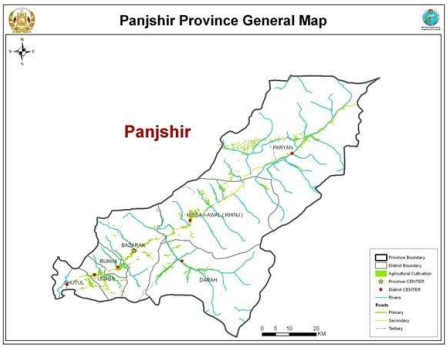

Figure 5.Panjshir river basin

3. CONCLUSIONS

This research found that there are several sources for provision of water to Kabul city such as Shahtoot dam, Shakardara dam (Shah & Arus), Ghorband river, Logar river, Barikab river, Helmand river and Punjsher river. After comparing these water sources, we found that Panjshir river is one of the most reliable and resistant sources to be invested on. Because this river besides that it flows from high peaks, high mountains are located on both sides that store the snows which melt gradually. In addition, these mountains have natural refrigerators in Paryan region with an area of 19.37 KM2 and supply the permanent water of this river. Therefore, this river should be given the priority to supply Kabul city's water compared to the other sources.

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BIOGRAPHIES

I was born in 1963 in Kabul – Afghanistan. I received my B.S. and MSc. degree in applied Geodesy from Uzbekistan. Now I work as a lecturer at Geomatics and Cadastre faculty of Kabul Polytechnic University.