5th International Conference on Water Resources and Arid Environments (ICWRAE 5): 167-170
7-9 January 2013, Riyadh, Saudi Arabia

The Hydrology of the Western Plateau Valleys in Iraq

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INTRODUCTION

The water resources in the Iraqi western plateau (desert region) are composed of little rainfall and deep ground water. Both are considered as the most important living resources in this part which requires special interest for making use of water wealth. Such an invest of water has an influential effect in constructing the western plateau, reaching to the economic and social development of the country. Therefore, it was necessary to direct the growing concern towards investing it in a typical way.

The current need for constructing dams and reservoirs in the dry western plateau comes out as a result of the available heavy water valleys and brooks throughout the rainfall seasons.

This research attempts to investigate geographically and hydrologically the western plateau valleys in Iraq in order to specify the available potentials for implementing the developing processes, economically and socially, in the region because water is an essential element for successful processes.

Intending to specify and assess the resources of the water region precisely, the investigating region has been divided into two parts: the northern wilderness and the southern wilderness. It has been focused on the important main valleys in the region through its geographical survey. Then, the hydrological potentials have been specified to ensure the success of the social and agricultural developing in this region. By such a development, it will be possible to invert the desert resource into a one source of the wealth resources which can contribute in attaining the desired developing aims in the country of Iraq.

The Geography of the Western Plateau Valleys: The western plateau is a one part of physiographic Iraq surface. It occupies 60% of the country area. Geographically, its area is divided into the following secondary parts according to the structure of the surface, the quantity of the annual rains and the nature of its soil and natural plants:

The Northern Wilderness: The northern wilderness occupies 1.1399 km^2, with lime-soil, exposing to the aerobic and water slopes. Its annual rainfall ranges between 100-150 ml and its relative humidity is about 69% in winter and gets lower to 23% in summer [1]. It is characterized by the large number of the seasonal valleys, which are filled with water through rainfall seasons that itself is affected by a number of natural factors such as the topography of the area, sloping factor and plants coverage in addition to the rainfall quantity and its rainfall period. The most important northern wilderness valleys are:

Alsawab Valley: Its position begins from the west of the ALKA'RA valley in a distance of 70 km north of ALRUTBA. It is formed from the meeting of a set of sub-tributaries that enters the Iraqi lands and goes in the north direction.

Alwalidge Valley: The area of this valley is estimated at 2000 km^2. It consists of rocky lands. It is considered one of the most important valley of the closed basin in the western heights in the lands of the (Iraqi-Jordan-Saudi) border triangle. Then, it extends to the Iraqi lands from the south to the north.

Alka'ara Valley: It lies in the north western area with an area of 435 km^2. It is recognized as a southern topographic boundary for the northern wilderness, whose waterways are directed from the north east to the south west till it flows to the Euphrates river north of the Syrian ALBOKAMAL town.

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Alhawran Valley: It covers an area of 1400 km^2 reaching the mouth of the Euphrates river north of KHAN AL-BAGDADI. Its length is about 485 km, beginning from the waterways of the eastern heights slopes near of Saudi-Jordan-Iraqi border. Then, the valley takes its way from the south west to the north east reaching ALRUTBA town. Then, it takes the eastern orientation reaching to the mouth of the Euphrates river. Its seasonal water starts its flowing after falling rains and torrents. Sometimes, its water reaches the Euphrates especially after a consistently heavy rain fall [2].

Amij Valley: The basin of Amij valley lies in the south of Alhawran valley basin. It is similar to Alhawran valley basin in the structure. The heights of the south east of Alrutba constitute the main springs of the valley. The area of its supplying basin is estimated at 3300 km^2.

Almuhammadi Valley: The basin of this valley lies in the eastern part of the northern wilderness next to the Euphrates in the region between Alrumadi and Heet towns. Its waterways begin from the south of Amij Valley. It consists of two main branches. The area of the basin is about 555 km^2. Its waterway reaches the Euphrates river in the rainy years and after heavy rain fall.

The Southern Wilderness: Its area is 76144 km^2. Its northern land is entirely desert, while in the southern part, there is little of sandy lands and sand hills but has a wide range of wavy highlands within which small single hills exist. It lacks heavy valleys. Most of its valleys are incomplete and unclear to be recognized. The average rainfall range between 50-100 ml and the relative humidity between 50-60 % in winter and gets lower to 20% in summer.

The most important valleys in the southern wilderness are:

Alnajaf Sea Valleys Basin

It Consists of Two Basins: Alkhr valley basin, which is the natural boundary between the north and the south wildernesses and SHU'AEB valley basin.

Alshabeha Valley Basin: It is constituted of the lands of the south of Alshu'aeb basin and the north of Alsalman basin. It is a closed basin that comprises from a number of valleys such as Alkharz valley. Its area is about 5000 km^2.

Alsalman Valley Basin: It includes the lands of the south of Alshabeha valley. It is a closed basin within an area of 4000 km^2 and with a length of 35 km.

In the following, we'll discuss the natural geographic features for the investigated region:

The First: the Geographical Structure: The geological formation of the western plateau region belongs to the Alaulkyosen and Almiosen of the middle and low ages (3), such as:

- The Euphrates formations: it contains solid lime rocks (sand rocks and pebbles).
- The Low Faris formations: it contains gypsum, lime-rocks and clay rocks.
- Kara Jock rocks: it contains lime-rocks from Alaulykosen and Alayosen ages
- The formations of the modern age and Alyayostosen: it contains sand rocks and Marl.

Soil: The soil of the two wildernesses is generally surface and limy in structure with some centimeters in depth. It is exposed to erosion factors, corrosion and aerobic and water slopes. It includes the red desert soil which is characterized by its red-brown surface layer, in addition to the desert soil constituted by the cracked rocky materials and sandy hills [4].

Plants Coverage: The dominant plant coverage in the investigating region is the desert plants which comprise of:

- The annual and long-life bushes such as Altartee' and Alrutha (5).
- The Grass and Herbs Such as Alnamees and Alsheeh
- The annual grass and herbs such as papyrus and barley

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The Torrent: it is formed by accumulating the heavy rain fall water. It is not more than the water consumed through the leak and evaporation. The quantity of the torrent water depends on the topographic and geological features of the region i.e. in other words;

it is affected by rain heaviness and intensity. We can summarize the factors that affect on the water flow size in the Iraqi western plateau by the following features:

The Topography of the Region and its Sloping Degree

The Type of the Plants Coverage: The quantity of the rainfalls and its time period of the fall.

To account for the average of the surface flowage, it is important to rely on some mathematical methods and static formula, such as:

Shnider Method (6): The super drain contrast with the length of the waterway, i.e. the super drain varies according to the rain fall quantity and sloping average,

$$QP = (CIA)$$

Berkley Formula to Measure the Flow Size:

$$R = C\text{-}S\ (\ )^{N}$$

C = is a fixed coefficient that ranges between 0.25 and 0.35
N= 0.45
S = valley sloping average m/km
W = the supplying basin width average k/km
L = the longest water way within the basin

The Formula of Ibrahim Ator and Jot Bike Applied on the Jordan Desert:

$$N = \frac{0}{\frac{5}{<75}}$$

M = the average of the rain fall ml

The Formula of Estimating the Valley Water Quantity in the Iraqi Western Plateau:

$$R = E\ P\ S^{1/2}\ (\ L\ )^{r}$$

R = the annual flow in the valleys billion /m^3
E = a fixed coefficient depends on other factors like the surface soil variation, plants coverage and the geology of the region. It varies between 0.2-0.35
P = the annual rain quantity in the basin
S = the sloping average m/km
L = the longest waterway in the basin km

Applying Another Formula Whose Coefficient Is Fixed:

$$R = L\ A\ /\ I + 301$$

R = the annual average in the valleys billion/m^3
I = is the annual rain average in ml
A = the area of the supplying basin /km^2
301 = a fixed coefficient depends on the slope, basin capacity and rain quantity.

The relative formula:
Q = C IA
Q = the flowing size in billions of square meters
I = the depth of the annual rain
A = the area of the basin / km^2
C = a fixed coefficient 0.25

This Table Is Made by the Researcher: The area of the basin is found by using Alyalatiometer depending on the topographic basin map.

The Longest Waterway Is Found by Using the Measuring Wheel: The basin depth is found by using the measuring wheel.

All the previous formulae are applied to find out the available water quantity which can be stored in the chosen valley and come out with the results in the two tables (2) and (3).

RESULTS AND RECOMMENDATION

It is clear from this research that the western plateau valleys have a mild surface water through the flowing torrents in the rain fall season in a way that it is possible to store this water via constructing dams and make use of it in the agriculture and as a way of housing nomads. In order to specify the potentials of the water western plateau accurately and get use of them, the researcher recommends the following:

- Making topographic surveys for the supplying basins of the western plateau valleys in order to locate typically the right positions for dams and reservoirs.

Table 1: The hydrological features of the valley in the western plateau

T	Valley name	Basin Area km^2	Rainfall average ml	Rain quantity	Sloping average m/km	Longest waterway	Width average m
1	ALSAWAB	8	145	1.16	2.1	200	45
2	ALRATKA	18	140	2.52	2	150	65
3	ALHAWRAN	20	120	2.40	2.1	300	65
4	ALKADAK	16	105	1.69	2	300	40
5	ALABIAD	71	85	6.04	1.2	400	135

Table 2: The average of the rainfall and the surface flowing coefficient

The region Billion/m^3	The area km^2	The rainfall average ml	The surface flowing coefficient	Water quantity/m^3
The north wilderness	101000	110	10%	1.11
The south wilderness	76000	70	5%	0.216

Table 3: The quantity of the insured water in the western plateau billion/m. ^{3}

Valley name	Formula(2)	Formula(3)	Formula(6)
ALSAWAB	0.306	0.370	0.080
ALRATKA	0.820	0.970	0.920
ALHAWRAN	0.610	0.675	0.580
ALKADAK	0.380	0.430	0.420
ALABIAD	1.420	1.300	1.01

This table relies on table (1) in the application and finding results.

- Establishing hydrological stations to measure the water quantity in the valleys in order to specify the capacity of the reservoirs on the western plateau valleys.
- Conducting investigation and research applied on utilizing the land in the western plateau and using water for different purposes.
- Conducting economic research to find out the economical benefits and the motives for establishing dams which meet the economic needs to the plateau residents.
- It is necessary to conduct a social research for the western plateau residents.
- Investigating the type of the agricultural product in the desert land in a way that copes with the agricultural crop and with the conditions of the climate and topographic plateau.
- Establishing a network of climate stations to recognize the conditions of the western plateau with all its different parts especially the members of temperature and rainfall in order to assign the water potentials available to them in the western valleys accurately.

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