

## The Effects of Sedimentary Conditions on Geometric Stable Section of Karvandar River

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### Abstract:

*One of the main problems in rivers and streams management is erosion and sediment issue. Annually large amounts of sediment enter in surface transfer systems and filling the dam reservoirs which causes tension on water resources management. The study zone includes catchment of Karvandar River which is located in north of Irandegan plain and in the vicinity of Sibe-Sooran, Khash and Poshtkooch plains in Sistan and Balouchestan province. This zone is in 20°34' to 28° 2' latitude and in 60° 35' to 61° 14' longitudes. The surface area of this catchment is 2128 km<sup>2</sup> that 1789 km<sup>2</sup> of it is covered by altitudes and the remaining is plain. Existence of sensitive formations to erosion with the lack of appropriate use of lands causes entrance of sediments into Karvandar River flow. For this research using topographic maps of the region and river path physiographic of the catchment were studied. Then morphology, lithology, bed and lateral erosion, river regime, location and extraction of quarries, vegetation and also the information of hydrometric station were collected. The results show that vegetation of the zone is bushed-germanous that has little effect on prevention of erosion and movement of sediments to the downstream of the river. Generally in 95% of Karvandar catchment area, parameters of geology, vegetation, harvest quarries, early erosion (susceptibility to erosion) is related to formation and development of on geometric stable sections and river morphology that indicate direct and indirect effect of mentioned factors on determination of erosion type, state of sediments carrying and sedimentation in this catchment area.*

**Keywords:** *erosion, sedimentation, river regime, stable section, effects of environmental conditions, Karvandar*

### Introduction

Most of civilizations are formed in the sides of rivers. Flooding and inundation of rivers are natural process of the earth that can change and destroy different aspects of human lives such as vital, economic and social. From the centuries ago, human have found special facilities anticipate to prevent of desolator effects of flood water, the establishment of dam on the rivers, construct parapet and fence of stones, plant vegetables and small trees across the rivers for the decrease of prejudicial effects of flood water and the destructive effects of rivers.

In the developing countries, such as Iran, because of special regional situation and non-observance and recognition of nature, in the past and present rivers were stage of flowing disastrous and injuries flood water. Statistics shows that in the zone of Karvandar take place big flood water in date of 2-07-2007 with discharge of 10.051 m<sup>3</sup>/sec and on 14 April 2008 with discharge 30 m<sup>3</sup>/sec.

Therefore, for the better recognition of river and prevention of floods damage understanding of river regime is necessary. Also knowledge about conditions of climate, geology and morphology of the studied zone and hydrology of flood water help to have better view of it. According to these elements, one can recognize better the points of erodible and sedimentation and also think about prevention of these and offer a suggestion. For better perception of erosion in rivers and its catchment, first one should consider different kinds of erosion, the elements that effect on erosion and function and its effects. For the most important of erosive elements in each zone, one can attribute to climate, time, geology, and water river regime and topography situation. In considering of climate, different parameters effect that their most important are temperature, precipitation, and wind. In geology and also lithology catchment and techtonique there are two elements which control erosion i.e. in topography, slopes and lowness and highness has important function, in duration the collection of these elements are the principal elements of erosion in a catchment.

### **Research procedure**

The goal of this study is recognition of Karvandar River regarding to hydrological information. Therefore, there are needs to the basic meteorological, hydrological and geological studies. In meteorological studies one can consider different parameters such as, temperature, rainfall, wind and so on. In hydrological studies river discharge, river flood and physiographical considerations need to be studied. Generally taking sample of rivers accomplished from left and right river bank and other places that may need the middle part of river. After tests such as granulometry and drawing their charts based on the statistical tables, statistical characteristics of river sediments were studied.

Investigations of morphology of river considering satellite and topography maps were examined. Also classification and division of river from the aspects of shape appearance and erosion were investigated. Finally, based on the drawn conclusion, several suggestions to prevent rivers erosion as well as decrease of desolator effects of flood water were presented.

### **Geographical condition of studied zone**

The studied zone is including river catchment with the geographical zone of eastern longitude 260000 to 350000 and 330000 to 3110000 (OTM). The towns that are near to this zone are from north is Khash, south Iranshahr, and from west Saravan and Zaboli. Figures 1 and 2 can show the situation of the studied zone as well as the accessible roads. The distance of Karvandar catchment, center of Sistan and Baluchestan, Zahedan is about 240 Km. The studied zone is located in the middle of the khash-Iranshahr connections road. Because of existence of large amount of connection roads, which are mostly for villages this zone there one can conclude that almost access to the most area of this catchment is possible.

### **PSIAC Experimental Procedure**

This procedure is presented for calculation of soil erosion and production sediment of the dry and semidry area of west the United States. PSIAC was used for the first time in Iran in 1973 in Dez catchment. Since it has a relatively good precision then it was used in other catchments such as Dokhaharan, Kahir, Maroon, Halilrood, Saravan, Wawzon Valley. Recently this procedure is used in most water and soil plans to evaluate erosion and sediment production. In

PSIAC procedure, effects of 9 important and effective elements in soil erosion and production of sediment in catchment (see table 1) were evaluated and depending on intensity and weakness of each element, one can assign a relative value to it and taking achieved total value for different elements, provides the amounts of catchment sediment use and this method is expressed in the following:

$$Q_s = 38.8 \text{ EXP}^{0.0353R}$$

i.e.

R: achieved total value for different elements of erosion and

Q<sub>s</sub>: erosion potential m<sup>2</sup>/km<sup>2</sup>.

### Discussion and Conclusion:

Regarding the present study, experiments in Karvandar zone, following conclusions are achieved:

1- In Karvandar catchment at upstream, the average amount of gravel, silt high amount of sand, and little amount of silt and clay were observed where as at down stream decrease in gravel and increase in silt and clay were measured. Therefore, decrease in gravel and sand and increase in silt caused by slope of 45 % zone of the catchment. So, statistical parameters from upstream to downstream were change in the following manner: mid from -2.24 to 8.3; mean from -1.6 to 3.06 increased; skewness from 1.1 to 2.92 (very bad to bad); and kurtosis curves from -2.4 to 2.96 .

2- Based on Folk classification (1974); most of sediment textures in this zone are sand muddy gravel.

3- In this zone the mid and mean of sediment from the upstream to downstream were increased that which is symptom of existence of a bed gravel and sand at upstream and a silt bed at downstream the river.

4- Rate of negative curvature of some river sediments from this zone were caused by existence of a great amount of large particles, because with effect of river flooding the small particles were washed and displaced and positive curvature of sediment were resulted by a large amount of suspended materials that they were kept with larger grains.

5- Regarding to decrease in size and diameter of grains of sediment in this zone, the form of zone were change separately with a sandy-Gravel bed.

6- Regarding to there samples according United state conservation service standards were tested and the results showed that about %78 of the sediments of the studied zone, varied with skewness from bad to very bad and their resistances to erosion were very low.

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**Table 1. Related values of PSIAC method**

No.	parameter	characteristics of the study zone	zone distinction	distinction of karvandar catchment
1	The surface geology	kinds of stone, rigidity of stone, measure of cracked	0 - 10	7
2	soil	texture, measure of lime salinity, organic material, contraction, expansion percent, of gravel	0 - 10	8.2
3	climate	alternation, intensity and duration of precipitation, measure of snow, to freeze melting	0 - 10	5
4	surface flow	volume in surface unit, peak flow	0 - 10	8
5	lowness and highness (topography)	measure of slope, lowness and highness the measure of developing of cone and flooding field	0 - 20	10
6	earth	vegetation, stone, the vegetation under trees, debris	-10 - +10	-9
7	usage of earth	percent of agriculture lands, intensity of grazing, the cutting trees and building road	-10 - +10	-9
8	present situation of erosion (In high land)	furrows and moats, stumbling land, sedimentation, windy in canal	0-25	10
9	river erosion and the sediment	the side erosion and bed, depth of flow, active Headcuts and vegetation in flood ways	0-25	9
sum of distinction			-20 - +130	53.8
<b>special erosion (m<sup>2</sup>/km<sup>2</sup>) year</b>				<b>1040.91</b>
<b>surface of Karvandar zone (km<sup>2</sup>)</b>				<b>1765</b>
<b>volume of annual sediment (m<sup>3</sup>)</b>				<b>1837209.12</b>