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Study and recognition of erosion characteristics of perennial and ephemeral rivers in Tehran province

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ABSTRACT

In current study, at the first step, the hydrographic net of province rivers were provided based on topography map and hydrographic net from Tamab Company of Iran. Based on these definitions, whole of Tehran province area was divided to 5 different areas . Based on these definitions, whole of Tehran province area was divided to 25 different areas. In this study, the areas comprises 415 streams, and long in about 3038 part that 55.5% area had low sensitive to erosion, 49.82 % area had moderate to erosion and 44.63% area had high sensitive to erosion. Based on geological study (Alluvial- Stone), 64.72% of area was categorized in alluvial class and 35.28% area was categorized in stone class. Based on sediments density, 26.61% area ranked in low density class, 17.05% area was ranked in moderate density class and finally 57.34% area was ranked in high density class. Finally, it in view of bed- marginal erosion, about 63.9% was grouped in marginal erosion class and about 36.10% was grouped in bed erosion class.

Keywords: ARC GIS Soft wares, Erosion, Erosion Forms, River, System of rivers and stream Data, Tehran Province

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INTRODUCTION

This article is a research project for longitude 50º,22´,47" to 53º,08´,39" and latitude 35º,01´,44" to 36º,10´,31". The region have 1331431 hectare area in up to more 70% from whole Tehran province and part of Alborz province (Sharifi, 2016). One of the most important phenomena in earth crust processes is the flow of water and rivers not only play a role in the general picture of the earth's surface, but also determine the shape of human life on the planet. If these benefactors are not preserved altogether, the destruction and loss of soil, lack of food and the loss of human, economic and social resources. Generally, preservation of natural resources can prevent soil erosion, sediment transport, flood and drought and, while ensuring the stability of river water regime and geometric characteristics of rivers, provides optimal utilization of natural resources. This is impossible with proper planning and management (Collins & Walling, 2002). Due to the fact that the vast areas of the country are plains and sedimentary plains that comprise the bed of streams, ramparts and small and large intestines, the flow of water in these channels due to the

physical, chemical and mechanical conditions of hospitalization materials, causes erosion, flood and The phenomenon of Pichran Roody is in them. Many rivers in the dry areas of the past have been heavily influenced by human activities such as diversion, flow regulation, or mining, urban planning or agriculture, or are currently threatened with these causes. This operation often has detrimental effects on the morphology or ecological conditions of the rivers. Currently, most of the rivers in arid regions are subject to change due to climate change, and river engineering work is required to change sediment discharge, river course, depth of streams, flood plain and water quality (Boardman, 2006).

The economic development of a community is closely related to the ability to maximize the benefits and minimize damages caused by rivers. A river repeatedly changes its cross-section, longitudinal profile, flow rate and pattern through the processes of scouring and sediment transport. Understanding these processes is essential in order to stabilize the cultural and economic development of the river. In the present project, with the knowledge of the forms of the rivers and streets of the province of Tehran, it is hoped that an effective step will be taken to achieve the above issues (De Vente & Poesen, 2005). On the other hand, geological, tectonic and topographic factors influence the morphology of rivers and predict the trend of river changes. Changes and displacements occurring as a result of the natural process or human abnormal development in the direction along the geometric dimensions of the river are a logical consequence of the river system's response to the establishment of a new balance. Therefore, dealing with the river should be quite conscious and governed by special rules, because any change, although a position in the structure of the river, will cause a number of new developments in a wider range of which it is necessary before any action is taken, The river response will be predicted (Inman & Nordstrom, 1971).

The rivers and their fertile plains have long since been the focus of the formation and growth of human civilizations. Therefore, riverside margins are a suitable place for agricultural, industrial and commercial activities; therefore, studying these areas is necessary in order to obtain accurate knowledge and study of possible problems and risks in order to maintain optimum utilization of natural resources. However, the precise study of the meander pattern and morphology of the area as an effective parameter in all of the above activities seems to be essential in order to understand the risks and ways of preserving existing resources and capital (Hooke, 1979). Regardless of the great role that rivers play in the lives of human societies, unfortunately, the inaccurate use of river basins as well as the dismemberment of the rivers and rivers that have undergone rivers and rivers have changed their hydrological, hydraulic and ecological conditions, which led to the creation of Difficulties and problems have been abundant. The most important problems that are present in the rivers are the reduction of river discharge and increased pollution. With the increase of population and especially the increase of residential areas mainly on the margins of rivers, the amount of exploitation of rivers increases and the amount of sewage and waste products and residues entering the rivers is also increased (Merritt, Letcher, & Jakeman, 2003).

This causes a sharp increase in the pollution of the rivers. While much of the water used to drink the population of neighboring residential areas or areas away from the river is also provided by the rivers. Therefore, not only the cost of water treatment is increased, but some of the contaminations may not be treated and controlled, leading to the spread of diseases and the limitation of the health of people, especially the development of industries at the river boundary and the direct transfer of industrial waste into them into pollution Their chemical added (Miao, Yang, Chen, & Gao, 2012). Having proper river basin data and data is essential for proper planning and proper utilization of water resources in the country. In this regard, with the implementation of this national plan, various information about the characteristics of the rivers and rivers of the country will be collected and disposed of. This information is of a diverse range, including spatial and descriptive information of the rivers and includes the erosion bed of side and sensitive to erosion percent (Sharifi, 2016). Water is the source of the life and blessings of God, and it becomes a source of mourning if it is not used in a proper way. In the present world, water has become a political tool and has a special place in the economy. As such, for the purpose of development, rehabilitation, land rehabilitation, etc., the above measures will not be possible unless identifying water resources, in particular, identifying the rivers and rivers of the country, and presenting management and management plans and policies. The current action will not be possible without identifying and collecting accurate statistics and information from the country's water and soil resources. So that after identifying and collecting information, they can be categorized in different categories such as morphology, discharge, water quality, vegetation cover, etc., and prioritize research and implementation of research projects (Oldeman, Hakkeling, & Sombroek, 2017).

MATERIALS AND METHODS

As mentioned above, it has been used to standardize the units of work and also to facilitate access to statistics and information from the classification and codification of watershed basins and study areas conducted by the Iranian Water Resources Research Center (Tamab).According to the division of the Tamab, the whole country is divided into 6 main basins or the very large basins (Caspian Sea basins, Persian Gulf and Oman Sea, Lake Urmia, Central, Hamoon, Serakhs), 12 smaller basins (Caspian Basin, Gulf Fars and the Sea of Oman, Lake Urmia, Lake Qom, Isfahan and Sirjan, Neyriz or Bakhtegan, Jazmourian, Desert palin, Lut Desert, Ardestan, Yazd and Kerman, Qara-Qom Desert, East or Hamoun), 30 Sub-basins and 1121 Study Areas Division and coding, according to which the Caspian Sea basins, Persian Gulf and Oman Sea, Lake Urmia, Central, Hamoon Srkhrs respectively codes 1, 2, 3, 4, 5 and 6 that more than 90 percent of the study area code 4 and only one case has the code 1(Sharifi, 2016). The study region with area 1331431 hectare have latitude 50,22,47 to 53,08,39 and longitude 35,01,44 to 36,10,31 in up to more 70% from whole Tehran province and part of Alborz province(Fig.1). According to the division of the Tamab, the whole study region of Tehran province is divided to area 25 with numbers 1515, 41151, 41521, 41522, 41523, 41524, 41525, 41526, 41531, 415321, 415322, 415331, 415332, 415333, 415341, 415342, 415343, 415344, 415345, 47143, 47144, 47145, 47146, 471531, 471533 (Fig.2). The total number of runways in the studied areas is 415 stream and about 3088 thousand-meters part (Simon, 1995).

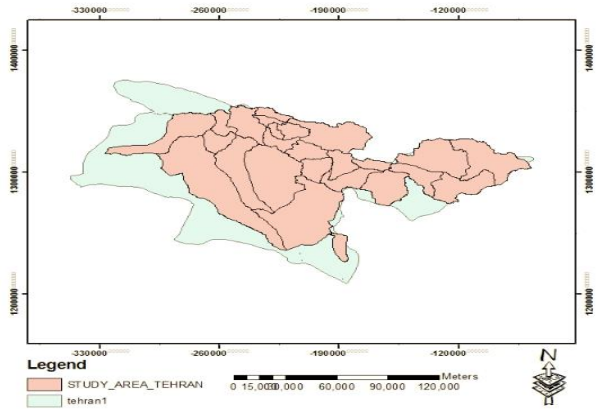

Fig.1. Study region and that's overlap with Tehran province

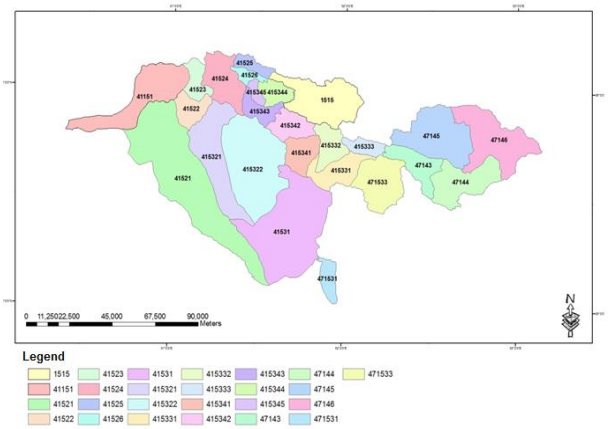

Fig.2. Location and region 25 distribution in whole Tehran province.

In order to carry out the present project and start practical work in the first step, the above mentioned steps are based on topographic maps of the scale of 1:250000 based on the hydrographic grid of Iran Water Resources Engineering Company (Tamab Iran), in the software environment of the GIS Hydrographic Network of Rivers The province was prepared (Fig.3).

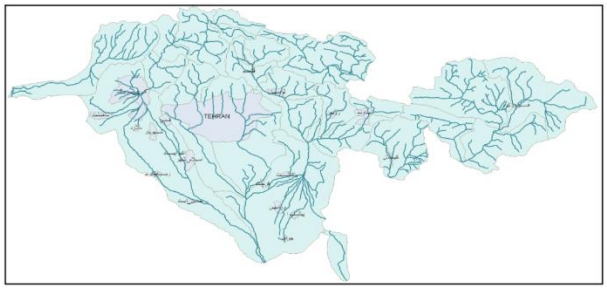

Fig.3. Hydrographic network and the position of the streams in them.

After the mentioned steps, on the geological map of Tehran province, lithological maps, erosion classification map or erosion map and erosion map of bed-side have been prepared, which summarizes the preparation of the above maps as follows:

A: The lithology map is based on the geological map of the region based on the prevailing lithology in the units and geological formations and is based on separate linguistic mapping units (Fig.4).

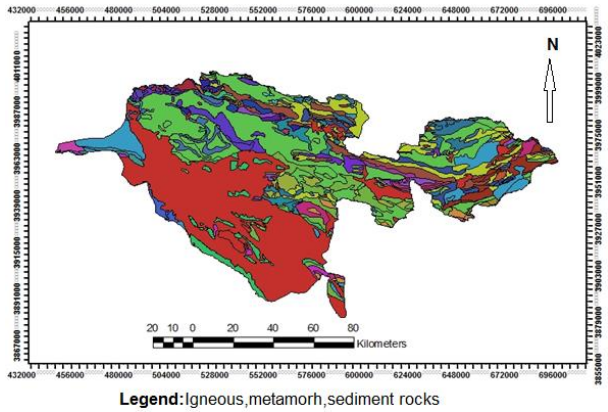

Fig.4. Study region of lithology map.

B:The erosion classification map was prepared based on the model provided by the national implementer of the project, in which most of the igneous units, thick units of the layer, mass units, unclassified units with low sensitivity classes and Chilean units, thin layer lime, mass conglomerate, dolomite Thin layer, clay limestone with moderate erosion and trusted units, alluvial deposits and most quaternary units are classified as high sensitive categories and based on the erosion map (Fig.5).

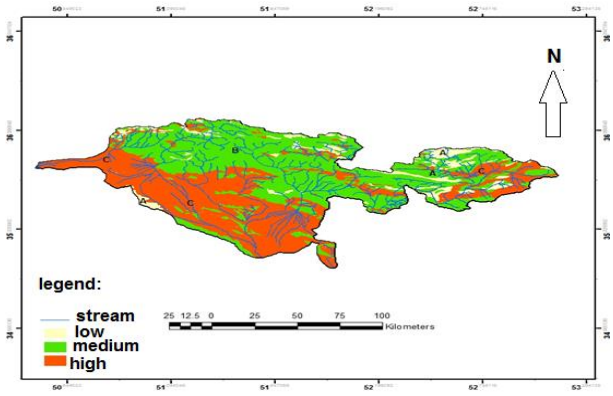

Fig.5. Study region of erosion category or erosion sensitivity ratio map.

C: Erosion map bed – side provided from erosion map layers. Erosion of low sensitivity classes and moderate erosion classes with a gradient of over 3%. erosion and bed classes and moderate erosion classes with a slope of less than 3% of side classes. Based on this map and lithology map was prepared with the specified conditions of rocky and alluvial paths too (Fig.6).

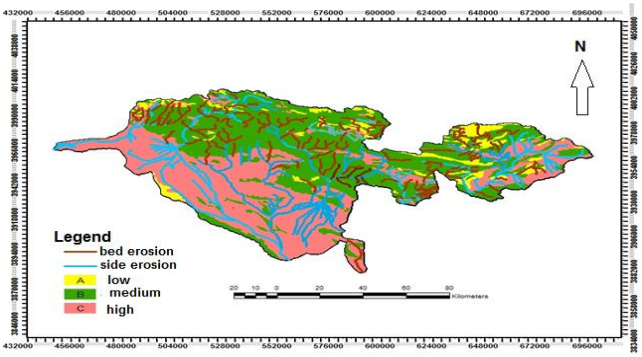

Fig.6. Study region of bed and side erosion map

Finally, for classification of rivers in terms of sediment density due to problems such as lack of hydrometric stations and sedimentation, accuracy of hydrometric stations and sedimentation, lack of data, lack of centralized statistics, problems with the accuracy of statistics in quantitative and qualitative terms, Rivers are classified in regions with high, medium, low sediment density, in which the average percentage is attributed to areas with low erosion, rocky regions, erosion-bed areas in the form of rivers with low sediment density, and the remainder of the rivers with a density Low and high sediment of the entire length of the river course as rivers with mean sediment density and averages One hundred high-erosion areas, alluvial regions, areas with erosion in the form of high-sedimentary rivers, and a comparison with the hydrometric station and sedimentation basin have been compared. The results show an acceptable relation with the division . Finally, according to the mentioned explanations, the rivers of the studied areas have been evaluated from the point of view of geology, lithology, erosion and sediment density (Sharifi, 2016).

DISCUSSION

According to the division of the Tamab, the whole country is divided into 6 main basins or the very large basins (Caspian Sea basins, Persian Gulf and Oman Sea, Lake Urmia, Central, Hamoon, Serakhs), 12 smaller basins (Caspian Basin, Gulf Fars and the Sea of Oman, Lake Urmia, Lake Qom, Isfahan and Sirjan, Neyriz or Bakhtegan, Jazmourian, Desert palin, Lut Desert, Ardestan, Yazd and Kerman, Qara-Qom Desert, East or Hamoun), 30 Sub-basins and 1121 Study Areas Division and coding, according to which the Caspian Sea basins, Persian Gulf and Oman Sea, Lake Urmia, Central, Hamoon Srkhrs respectively codes 1, 2, 3, 4, 5 and 6 that more than 90 percent of the study area code 4 and only one case has the code 1 (Sharifi, 2016).

Finally, the entire area of Tehran province has 25 basins that have been studied and evaluated as a condition of sensitivity to erosion, geology, sediment density and side-bed erosion-admission in each area:

A: Status of the rivers of the region in terms of sensitivity to erosion:

To assess the erosion sensitivity as mentioned above, using geological maps, lithography maps and also based on the model presented by the national implementer of the design, in which most igneous units, thick layer units, mass units, unidentified units of classes With a low sensitivity, Shall units, thin-layer limestone, mass conglomerate, thin-layer dolomite, layered limestone with moderate erosion and trusted units, ALLUVIAL, and most quaternary units are classified as high-grade classes, the erosion classification map as the basis for the assessment and sensory analysis The erosion of the area was evaluated and evaluated. According to the study, the watershed basin with 29 streams has the maximum length of the streams and watersheds with the number of one streams. The minimum length of the stream, as well as the basin, is the highest and the lowest water level of the region. However, the low erosion share in the region is about 168.60 km, in which the water catchment area of Firoozkooh with a magnitude of 1.31 km, and the watershed basin with a value of 49.04 km, has an average moderate corrosively of 1513.58 km, in which the Evanakei catchment with an impact value of 3.11km and the basin The water catchment area is 136.79 km / km, with a high erosion share of 1356.08 km, in which the catchment area of Jaegerud Ahar is 1.20 km / h and the water catchment area of Bilqan is 343.04 km / h.

B: Status of the rivers of the region in terms of geology(rock-ALLUVIAL bed):

First, the geological map of the region was prepared from existing geological maps and field activities, after which a lithological map was drawn from the geological map of the region based on the prevailing lithology in units and geological formations and was prepared on the basis of separate units. Finally, based on the erosion and lithology classes of the area, low sensitivity classes and moderate erosion classes with a slope of more than 3% were found in rocky substrates and erosional classes and moderate erosion classes with a slope of less than 3% of the alluvial substrate. Based on the table, the contribution of the alluvial bed in the region is about 1966.38 km, in which the watershed Varangerood and Garmabdar have no alluvial beds and the lowest impact and Bileghan basin are with 356.10 km. The share of the bedding in the region is 1071.88 km, in which the basin and the reservoir of Payabe Evanakei and Bileghan have no basement bed and water catchment area with the value of 137.86 km.

C: Status of the rivers of the region in terms sediment density:

As mentioned above, for assessing rivers for sediment density due to problems such as lack of hydrometric and sedimentation stations, accuracy of hydrometric and sedimentation stations, lack of statistics, lack of centralized statistics, problems with accuracy of statistics from the point of view Quantitatively and qualitatively, the rivers are classified as high, medium and low sediment densities in which the average percentage is related to areas with low erosion, rocky regions, erosion-free areas as rivers with low sediment density and average percentages To areas with high erosion, Alluvial regions, Areas with erosion in the form of rivers The high sediment yield and the remainder of the rivers with low and high sediment density of the total length of the river route are classified as rivers with medium sediment density and compared with the hydrometric station and sedimentation station statistics. The results show an acceptable relation with the division The clause has been mentioned. According to the explanation, the basis of assessment and analysis of sediment density was studied and evaluated. The amount of low sediment density in the region was about 778.08 km, in which the Evanakei watershed basin was almost ineffective in sediment production and the basin of Bileghan with a value of 3 The 32-kilometer maximum impact of the catchment area is 109.51 km, and the contribution of sediment production is average to 517.98 km, in which the Evanakei catchment area is 1.04 km and the catchment area is 45.55 km, and the share of sediment production B The high level is 1742.20 km, where the Garmabdar basin is almost ineffective, and the Shemshak basin has a 2.80-km-long impact, and the water catchment area of Bilghan is 350.19 km.

D: Status of the rivers of the region in terms sid-bed erosion:

As indicated above, the first sensitive erosion map was originally prepared using geological maps, lithology maps, and also based on the model provided by the national implementer of the plan, and as a basis for evaluating and analysing and differentiating the erosion of bed-sid and in Ultimately, provided erosion map of bed-side. On the map

erosion of classes with low sensitivity and moderate erosion classes with slope over 3% of erosion and erosion classes and moderate erosion classes with slope less than 3% of erosion bed-side are categorized and evaluated and analysed. Based on this study, the erosion rate of bed type was 1096.76 km, in which the water catchment area of Evanakei with a non-eroded stream and the Velayat Rood watershed river with three stream with a length of 5.37 km, had the lowest contribution to erosion and the Namrood watershed with 66 stream and with length 141.37 has the largest share in bed erosion. The side erosion share was 1941.50 km, in which the water catchment area of the Varangerood and the Garmabdar any erosion, and the watershed Shahshak with a 4.20-kilometer-longest share in erosion and the watershed of Bileghsn with a value of 348.54, has the largest share in the floodplain.

CONCLUSION

As noted above, in different parts of the river of the region, different levels of erosion, geology, river sediment density and ultimately erosion of the bed-side were studied in different classes, and the following results were obtained in four sections:

A: Results of status of rivers of the region in terms of the sensitivity to erosion:

In the region, the sensitivity to erosion is about 5.55%, or 168.60 km, in the category of low erosion and about 49.82%, 1513.58 km, in the category of medium erosion, and at the end about 44.63%, equivalent to 1356.08 km in the category of high erosion, which is summarized. The results and names of the basins are presented in Table.1.

Table.1. Status of rivers of the region in terms of the sensitivity to erosion

Title	Category	Basin of streams length sum based on		Minimum basin three difficulty based on	
		Km	Percent	Most Difficult	Least Difficult
Sensitivity to erosion	Low	168.60	5.55	Namrood-Lar-Hablerood2	Firoozkooh-Bileghan-Kilan
	Medium	1513.58	49.82	Namrood-Kilan-Kordan	Payabeevanakei-Bileghan-Varangerood
	High	1356.08	44.63	Bileghan-ayabe Jajrood-Masie Tehran	Lavasanat-Jajrood Ahar-Delichai
Sum	----	3038.26	100	----	----

B: Results of status of rivers of the region in terms of the geology(alluvial-rock): Based on geologically (alluvial-rocky), about 64.72% is equivalent to 1966.38 km in the alluvial class and about 35.28% is 1071.88 km in the rock category, where the summary of the results and names of the basins are given in Table.2.

Table.2. Status of rivers of the region in terms of the geology(alluvial-rock)

Title	Category	Basin of streams length sum based on		Minimum basin three difficulty based on	
		Km	Percent	Most Difficult	Least Difficult
Geology	Alluvial	1966.38	64.72	Bileghan- Payabe Jajrood-Firoozkooh	Shemshak-Sarabe Damavand-Lavasanat
	Rock	1071.88	35.28	Namrood-Kilan-Kordan	Velayatrood- Payabe Jajrood-Shemshak
Sum	----	3038.26	100	----	----

C: Results of status of rivers of the region in terms of the sediment density: In the region, the sediment density was about 26.61% equivalent to 778.080 km in the low sediment density and about 17.05%, 517.98 km in the medium sediment density class, and at the end about 57.34%, respectively, 1742.20 km in the high sediment density group, which summarizes the results and names The basins are listed in Table.3.

Table.3. Status of rivers of the region in terms of the sediment density

Title	Category	Basin of streams length sum based on		Minimum basin three difficulty based on	
		Km	Percent	Most Difficult	Least Difficult
Sediment Density	Low	778.08	25.61	Namrood-Lar-Kilan	Bileghan-Velayatrood-PayabeJajrood
	Medium	517.98	17.05	Namrood-Kilan-Kordan	Payabeevanakei-Bileghan-Varangerood
	High	1742.20	57.34	Bileghan-PayabeJajrood-MasieTehran	Shemshak-Karajmiani2-SarabeDamavand
Sum	----	3038.26	100	----	----

D: Results of status of rivers of the region in terms of bed-side erosion : In terms of side-bed erosion - about 63.90%, 1941.50 km, in side erosion category and about 36.10%, respectively, 1096.76 km, were classified as bed erosion, where the summary of the results and basin names are given in Table.4.

Table.4. Status of rivers of the region in terms of bed-side erosion

Title	Category	Basin of streams length sum based on		Minimum basin three difficulty based on	
		Km	Percent	Most Difficult	Least Difficult
Erosion	Side	1941.50	63.90	Bileghan- PayabeJajrood- Firoozkooh	Shemshak-Sarabe Damavand-Lavasanat
	Bed	1096.76	36.10	Namrood-Kilan-Kordan	Velayatrood-Bileghan-Shemshak
Sum	----	3038.26	100	----	----

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