

Mini Review

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The Contribution of Sedimentological Studies to River Engineering Projects in Khuzestan Province, Iran

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Introduction

Khuzestan Province in the southwest of Iran has the longest and largest rivers of the country (Figure 1). Accordingly, river engineering studies including sedimentological and geomorphological investigations are of especial concern in the province. Erosion and weathering of easily erodible geological formations particularly evaporitic ones in the region is a significant

problem that could affect the projects. This is due to the impact of erosion on river morphology. However, most of these studies are concentrated on hydraulic aspects of sedimentation and little has been devoted to sedimentary geology of river sediments. In this regard some of the related projects related could not attain their forecasted aims.



Figure 1: Approximate limits of the study area in Khuzestan Province.

Geological Setting

The Zagros Fold Belt in the northeast of the Persian Gulf is a branch of the Alpine-Himalayan Orogenic belt divided into different structural or morphotectonic zones [1-3]. The study area is located in the middle of the Simply Folded Belt [4], being comprised of parallel, long anticlines and synclines; the former shows topographic crest lines, while the latter coincides with the trough lines. The most outcropped lithologies in the area as part of the Simply Folded Belt are of Post-Miocene age including, from older to younger, Asmari Limestones, Gachsaran Evaporites, Mishan Marlstones, Agha Jari Sandstones, Bakhtiari Conglomerates and Quaternary deposits. The folding trend is northwest-southeast and the system is composed of elongated whaleback or box-shaped anticlinal mountains. In addition to gently dipping over-thrusts, folds are dissected also by sub-vertical normal and strike-slip faults. From a geomorphological viewpoint, the anticlines can be divided into two sets: plain anticlines and mountain anticlines. The lithological exposure in the former is mostly limited to Post-Miocene formations while in the latter the outcrops are mainly of Pre-Miocene formations. Morphotectonic studies indicate a fairly relationship between the geologic structure and morphology of the region [5-8].

River Engineering Studies

River engineering projects in Khuzestan Province are mainly aimed at the following subjects: dam sedimentation, flood control, sand mining, protection and maintenance of river training structures and partly navigation purpose. Existence of five largest and longest rivers of country in the province namely, Karun, Dez, Marun, Karkheh and Zohreh rivers necessitated comprehensive sedimentological and geomorphological investigations in the region. Regarding to this fact, a good knowledge of erosion and weathering aspects of the outcropped formations is vital. As noted previously, some of the formations have very weak and easily erodible lithology and produce a large amount of sediments annually. Among them, Gachsaran Formation is almost of most importance due to its evaporitic layers consisting of salt, gypsum, anhydrite and marl. It has been shown that river morphology and geometry of river course affect sedimentation process. The morphology of the streams in the Zagros Fold-Thrust Belt has been previously studied and its relation to the regional tectonics has been proved [3,6,8,10-12]. Observation of satellite image, measurement of morphological parameters and field surveys show such a relationship. In the studied region, at least two main geomorphic features regarding to the channel course of the rivers can be seen [9]. The river trunks are mainly aligned with the Zagros trends (saying northwest-southeast trend) whereas the small and much local parts mostly coincide with an east-west and partly the Arabian trends (that is predominantly north-south trending). Riverbank erosion is closely related to the velocity of flow in the river channel [13-15]. The alignment of the rivers with structural trends influences type of sediments as these river courses are mostly identified as straight

channels and are deeper and narrower than others so their flow velocity is usually higher and less sediments can be deposited on the riverbed. On the other hand, these straight channels commonly have steeper walls and more potential to erosion and weathering. The amount of sediment load carried by the river is important as it affects riverbank erosion. If sediment load of river decreases below its transport capacity, the river tends to erode its banks and bed to keep its balanced regime. This is mostly seen in straight streams which run through structurally controlled courses.

Conclusion

Due to obvious role of formation lithology and river morphology on sediment type, petrographic and sedimentological investigations should be more considered in investigations related to river engineering projects. Erosion and weathering of easily erodible geological formations in the studied region is a significant problem that could affect the projects. Besides, riverbanks erosion is dependant on the velocity of flow in the river channel that is in turn influenced by geological structural trends. River engineering studies in Khuzestan Province of southwest Iran are more concentrated on sediment hydraulics and less attention has been paid to sedimentary petrology of river deposits. Thus, more studies should be conducted to complement other relevant investigations.

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Conflict of Interest

The authors declared no conflict of interest.

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