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Effect of External Dynamic Processes on the Quality of Aggregate resources in the Kermanshah Region

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Summary

Aggregates are inert granular materials such as sand, gravel, or crushed stone that, along with water and cement, are an essential ingredient in concrete. For a good concrete mix, aggregates need to be clean, hard, strong particles free of absorbed chemicals or coatings of clay and other fine materials that could cause the deterioration of concrete. Assessing of landform potentials for aggregate resources originally has been studied in engineering geomorphology. Alluvial fans, river terraces, river channels, cones, and taluses are mostly landforms which support the aggregate resources. The main objective of this study is the identification of quality and resistance of aggregates in Kermanshah plain where Kermanshah city needs large amounts of aggregates for urban development. In the first step we have selected 3 alluvial fans, 2 river terraces and 3 colluviums debris by satellite image processing to organize a field sampling. Quality and resistant analyses of the aggregates were carried out both in the field and the laboratory, with 240 coarse sediment particles collected from 16 pits, measuring approximately 80-90 cm in depth, made in the field. Sediment particle samples had been broken by a point load instrument in the laboratory and point load indicators were calculated based on point load index. We found out the alluvial fans which are located in the northeastern parts of the area contain high quality of aggregates, and then river terraces and colluvial debris formed the next groups respectively. Decreasing of quality in colluviums debris had occurred by weathering processes particularly frost action and limestone solution

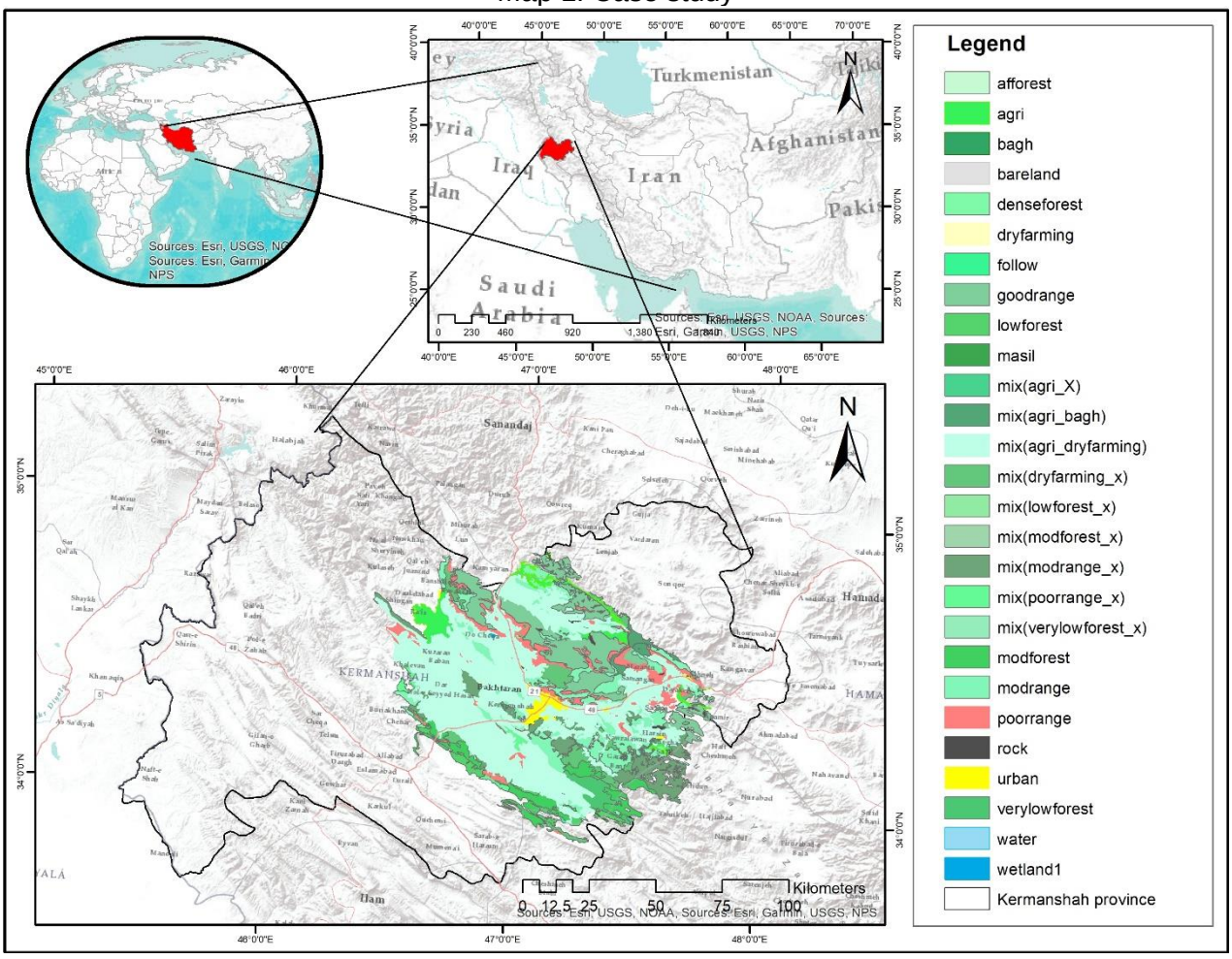
Theory / Method / Workflow

The studied area is located in the west of Iran. From a stratigraphic and geological perspective, this area is mainly covered with quaternary alluvial sediments. In terms of structural geology, the study area belongs to simply Folded Zagros. Point load test is one of the most important parameters for determining external dynamic processes on the quality of aggregate resources. The International Society of Rock Mechanics (ISRM,1985) has introduced the method for testing and analyzing the point load test. This method has three types: axial, diametral and lump. The point load test allows the determination of the uncorrected point load strength index (Is). It must be corrected to the standard equivalent diameter (De) of 50 mm.

$$Is_{50} = \frac{P}{De^2}$$

P = Failure Load in 1bf (pressure x piston area)
De = Equivalent core diameter

Map 1. Case study



Results, Observations, Conclusions

According to results from table one fluvial terrace in the study area has the best aggregate quality among other landforms. Therefore, alluvial fans and colluviums debris can be used respectively as appropriate alternatives for river sources. In addition, they are of high quality for road construction.

Table 1. Load point test

Load point test- fluvial terrace (first hypothesis)	Load point test- fluvial terrace (second hypothesis)
Geographical coordinate: N: 34° 39 ° 45.3 E: 46° 53 ° 04.3	Geographical coordinate: N: 34° 39 ° 45.3 E: 46° 53 ° 04.3
The height of the study point: 1347 Cm	The height of the study point: 1347 Cm

Sample rupture load (N)	Sample diameter (Cm)	Sample rupture load (N)	Sample diameter (Cm)
The mean of load: 447.69	The mean of diameter: 4.06	The mean of load: 513.84	The mean of diameter: 4.6
Min 200	3.1	1040	4.8
360	3.6	Max 1180	5.1
320	4.1	500	4.2
580	3.9	400	4.3
380	4.2	560	4.5
280	3.5	260	4.1
500	4.6	400	4.4
1060	5.6	640	4.5
280	3.2	800	4.7
340	4.3	Min 160	3.8
220	3.5	360	4.6
Max 1660	5.8	840	4.7
620	4.5	360	4.4
280	3.6	340	4.2
600	4.2	180	3.8
$I_s = \frac{P}{De^2} \rightarrow I_s = \frac{447.69}{4.06^2} = 27.15$ F = $\left(\frac{DE}{50}\right)^{0.45} \rightarrow F = \left(\frac{4.06}{50}\right)^{0.45} = 0.323$ $IS_{50} = F.I_s = 0.323 \,.28.08 = 8.77$		$I_s = \frac{P}{De^2} \rightarrow I_s = \frac{513.84}{4.6^2} = 24.28$ F = $\left(\frac{DE}{50}\right)^{0.45} \rightarrow F = \left(\frac{4.6}{50}\right)^{0.45} = 0.323$ $IS_{50} = F.I_s = 0.323 \,.24.28 = 7.84$	

Novel/Additive Information

Study of geomorphic shapes is critical, because it has the most important role in discovery and dispersion of building materials. This research suggests the best location for exploitation of resources as well as attention to economic and environmental criteria. So, the results of this research are of great help to industrial sectors such as road and dam construction, building, and development of airports.

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