Analysis of the intensity of Alluvial Fans Hazards in South Binalud Based on Acceptability of Morphotectonic Indices

Adel Sepehr *
Assistant Professor of Geomorphology, Faculty of Natural Resources and Environment, Ferdowsi University, Mashhad, Iran
Zahra Abdollahzadeh
MA Student of Desert Management, Ferdowsi University, Mashhad, Iran

Received: 01/07/2014   Accepted: 22/10/2014

Introduction
Alluvial fans are depositional landforms developed on a confined channel emerged from a drainage basin, i.e. between a mountain range and a plain. An alluvial fan is a fan- or cone-shaped deposit of sediments crossed and built up by streams. If a fan is built up by debris flows, it is properly called a debris cone or colluvial fan. These flows come from a single point source at the apex of the fan. They move to occupy the positions on the fan surface over time. The fans are typically found where a canyon draining mountainous terrain enter out onto a flatter plain, and especially along fault-bounded mountain fronts.

Alluvial fans have gentle slope, cone-to fan-shaped landforms created over thousands to millions of years by deposition of eroded sediments at the base of mountain ranges. They are easily recognized in arid, to semi-arid environments such as that of the bajada of southern Binalud. A convergence of neighboring alluvial fans into a single apron of deposits against a slope is called a bajada, or compound alluvial fan. The term active refers to that portion of an alluvial fan where deposition, erosion, and unstable flow paths are possible. If flooding and deposition have occurred on a part of an alluvial fan in the past 100 years, that part of the fan can be considered active. This conclusion can be supported by historic records, photographs, aerial photography, and engineering and geomorphic information. The main objective of this paper is to study the relationship between morphotectonic properties and alluvial fans hazard intensity in the alluvial fans located in the areas of southern Binalud. This is to understand vulnerability of settlements established in these fans. Alluvial fans can be a source of major hazards. Recognizing the type of depositional process (e.g. debris flows, rock avalanches, and sheet floods) in the early stage of urban planning and land development will prevent loss of lives and damages to infrastructure. According to the correlation between active tectonic and hazard intensity, the study has analyzed urban vulnerability of alluvial fans.
Materials and Methods
To analyze urban vulnerability and hazard intensity of the alluvial fans, the research employed four morphotectonic indices including Vf, AF, Smf and fan conically index, and tectonic degree of each alluvial fan. Then, using acceptability index and central weight vector was measured for utility of each morphotectonic index by weight vector and effectiveness on urban vulnerability. The rank acceptability index describes the share of parameter values granting alternative xi rank r. The most acceptable (best) alternatives are those with high acceptability for the best (smallest) ranks.

The central weight vector is defined as the expected center of gravity of the favorable weight space. The confidence factor is defined as the probability for an alternative to be the preferred one with the preferences expressed by its central weight vector. Ultimately three hazard classes were identified for risks of alluvial fans.

Results and Discussion
The results of the study indicated that three alluvial fans involving Bozmehran 1, Kharv and Darroud have been gained most acceptability for the first rank. The results showed that Vf and Smf are main morphotectonic indices to high acceptability for Kharv and Darroud. This status in the Bozmehran 1 was approximately equal for all. The vulnerability classification showed that alluvial fan of Bozmehran 1 has high intensity and then population of this region is in face of geomorphological hazards. This condition is also true for Bozmehran 2.

The acceptability analysis for Nishabur city as the main settlement established in the alluvial fan is different. The result showed that Nishabur obtained moderate vulnerability class which refers to ratio of alluvial fan shape in this area. In spite of active tectonic for AF and Vf, shape ratio 1 for this alluvial fan decline the effects of other tectonic indices. In general, landslide and flooding hazards are probable and possible according to the faults and climate conditions in Binalud. Therefore, a risk management is needed to manage the urban areas developed on the alluvial fan located on Binalud.

Conclusion
Alluvial fans are flat to gently-sloping masses of loose rock material (largely sand and gravel) that are shaped like an open fan. They are formed at the base of mountains where fast-flowing streams meet relatively-flat surfaces of basin floors or broad valleys. In this research, correlation between tectonic condition and hazard potential has been analyzed on the alluvial fans located in south Binalud using acceptability index. It can also be concluded that the cities of Bozmehran, Kharv and Darroud are highly vulnerable to the hazards.

Keywords: acceptability index, central weight vector, morphotectonic, vulnerability.