GIS-DERIVED RESOURCE QUALITY OF ALLUVIAL FANS, VALLEY FILLS AND DEBRIS CONES IN AUSTRIA

PFLEIDERER, Sebastian*; HEINRICH, Maria; LIPIARSKA, Irena; RABEDER, Julia; REITNER, Heinz; TRÄXLER, Barbara; UNTERSWEG, Thomas; WIMMER-FREY, Ingeborg

Geological Survey of Austria, Austria

pflseb@geologie.ac.at

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In alpine regions, alluvial fans, valley fills and debris cones represent natural aggregate resources of economic importance. Due to continual erosion, they constitute renewable sources of sand and gravel. However, not all material is equally suitable for the construction of roads or buildings. Usability depends on grain size distribution, sorting, roundness and mineral composition. These parameters in turn depend on the rock types in the provenance area, on the mode and distance of transport and on the depositional environment.

A previous study developed GIS routines to derive the morphology and geology of the provenance area of a given deposit, and explored how far results can serve as an indicator for aggregate quality. Now, these routines are applied systematically within the Austrian Alps, and deposits are described with the derived information. Altogether, over 17,600 deposits were processed and morphological parameters (surface area, altitude range, slope angle and transport distance) as well as geological information (rock types and their respective area percentages) were calculated for each provenance area. Results were then translated into aggregate quality forecasts.

To verify the forecasts, GIS results were compared to data at 215 debris dams where the composition of accumulated material is known. In addition, 59 deposits were sampled and petrographically analysed through visual determination of rock types and automatic measurements of grain geometry using a PetroScope. This instrument derives grain size, shape, angularity and sorting with the aid of optical cameras. Together, the data allow the analysis of grain geometry as function of rock type and grain size.

Results show that the litho-spectrum of gravel deposits can be predicted from provenance area geology with 80–95% accuracy on average. In addition, median grain size, sorting and shape can be reliably estimated from depositional environment, travel distance and lithological composition. Although these estimates cannot replace tests for mechanical quality, they can serve as a first selection criterion to assess the suitability of gravel resources.