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Road embankments versus badlands. Are they the same from an erosional point of view?

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On Mediterranean Type-Ecosystems most of the Badland landscapes develops as a consequence of environmental changes. Badlands are developed also due to local uplift and changes in climate. In Eastern Spain, the combination of local uplift, and the land abandonment during the 50s in regions with a semiarid climate (300-500 mm y-1 rainfall and average temperatures of 25 ºC in summer), with recurrent drought (1 each 7-10 years) and intense thunderstorms (> 100 mm day-1 each 5 years) contribute to local development of badlands. The Badlands of Valencia and Alicante Province are found locally and mainly developed on Marls and Keuper Clays. In this regions, Badlands are local features (1 % of the land) but they are being studied as a laboratory for erosion and hydrology, and also because the give us information of the environmental change in the region.

Spain is leading the increase in roads, railways and other infrastructure construction in Europe. Those new constructions trigger the formation of bare surfaces as road embankments during and after the infrastructure development. Those new surfaces are bare, crusted, with few cm or mm of regolith. The vegetation is absent or negligible, and the morphological surface after some years show a deeper (4-5 cm) regolith formation, cracks, rills and sometimes gullies. Although road embankments are short (3 to 30 m) and then the surface wash dominated by the raindrop impact and sheet flow, rills are developed. Then, the features are similar to the badlands developed on natural slopes.

This paper research on the comparison between road embankments and badlands surfaces from an erosional point of view. Rainfall simulation experiments were carried out at 1 m2 plots and under 55 mm h-1 rainfall intensity events with three runs of 5, 10 and 30 minutes (1, 2 and 5 years return period respectively). The studied areas were Monnegre (marls) and Anna (clays) for the badlands surfaces and L'Olleria (marls) and Quesa (clays) for the 2 years old road embankments. Ten rainfall simulation experiments at each of the study areas (40 experiments) demonstrate that the parent material is the key factor, and there are not differences between "natural" badlands and road embankments. Both contributed with high runoff sediment concentration (< 10 g l-1), high runoff rates (> 25 %) and quick ponding (< 3 minutes in marl regolith and < 12 minutes in clay regolith). The, the erosion rates were the highest in comparison to other land uses and land covers.

The results of this research show that the large experience of scientific research on badlands slopes can be transferred to the study of the road embankments. This can also contribute to reduce the degraded embankments on roads and railways of Spain.