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Gully erosion susceptibility modelling for avoided degradation planning

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Gully erosion can reach alarming dimensions and contribute significantly to soil loss and sediment yield in a catchment. Since restoration resources are usually limited, strategic information on sensitive and erosion susceptible areas are needed to avoid future degradation. Although the mapping of areas susceptible to gully formation is not a new concept, this study has potential in the Mzimvubu River Catchment, the only large river network in South Africa without a large reservoir. The Tsitsa tributary's catchment, where two large reservoirs are planned, consists of large areas of highly erodible soils with widespread gully erosion evident. It is important to prevent further gully erosion in the catchment due to the presence of duplex and dispersive soils. Therefore, this study modelled areas that are susceptible to gully development in the Tsitsa River Catchment, as well as estimated the sediment yield potential from the susceptible areas if gully development occurs. This was achieved by mapping gully-free areas in a GIS that have the same DEM-derived topographical variables, soil associations and land cover than gullied areas, followed by scenario analysis of the potential sediment yield. More than 30 000 ha (7%) of the catchment is intrinsically susceptible to further gully development, consisting of drainage paths with a large contributing area and erodible duplex soils. If not protected, these susceptible areas could contribute an additional 300 million m³ of sediment to the river network, reducing the volumes of both reservoirs by more than 50%.