



## **Sustainability of land reclamation measures in erosional badlands: A comparative perspective on semi-arid landscapes of South Morocco and Central India**

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Semi-arid regions around the world, where gully erosion is a major land-degradation process, are particularly vulnerable to the effects of population growth and land-use change. In regions with high pressure on land as a resource – either due to population pressure or to agricultural intensification or both – erosion-affected areas are increasingly being reclaimed as agricultural land in an endeavour to turn marginal or unused land into fields, plantations, greenhouses or even building ground. Depending on the severity and depth of the erosion processes, this may be done by ploughing (for ephemeral gullying), land-levelling with bulldozers (for permanent gullies and badlands) or infilling with ex situ material (for large and deep gullies and badlands). The success of such measures, which also depends on subsequent soil-erosion protection, varies strongly and is not yet well researched.

The little developed part of Lower Chambal Valley (Madhya Pradesh) is one of the four regions most badly affected by gully and badland erosion in India. Around 80% of the rural population are dependent on agriculture, an estimated 5000 km<sup>2</sup> are affected by gullies and badlands as deep as 80 m. Various land reclamation measures have been conducted on widely different spatial scales both by governmental and non-governmental agencies and individual farmers. However, the reclamation strategies of rich and poor farmers also exhibit significant differences, and agricultural use that often is based on short-term economic needs of households leads to inefficient land-use practices particularly in land-levelled and reclaimed areas.

Although set in rural surroundings as well, the Souss Valley (South Morocco) is characterized by highly dynamic land-use changes with transformations from traditional agriculture to vast agro-industrial plantations of citrus fruits, bananas and vegetables. These plantations, as well as other arable land, are threatened by gullies and other forms of soil erosion. The ubiquitous transformation of land into the high-intensity agro-industrial production system has now reached marginal land formerly unsuitable for agriculture: Badland areas and wasteland dissected by gully erosion are being levelled with heavy machinery. However, these measures are often contra-productive. Levelled sites show a clear amplification of soil erosion processes, and temporarily infilled gullies tend to be re-activated very fast, eroding this freshly provided soil material.

As a first step in a comparative investigation of the sustainability of land reclamation measures in erosive landscapes with contrasting situations, data derived from remote sensing (satellite and unmanned aerial vehicle images) as well as socio-economic surveys were used for establishing an inventory on the two regions in South Morocco and Central India. The long-term aim is the development of a framework for further research into the positive and negative influences of land-levelling as a gully-erosion control measure.