

# The impact of climate change on soil hydrology and degradation: an assessment of vulnerabilities in Ireland

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Soil formation and soil erosion are natural processes, occurring over geological time. Given the slow rate of soil formation, soil erosion of more than 1 t/ha/yr represents an irreversible process on a time scale of several decades. There is widespread evidence however that accelerated erosion, especially by water, is presently occurring in vulnerable areas of Europe due mainly to inappropriate agricultural practices. Losses of topsoil of 20-40 t/ha occur in southern Europe in association with individual storms every two or three years and extreme events can result in the removal of more than 100 t/ha. Presently, soil erosion problems in northern Europe are less serious due to less intensive rainfall and gentler topographical gradients on average. Global climate change however is likely to change this. Downscaling from most global climate models project that increased annual rainfall amounts will occur in future years in areas of northern Europe, including Ireland. Furthermore, increased intensity is likely to be a feature of these changed rainfall regimes, both in winter and summer. Such scenarios suggest that the identification of areas that are vulnerable to soil erosion should be undertaken with a view to ultimately developing measures to control any emerging problem

As Irish population increases and settlement expansion sterilizes large tracts of highly productive agricultural land, and as new transport arteries reach inexorably into the rural hinterlands, soil resources more than ever before face new threats. Existing research on soils in Ireland has thus far not encompassed considerations of climate change as the required climatic scenarios have not been developed at a sufficiently high resolution. Recent advances in downscaling of global climate models mean that increasingly confident future climate scenarios can be provided for Ireland. It is now clear from these that substantial changes in soil moisture and temperature are commencing which will have implications for many aspects of Irish soils. Consequently, by researching the likely impact of climate change on Irish soils, national agencies can be provided with the high resolution spatial information they require to enable them to focus policies on vulnerable areas. Therefore the central question this research addresses is to assess likely changes in soil characteristics, hydrology and functioning in Ireland as a result of projected climate change.

The main objectives in which the work is *under progress* are

- To develop an understanding and quantification of the resistance and resilience of Irish soils to changes in climate as projected from ensemble combinations of the best currently available downscaled global climate models.
- To assess the likely impact of climate change on soil functional parameters over a range of spatial and temporal scales.
- To assess erosion risks in response to changing precipitation regimes.
- To assess the impact of climate change on the organic and nutrient content of all major Irish soil types