Geophysical Research Abstracts
Vol. 16, EGU2014-11310, 2014
EGU General Assembly 2014

Modelling the impacts of climate change on muddy flooding and the effectiveness of mitigation measures in Flanders, Belgium

Donal Mullan (1), Karel Vandaele (2), John Boardman (3,4), and Dave Favis-Mortlock (3)

(1) School of Natural Sciences & Psychology, Liverpool John Moores University, Liverpool, England, UK (D.J.Mullan@ljmu.ac.uk), (2) Soil & Water Conservation Unit, Melsterbeek Catchment, B-3800, St-Truiden, Belgium (Karel@land-en-water.be), (3) Environmental Change Institute, Oxford University Centre for the Environment, University of Oxford, England, UK (John.Boardman@eci.ox.ac.uk) (david.favis-mortlock@ouce.ox.ac.uk), (4) Department of Environmental & Geographical Science, University of Cape Town, South Africa (John.Boardman@eci.ox.ac.uk)

The 'off-site' impacts of soil erosion have become a major source of concern in Europe and elsewhere during recent decades. This is due, in part, to the environmental damage and economic costs associated with 'muddy flooding.' Muddy floods occur when large volumes of runoff are generated on agricultural land, triggering the detachment and transport of sediment. This may then be deposited in neighbouring settlements. The Belgian loess belt is particularly vulnerable to muddy floods since loess-derived soils are susceptible to crusting, which decreases their infiltration rates and promotes high levels of runoff and erosion. Severe economic damages in many Flemish municipalities led to government provision of funding for voluntary mitigation measures from 2001. In the Melsterbeek catchment, where several villages have been particularly affected by severe muddy floods, mitigation measures have been implemented and their effectiveness subsequently monitored. Runoff, erosion and the occurrence of muddy floods have all considerably decreased. The scheme was cost-effective within three years.

The success of these mitigation measures may diminish over the coming decades, however, as climate change poses new threats ranging from direct changes in rainfall intensity to the indirect effects of climate-driven shifts in land use. Such changes could potentially generate increased runoff over agricultural land and lead to a resurgence of muddy flooding in vulnerable areas, with severe repercussions for the effectiveness of mitigation measures. In this study, we model the impacts of climate change on muddy flooding for a hillslope in the Melsterbeek catchment where mitigation measures have been implemented, enabling us to quantify the threat which climate change poses to their effectiveness. The Water Erosion Prediction Project (WEPP) was employed. Model data for present-day conditions were perturbed with future climate change parameters derived from statistical downscaling methods, and for land use change projections developed using a scenarios-based framework. Results reveal that existing mitigation measures may become compromised under a selection of future scenarios of climate and land use. Future efforts at conservation may need to become more flexible to remain effective in the changing environment of the coming decades.