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A new method for large-scale assessment of change in ecosystem functioning in relation to land degradation

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Ongoing pressures on European land are manifold with extreme climate events and non-sustainable use of land resources being amongst the most important drivers altering the functioning of the ecosystems. The protection and conservation of European natural capital is one of the key objectives of the 7th Environmental Action Plan (EAP). The EAP stipulates that European land must be managed in a sustainable way by 2020 and the UN Sustainable development goals define a Land Degradation Neutral world as one of the targets. This implies that land degradation (LD) assessment of European ecosystems must be performed repeatedly allowing for the assessment of the current state of LD as well as changes compared to a baseline adopted by the UNCCD for the objective of land degradation neutrality. However, scientifically robust methods are still lacking for large-scale assessment of LD and repeated consistent mapping of the state of terrestrial ecosystems. Historical land degradation assessments based on various methods exist, but methods are generally non-replicable or difficult to apply at continental scale (Allan et al. 2007). The current lack of research methods applicable at large spatial scales is notably caused by the non-robust definition of LD, the scarcity of field data on LD, as well as the complex inter-play of the processes driving LD (Vogt et al., 2011). Moreover, the link between LD and changes in land use (how land use changes relates to change in vegetation productivity and ecosystem functioning) is not straightforward.

In this study we used the segmented trend method developed by Horion et al. (2016) for large-scale systematic assessment of hotspots of change in ecosystem functioning in relation to LD. This method alleviates shortcomings of widely used linear trend model that does not account for abrupt change, nor adequately captures the actual changes in ecosystem functioning (de Jong et al. 2013; Horion et al. 2016). Here we present a new methodology for assessing gradual and abrupt changes in ecosystem functioning in Europe. Based on segmented trend analysis of water-use efficiency (WUE) time series, an Ecosystem Change Type (ECT) map was produced over Europe at 1km resolution for the period 1999 to 2013. An analysis of auxiliary data on land use/cover change, drought trends, and soil threats was performed over hotspot areas to better understand the observed changes in ecosystem functioning and their driving mechanisms. The ECT map was validated using the case study sites from the EU-funded RECARE project. Overall, the ECT map accurately highlighted areas characterized by a major change in pathways of ecosystem functioning as well as indicated the type and timing of changes.

Allan, R. et al. (2007). Climate and land degradation. Verlag Berlin Heidelberg: Springer.
de Jong, R et al. (2013). Remote Sensing, 5, 1117-1133
Horion, S. et al. (2016). Global Change Biology, 22, 2801-2817
Vogt, J. V et al. (2011). Land Degradation & Development, 22: 150–165.