EJP SOIL SCALE

Policy Brief

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From Risk to Resilience: Policy challenges for Soil Erosion Control

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- Water-induced soil erosion is a growing concern in the EU, with climate change projections indicating a potential 13-23 % rise in erosion rates.
- The variability of soil erosion modelling techniques highlights the need for standardisation of data sets and harmonisation of model parameterisation to allow valid comparisons of policy measures.
- The Common Agricultural Policy (CAP) has a limited effect in decreasing erosion risk, as the voluntary measures are often not well targeted to the identified erosion-prone areas.
- Policymakers should advocate for targeted erosion mitigation measures and elaborate more appropriate assessment protocols including sediment connectivity modelling to improve accuracy in erosion risk assessments.

INTRODUCTION

Water-induced soil erosion presents a growing concern within the European Union, posing numerous challenges to soil health, agricultural sustainability, and water quality. Although typically associated with southern and central European regions, recent studies have identified unforeseen vulnerabilities in the north. Climate change projections by the European Commission's Joint Research Centre (JRC) imply an urgent need to address soil erosion, with indications showing a potential 13-23% rise in erosion rates by 2050. This policy brief is a result of the EJP SOIL SCALE project, that seeks to unravel the complexities of water erosion on farmland and its off-site impacts. Specifically examined is the effectiveness of erosion risk management measures implemented in the national CAP strategic plans (2023-27), aiming to facilitate informed policy-making for the diverse European landscapes and to address discrepancies between various methodologies for erosion risk zonation by modelling.

The challenge of soil erosion centres on connectivity and highlights the impact of landscape elements on the transport of water and sediment during hydrological events.

The regulatory framework of the CAP and Water Framework Directive (WFD) require member states to integrate measures to reduce soil erosion into their national policies. Soil erosion risk maps, acquired through a range of modelling techniques, are essential instruments for policymakers to pinpoint high-priority zones and design specific measures.

Empirical, process-based and hybrid models constitute the variety of modelling methods available. Clear comprehension of these modelling techniques is crucial in light of the varied outcomes and importance of these models. The variability in the incorporation of landscape aspects and mitigation measures in these models presents a challenge to meaningful comparisons and underscores the necessity for a comprehensive appreciation of their

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implementation throughout the European Union.

Sediment Connectivity and Mitigation Measures in National Legal Standards

Mandatory regulations that address soil erosion mitigation and sediment connectivity are rare beyond the Good Agricultural and Environmental Conditions (GAECs) standards of the CAP, such as those implementing buffer strips (GAEC 4), erosion control (GAEC 5), and minimum soil cover (GAEC 6). Although GAEC 5 presents an opportunity for land users to address erosion, the effectiveness of these efforts rests on accurately targeting erosion-prone areas. GAEC standards and voluntary measures vary significantly between countries and disparities in national regulations are reflected by the different techniques used to zonate soil erosion risk areas (e.g. modelling or expert knowledge). There is a scarcity of voluntary measures specifically designed to mitigate erosion risk, and often they lack targeting to identified erosion-prone areas. Long-term solutions, such as adapting land use, are not frequently implemented. Some measures funded under voluntary schemes, though not explicitly designed for erosion risk, may have an impact, but their effectiveness requires targeted application to identified risk areas or specific offsite problems (e.g. sediment input into water courses).

The introduction of the GAECs has had a modest impact on reducing erosion risk, with a noted 20 % reduction in overall soil loss for arable lands (JRC). The voluntary measures pose difficulties on account of their inherent non-compulsory nature. This underlines the need for policy interventions aimed at the 4 million hectares of arable land experiencing soil loss rates exceeding 5 tonnes per hectare per year, presently disregarded in the CAP policy. The new CAP period of 2023-27 builds upon greening obligations, agri-environmental and climate commitments from Pillar 2. However, its efficacy in mitigating soil erosion by water remains uncertain.

Figure 1: Example for sediment (dis-)connectivity at a parcel border. / © Elmar M. Schmaltz

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Key messages for Policy Makers

Recommendation One: Harmonisation and Standardisation

Harmonisation of datasets and parameterisation across erosion models to facilitate consistent soil erosion assessments and improve the efficiency of management requirements.

Recommendation Two: Targeted Erosion Mitigation Measures

Erosion mitigation measures ought to be applied specifically in areas exhibiting a heightened risk of erosion. It is important to enhance effectiveness by more firmly promoting voluntary measures in these risk areas, and, where needed, instituting mandatory measures in a more focused manner.

Recommendation Three: Enhanced Sediment Connectivity Modelling

Sediment connectivity ought to be a principal consideration when modelling erosion risks, particularly when utilising erosion risk maps for policy or planning purposes. It is typically recommended that validation of these maps is undertaken through the use of empirical data and threshold values from these maps should be tailored to meet regional conditions. This approach enhances the reliability and comparability of policy-relevant soil erosion risk maps.

Sediment Connectivity and Mitigation Measures in Soil Erosion Models

The Universal Soil Loss Equation (USLE) and its variations are by far the most widely used to produce policy-relevant soil erosion maps. Other models are used for planning or advising farmers, such as process-based models, expert judgement/decision tree models and qualitative models. These applications, which are geared towards different problem-solving levels and objectives, particularly in politics, research or consulting, require different levels of high-resolution initial data to calculate the erosion risk and are only applicable and effective at very different spatial scales. The ability to take mitigation methods or sediment connectivity into account also differs greatly between the models.

In order to improve the assessment of erosion risk and targeted mitigation measures, it will be necessary to continue to integrate sediment connectivity and mitigation measures particularly in large-scale modelling approaches and to develop solutions that contribute to a better understanding of the erosion and sediment transport mechanism. The SCALE project report emphasises the importance of reviewing erosion risk maps for policy using empirical data.

Hence, the use of various soil erosion models highlights the crucial necessity for harmonisation and standardisation of datasets and parameterisation approaches. By doing so, not only shall a uniform assessment of soil erosion be guaranteed, but also comparability and resolution of discrepancies arising due to disparate requirements of these risk maps.

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Improving Policy Support

To strengthen policy initiatives aimed at tackling soil erosion within the European Union, there should be a focus on harmonisation in soil erosion modelling practices, with an emphasis on consistent parameterisation and dataset utilisation to improve the comparability of model predictions across diverse landscapes within Europe.

To enhance the efficacy of policy interventions, it is necessary to implement targeted mitigation strategies specifically designed for identified erosion-prone zones. This process will optimise the efficiency of interventions and enhance the impact of policy measures. Greater focus should also be placed on modelling sediment connectivity in agricultural landscapes to improve the understanding of the effects of landscape components on connectivity, so that policies can be better tailored to reduce erosion hazards.

Ensuring empirical validation of erosion risk maps is vital for credible policy decision-making. In-field measured data must be used to verify their accuracy and reliability. Policy guidelines and thresholds must be tailored to regional circumstances to establish a reliable foundation for policy-making, taking into account the heterogeneity of European landscapes that requires adapting erosion risk management strategies to specific environmental conditions. Additionally, encouraging changes in land use practices, where feasible, can guarantee sustainable soil protection beyond immediate mitigation measures.

References

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