

## **Minutes of the session “Soil erosion in relation to land degradation, climate change & food security” of 1st EUSO Stakeholders Forum (taken place 21.10.2021)**

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**Reviewed by:** colleagues who presented during the session

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A welcome was given by Panos Panagos who introduced the speakers and he underlined that this is not scientific event but it covers a large spectra of interested stakeholders: policy makers in EU level, Academia, Research, regional authorities, IUSS, farmers, NGOS and the private sector.

Some background information given by Panos Panagos: The first soil erosion-modelling workshop took place in Ispra in March 2017 followed by second one in Seoul (December 2017) and the third one in the World Soil Congress in Rio (August 2018). Therefore, this WG does not start from scratch.

Mike Mackenzie (DG AGRI, European Commission) presented the post 2020 CAP requirements in relation to soil. The future CAP has a great potential to contribute to care for soil. Next months are crucial in this direction. One of the impact indicators in the future CAP is the soil erosion (% of agricultural area under severe erosion). GAEC 2 (protection of wetlands), GAEC 5 (Tillage management), GAEC 6 (minimum soil cover) and GAEC 7 (crop rotation) are relevant to soil conservation and present the future conditionality in the new CAP.

Julia Pongratz (University of Munich) presented the land use change and carbon fluxes. Land use changes (deforestation, conversion of grassland to forests) or other soil processes are responsible for CO2 emissions in the atmosphere. The Earth Science models to estimate carbon budget, not all of them include soil erosion process. Erosion protection measures may play a role in carbon mitigation: avoid deforestation, biochar, agricultural conservation, reduce grassland reduction. To better account carbon losses, we need accurate estimates of erosion and sediment fluxes for the last century at global scale.

Christine Alewell (University of Basel) presented the food security threat due to phosphorus reduction. There will be a political scarcity in relation to phosphorus reserves in Europe. Phosphorus is mainly lost in agro-ecosystems due to soil erosion and this output is neglected in global P budgets and cycling. Combining the P concentration (INRA) with Global soil erosion, a group of scientists estimated the P losses due to erosion. The big challenge is how we can feed the world without P and how to reduce the erosion in Africa and south America and Asia.

Edoardo Costantini (president of the International Union of Soil Sciences - IUSS) presented the importance of soil conservation. IUSS has two commissions relevant to land degradation in the IUSS. 76% of land degradation globally is due to water and wind erosion. Mr. Constantini presented the anthropogenic pressures to increase soil erosion: Tillage translocation, ploughed erosion, mechanical mass movements (bulldozer erosion) and soil fluxes on compacted subsoil. The mechanical movement may affect around 500,000 ha in Italy, in particular in vineyards. He also presented solutions for soil care against soil erosion: conservative agriculture, organic farming, agroforestry, crop diversification, etc.

Pasquale Borrelli (University of Pavia) presented the future challenges for soil erosion community. Soil erosion is more a problem for area that suffer more in the past as well. Global models give little understanding on what is happening at the field. We need to target the fields as we have enough modeling

capacity to face the complexity of processes. Modelling approaches at field scale is the solution and we explore to changes in cover (crop and management driven). The EUSO may give the opportunity to predict erosive events, improve our capacity to monitor the effectiveness of land management and provide ex-ante and ex-post policy support through a scientific monitoring network.

Petra Deproost (Region of Flanders) presented the monitoring scheme on soil erosion in Flanders. They noticed an increase in rain erosivity since early 2000 using detailed rainfall depth time-series in Flanders at 10 min temporal resolution. All agricultural parcels get one general C-factor value when calculating the potential soil erosion. The soil erosion risk is calculated based on the specific crop and crop management (main crops, cover crops, CAP conditionality, AECM) per parcel using look up tables and reduction factors. Based on the potential erosion class, in Flanders there is an application of specific measures (obligatory GAECs) for soil conservation. The C-factor for calculating the soil erosion risk is based on the crop choices and various (obligatory or voluntary) management practices. Considering the evolution of the soil erosion risk from 2008-2019, Flanders estimates a decline of severe erosion in this period (obvious influence of GAECs in reducing soil erosion). Keeping constant the rain erosivity factor allows to estimate the impact of CAP measures.

Claudio Screpanti (Sygenta) presented innovation for sustainable agriculture with investments in soil health. Soil health is a long-term, large-scale phenomenon that requires system-level management. The R&D use specific priorities for soil health: Promote soil biodiversity, preserve soil resources and mitigate climate change. The 3 priorities include 8 targets such as protect soil microfauna, increase H<sub>2</sub>O storage, improve nutrients bio-availability, reduce N<sub>2</sub>O emissions, etc. A more resilient and sustainable agriculture is needed through the promotion of soil health. Public and private collaborations would unlock new solutions.

Elizabeth Lunik (Rabobank) presented the Carbon bank. The Rabo Carbon bank project focus in carbon farming, supply chain decarbonization and carbon reduction retail. Important to have long-term carbon gaining agricultural systems. Managing carbon is a key issue in soil health: Reduce tillage, increase cover crops and crop rotation and the managed grazing. Most of those solutions are “win-win” for soil erosion mitigation as well. It is important the agricultural management that helps soil capacity to store carbon and reduce GHG emissions. The rural clients have co-benefits such as improved soil fertility, increased yield, better water holding capacity and biodiversity.

Sebastian Vogler (Farmer in south Germany) presented his experience in applying conservation agriculture in his 85 ha farm. He tries to protect his farm against erosion by having a plant coverage 365 days per year in the field, feed soil with compost and adjust nutrients. Some practices in detail: after maize silage to apply compost, seeding triticale or winter crops without any tillage. After harvesting grain around 20<sup>th</sup> June, the rye grass/red clover regrows in 10 days and the field is green again (protect against erosion, feed soil with nutrients).

Rigas Tsiakiris (NGO Green Institute) presented productive reforestations for creating jobs, tackling erosion/desertification and mitigating the effects of climate change. Ancient rural agro-forestry landscapes are being lost at large scale in the Mediterranean due to fires, land abandonment and land use change. Productive reforestation can protect against erosion, increase biodiversity, provide income to less favorite areas. The Green Institute is very active in raising awareness in social media, TV and magazines. He proposed a proposal on a climate-smart Mediterranean forestry and a climate smart innovative product policy involving local farmers to achieve economic viability.

## Discussion:

- The CAP management plans and their importance in soil conservation
- Models uncertainty and application on local/regional and larger scale.
- It was also important to involve also geomorphologists in discussions on this WG as they have deep knowledge on the process.
- Reduced tillage and no tillage conservation practices are linked to glyphosate application. Alternatives are the cover crops or even expensive products to replace glyphosate. There is a huge interest to substitute it or looking for biological/electrical alternatives. However, the proposed alternatives to glyphosate cost a lot and their uptake from farmers is low.
- As farmers do not have such a high knowledge for applying conservation measures, how we can convince them.
- Discussion about the application of models to test the extreme events such as the ones in summer 2021.
- How we can better monitor also other erosion processes than water erosion (tillage erosion, gully, wind).
- Importance to integrate not only with other processes but include also socio-economic data (age of farmers, income, etc)

## Next steps - Recap:

Since the three workshops (Ispra – Seoul – Rio), different activities have been addressed in informal working groups led by JRC. A WG on gully erosion met in 2018 and developed the current status in measuring, modeling and managing gullies. This was published in Earth Science Reviews including datasets from Member States. In addition, another informal WG of 67 scientists have developed the first Global Applications of Soil Erosion Model Tracker (GASEMT) – a database of studies with erosion modelling. The GASEMT is publicly available and is accompanying with two research publications. Since 2017, other erosion processes have been studied and published in EU: Wind erosion, harvest erosion and gully erosion with LUCAS monitoring.

The Soil Erosion Working Group will have the following objectives for a first period 12-24 months:

1. develop an **object oriented (bottom-up) approach** for estimating soil erosion and health indicators at farm scale – The development of a bottom-up soil erosion monitoring modelling framework.
2. **Integrate** soil erosion with emerging issues such as soil contamination, carbon loss and food security.
3. improve **large scale assessments**
4. have **different sub-groups** based on research question or policy request.

The first priority will be to develop a modelling approach that it modular/adaptive and would target applications at regional and local scale. This requests the involvement of all potential stakeholders: Farmers, advising services, regional authorities, Member States, EU policy makers and scientists. This new approach would use as a basis the information/data on a **farm level**. Therefore, new datasets at high spatial resolution (e.g. **Land Parcel Identification System LPIS**) and new Remote sensing inputs (e.g. Phenological indexes) would be important inputs. This modelling tool could be applied at farm and local scale taking also into account the farmers' management practices to reduce erosion and improve soil health. Our biggest challenge is to take the feedback from farmers and local stakeholders and include it

in assessments, proposed management practices and policy inputs. This requires a scientific monitoring network and at least a region, which will serve as case study. Synergies with lighthouses network and mission on soil can be also an option.

Flexible sub-groups will address new research challenges such as food security, climate change and sediment distribution. EUSO already put in place a network for an extensive data collection of Sediment distribution data in 2021 with the objective to populate all the findings at EU level by 2022. The sediment assessments could support policy options in the new EU Green Deal.

The global studies will focus on how to better integrate soil erosion data in Earth Systems models and include them in IPCC or IPBES assessments. In addition, we should look forward to improve the current UNCCD Land Degradation indicator definition 15.3.1 by including soil erosion.

**Working group structure:** in a first stage informal and voluntary; in consecutive stages, a more formal approach could be envisaged. It is proposed that persons/organizations that want to contribute actively send a mail to [panos.panagos@ec.europa.eu](mailto:panos.panagos@ec.europa.eu), with their intentions.

EUSO (JRC) will chair the WG (Panos Panagos) with two vice chairs: one from academia (vacant for the moment – Diana Vieira will cover this role in the beginning) and one from regional/policy (Petra Deproost – Government of Flanders).