

Soil erosion in relation to land degradation, climate change, food security

Panos Panagos
Joint Research Centre



Background and relevant workshops

Erosion modelling workshop

This workshop will mainly discuss issues regarding how the local/regional modelling results can be upscaled to (or applied at) the European scale. The workshop also serves as a follow-up to recent JRC modelling developments and published maps of soil erosion by water and wind. The workshop will try to focus on how various project or local/regional modelling applications can improve 'know-how' at the European scale. Emphasis will also be given to management practices that can reduce soil erosion.

Joint Research Centre
Ispra (VA), Italy

20 March 2017
Auditorium, Bldg 58

21-22 March 2017
Amphitheatre, Bldg 36



<http://esdac.jrc.ec.europa.eu/themes/erosion-modelling-workshop>



#SOILER17

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European
Commission

Asia-EC JRC Joint Conference 2nd workshop (5-7 Dec 2017) Seoul, Korea



Research Center of Surface Soil Resources Inventory and Integration (SSORii)

Asia-EC JRC Joint Conference 2017 on
"All That Soil Erosion the Global Task to Conserve Our Soil
Resources"

World Soil Congress - Soil erosion modelling: Global Alliance – 3rd workshop – Rio, Brazil



AUGUST 12-17, 2018 BRAZIL

Soil science:
beyond food and fuel

www.21wc.org

WELCOME TO



2019-2021: focus on Gully erosion – GASEMT (among others)

Gully Erosion: Workshop in Ispra – March 2018

Earth-Science Reviews 218 (2021) 103637

Contents lists available at ScienceDirect

Earth-Science Reviews

journal homepage: www.elsevier.com/locate/earscirev



Invited Review

Measuring, modelling and managing gully erosion at large scales: A state of the art



Matthias Vanmaercke^{a,b,*}, Panos Panagos^c, Tom Vanwalleghem^d, Antonio Hayas^e, Saskia Foerster^f, Pasquale Borrelli^{g,h}, Mauro Rossiⁱ, Dino Torriⁱ, Javier Casali^j, Lorenzo Borselli^k, Olga Vigiak^c, Michael Maerker^l, Nigussie Haregeweyn^m, Sofie De Geeter^{a,b}, Wojciech Zglóbeckiⁿ, Charles Bielders^o, Artemi Cerdà^p, Christian Conoscenti^q, Tomás de Figueiredo^r, Bob Evans^s, Valentin Golosov^{t,u}, Ion Ionita^v, Christos Karydas^w, Adam Kertész^{x,y}, Josef Krása^z, Caroline Le Bouteiller^{aa}, Maria Radoane^{ab}, Ratko Ristić^{ac}, Svetla Rousseva^{ad}, Milos Stankoviansky^{ae}, Jannes Stolte^{af}, Christian Stolz^{ag}, Rebecca Bartley^{ah}, Scott Wilkinson^{ai}, Ben Jarihani^{aj,ak}, Jean Poesen^{b,n}

- Monitoring
- Measurements on gully erosion in Europe
- gully erosion using models
- Model input data at the continental scale
- Policies relevant to gully erosion
- Gully erosion datasets from 16 EU countries

Development of Global Applications of Soil Erosion Model Tracker (GASEMT)

An international group of 67 scientists, led by the EU Soil Observatory (EUSO) team at the JRC, have developed the first Global Applications of Soil Erosion Modelling Tracker (GASEMT), which aims to give a better understanding of the global application of soil erosion prediction models.

GASEMT is open Access database



Review

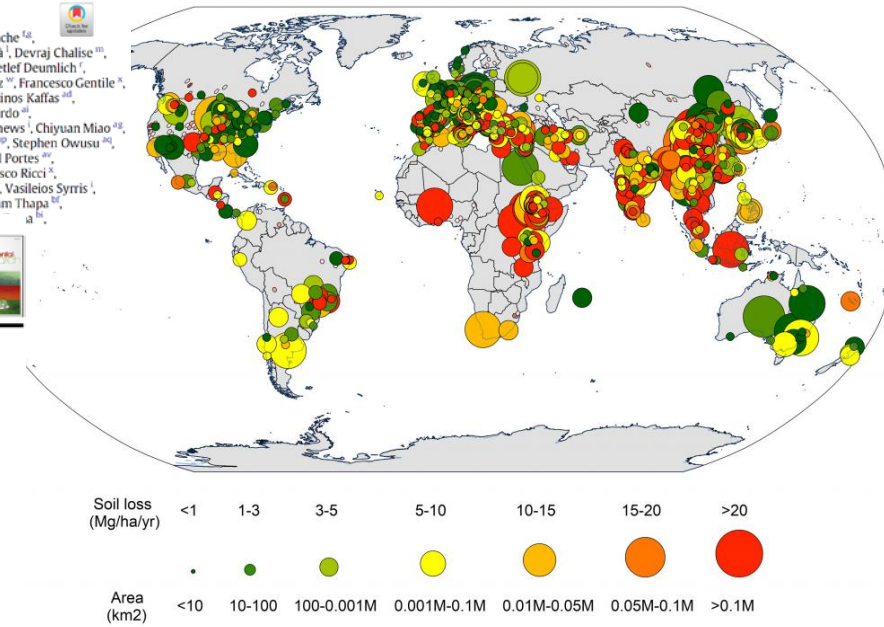
Soil erosion modelling: A global review and statistical analysis

Pasquale Borrelli^{a,h,c,*}, Christine Alewell^d, Pablo Alvarez^{d,e}, Jamil Alexandre Ayach Anache^{f,g}, Jantiene Baartman^b, Cristiano Ballabio^l, Nejc Bezak^l, Marcella Biddoccu^o, Artemi Cerdà^l, Devraj Chalise^m, Songchao Chenⁿ, Walter Chenⁿ, Anna Maria De Girolamo^o, Gizaw Desta Gossesse^q, Detlef Deumlich^r, Nazzareno Diodato^l, Nikolaos Efthimiou^l, Gunay Erpul^l, Peter Fiener^r, Michele Freppaz^o, Francesco Gentile^o, Andreas Gericke^o, Nigussie Haregeweyn^o, Bifeng Hu^{ab,ab}, Amelie Jeanneau^{ab}, Konstantinos Kaffas^{ad}, Mahboobeh Kiani-Harhegani^{ae}, Ivan Lizaga Villuendas^{af}, Changjia Li^{ag,ab}, Luigi Lombardo^{ah}, Manuel López-Vicente^{ai}, Manuel Esteban Lucas-Borja^{aj}, Michael Märker^{ak}, Francis Matthews^{al}, Chiyuan Miao^{am}, Matjaž Mikos^{an}, Sirio Modugno^{ao,ar}, Markus Möller^{ap}, Victoria Naipal^{aq}, Mark Nearing^{ar}, Stephen Owusu^{as}, Dinesh Panday^{at}, Edouard Patault^{au}, Cristian Valeriu Patriche^{av}, Laura Poggio^{aw}, Raquel Portes^{ax}, Laura Quijano^{ay}, Mohammad Reza Rahdari^{az}, Mohammed Renima^{ba}, Giovanni Francesco Ricci^{bb}, Jesús Rodrigo-Comino^{bc}, Sergio Saia^{bd}, Aliakbar Nazari Samani^{be}, Calogero Schillaci^{bf}, Vasileios Syrris^{bg}, Hyuck Soo Kim^{bh}, Diogo Noses Spinola^{bi}, Paulo Tarso Oliveira^{bj}, Hongfen Teng^{bk}, Resham Thapa^{bl}, Diogo Noses Spinola^{bm}, Paulo Tarso Oliveira^{bn}, Resham Thapa^{bo}, Shuiqing Yin^{bp}, Demetrio Antonio Zema^{bq}, Guangju Zhao^{br}, Panos Panagos^{bs}



Soil erosion modelling: A bibliometric analysis

Nejc Bezak^{a,*}, Matjaž Mikos^a, Pasquale Borrelli^{b,c,d}, Christine Alewell^d, Pablo Alvarez^{d,e}, Jamil Alexandre Ayach Anache^{f,g}, Jantiene Baartman^h, Cristiano Ballabio^l, Marcella Biddoccu^o, Devraj Chalise^m, Songchao Chenⁿ, Walter Chenⁿ, Anna Maria De Girolamo^o, Gizaw Desta Gossesse^q, Detlef Deumlich^r, Nazzareno Diodato^l, Nikolaos Efthimiou^l, Gunay Erpul^l, Peter Fiener^r, Michele Freppaz^o, Francesco Gentile^o, Andreas Gericke^o, Nigussie Haregeweyn^o, Bifeng Hu^{ab,ab}, Amelie Jeanneau^{ab}, Konstantinos Kaffas^{ad}, Mahboobeh Kiani-Harhegani^{ae}, Ivan Lizaga Villuendas^{af}, Changjia Li^{ag,ab}, Luigi Lombardo^{ah}, Manuel López-Vicente^{ai}, Manuel Esteban Lucas-Borja^{aj}, Michael Märker^{ak}, Chiyuan Miao^{am}, Sirio Modugno^{ao,ar}, Markus Möller^{ap}, Victoria Naipal^{aq}, Mark Nearing^{ar}, Stephen Owusu^{as}, Dinesh Panday^{at}, Edouard Patault^{au}, Cristian Valeriu Patriche^{av}, Laura Poggio^{aw}, Raquel Portes^{ax}, Laura Quijano^{ay}, Mohammad Reza Rahdari^{az}, Mohammed Renima^{ba}, Giovanni Francesco Ricci^{bb}, Jesús Rodrigo-Comino^{bc}, Sergio Saia^{bd}, Aliakbar Nazari Samani^{be}, Calogero Schillaci^{bf}, Vasileios Syrris^{bg}, Hyuck Soo Kim^{bh}, Diogo Noses Spinola^{bi}, Paulo Tarso Oliveira^{bj}, Hongfen Teng^{bk}, Resham Thapa^{bl}, Diogo Noses Spinola^{bm}, Paulo Tarso Oliveira^{bn}, Resham Thapa^{bo}, Shuiqing Yin^{bp}, Demetrio Antonio Zema^{bq}, Guangju Zhao^{br}, Panos Panagos^{bs}



14:00-16:30 : **Soil erosion in relation to land degradation, climate change, food security**

Moderator: Panos Panagos, European Commission JRC, Director Sustainable Resources

14:05 – Soil erosion in the post-2020 Common Agricultural Policy: Mike Mackenzie, DG AGRI, European Commission

14:15 – Land use changes and Carbon fluxes , Julia Pongratz, Univ. Munich

14:25 – Food security and erosion: Christine Alewell, Univ. Basel

14:35 – Land degradation and the importance on Soil conservation: Edoardo Costantini, President IUSS

14:45 – Gap of erosion models and Development of a network to validate models: Pasquale Borrelli, Univ. Pavia

14:55 – An example of soil erosion monitoring in Flanders: Petra Deproost, Flanders Region

15:05 – Chemical innovation to support sustainable agriculture and soil health: Claudio Screpanti, Sygenta

15:15 – Carbon sequestration in agricultural soils : Elizabeth Lunik, Rabobank

15:25 – Best practices followed by farmers : Sebastian Vogler, Farmer

15:35 – Afforestation to reduce land degradation: Rigas Tsiakiris, NGO Green Institute

15:45-16:30 Discussion – Next Steps

 #EUSOforum

Soil Erosion Working Group

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. (Development of a **scientific monitoring network**)
2. **Integrate** soil erosion with emerging issues such as soil contamination, carbon losses, nutrient losses and food security.
3. improve **large scale assessments**
4. have **different sub-groups** based on research question or policy request (e.g Sediments working group, etc)

*Soil erosion in relation to
land degradation, climate change, food security*

1. Bottom up approach for farm scale model

- Develop soil erosion model at **farm scale** (agricultural parcel)
- Importance of **land management**
- New datasets at high spatial resolution (e.g. **Land Parcel Identification System** LPIS) and new **Remote sensing inputs** (e.g. Phenological indexes)
- Feedback from **farmers and local stakeholders** (advising services, regional authorities, Member States, EU policy makers and scientists).
- Development of a **scientific monitoring network**

2. Integration

Soil erosion is contributing to “transfer” soils from one field to another and potentially to water resources.

We aim to explore the interactions between soil erosion and:

- soil pollution (e.g. heavy metals, micro-plastics, pesticides),
- excess of nutrients
- Water cycle
- Biodiversity and
- feedbacks of soil loss and carbon cycle.

3. New research challenges

Face new research challenges and policy questions in a specific subject

Sub-group of experts and stakeholders can be formed to either collect data or review or develop new approaches.

As an example, an extensive data collection of **Sediment distribution data** takes place in 2021 with the objective to populate all the findings at EU level by 2022.

Deliverables

- a farm based conceptual framework for estimating soil erosion at **parcel scale**
- Better Integration of soil erosion in **the Land Degradation indicators 15.3.1**
- Include soil erosion both with large scale Earth Science modelling and in the global assessments of IPCC or/and IPBES
- Develop the **Lighthouses network** for soil erosion: Practitioners who apply the best management methods for soil conservation and protection.

Working Group Structure (as one of EUSO WGs)

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 , with your intentions.

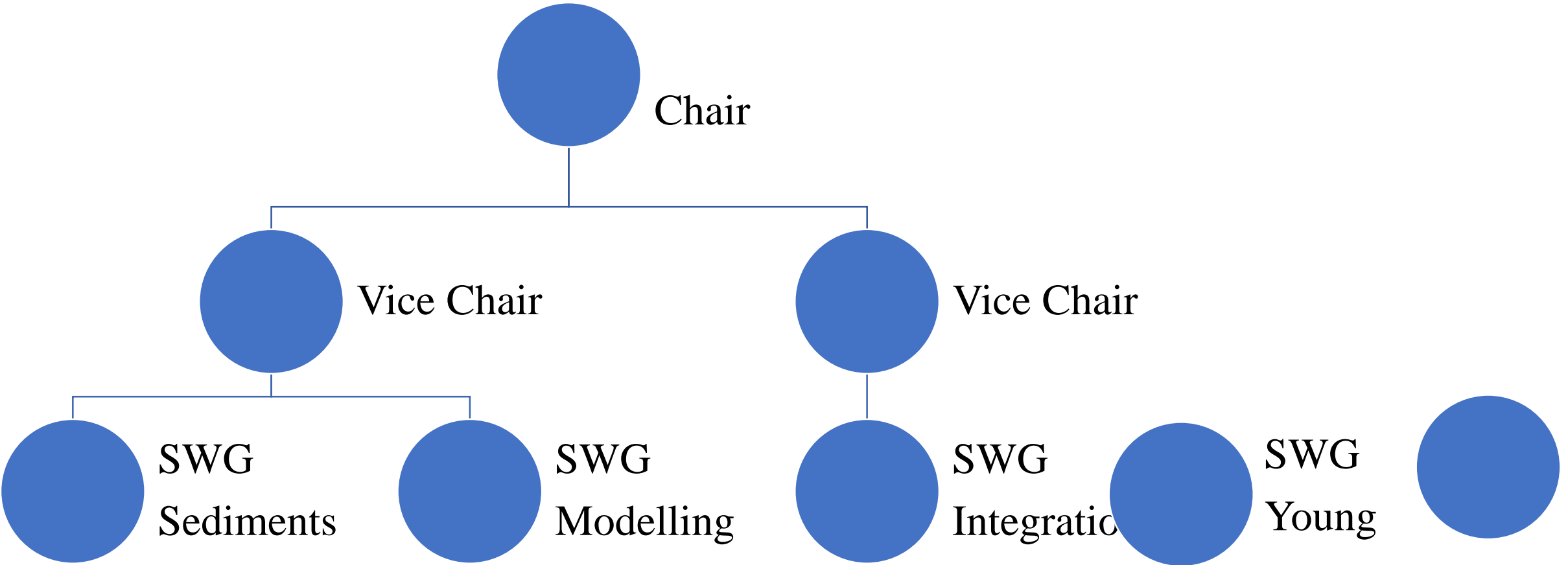
- Support the EU related policies (e.g. CAP, EU Strategy for Soils, Biodiversity strategy)
- Build a community – exchange of practices
- Address the technical challenges, new developments.

Chair: Panos Panagos, Diana Vieira (JRC,EUSO)

Vice-chair from stakeholders - policy:.....

Vice-chair from Academia: Pasquale Borrelli

WG Structure



Timetable

2021-2022					
	Milestone	Focus (vs. 4 objectives)	Date	Who	Relevant Policies
1.	EUSO Stakeholder Forum	EUSO soil Erosion WG: Introduction and Scope	Oct. 2021	Stakeholders	
2.	Sub-WG Sediments	Collect the sediment data at EU scale with focus in agricultural lands (No 4)	Dec. 2021	Data owners, modellers	Zero Pollution; EU Soil Strategy
3.	Sub-WG Farm model	Specifications for the development of a farm-scale model (No 1)	Mar. 2022	Modellers, policy makers, farmers	CAP
4.	Sub-WG Integration with Carbon	Collect contributions from WG Members (No 2)	June 2022	Carbon experts, erosion modellers	LULUCF
5.	Sub-WG Young Generation	Challenges of new research in relation to policy needs (All) Policy Brief – Special issue	Jul. 2022	Young researchers	
6	Sub-WG Integration with Food security	Assessment of nutrient losses due to soil erosion(No 2)	Oct. 2022		Farm to Fork
7	Sub-WG Large scale assessments	How to improve current large scale assessments	Dec. 2022		SDGs