

**COST Action TU1202**  
**Impact of climate change on engineered slopes for infrastructure**



**5<sup>th</sup> WG2 Meeting**  
 Zurich Switzerland  
 24 April 2015

**In attendance (for WG2):** Nichos Michas, Harry Saroglou (HS), David Hughes, Joel Smethurst (JAS), Razvan Gheorghe, Alister Smith (AS), Sebastian Uhlemann (SU), Jon Chambers (JC), Daisy Lucas, Sarah Springman (SMS), Stephanie Glendinning, Paul Hughes (PH), John Van Esch, Hjordis Lofroth (HL), Stanislav Lenart, Yu-Jun Cui

**Apologies received:** Neil Dixon, Chris Wooff

**Minutes of WG2 session – morning of 24 April 2015**

1. SOTA Review paper

JAS explained that while some case histories would be incorporated in the SOTA review paper, restrictions on total length will mean that it would only be possible to include some, and even then the detail would be very brief. The intention is to have a series of case histories as short-form papers to accompany the SOTA Review paper in QJEGH – this will allow more detail on relevant case histories to be included.

Several members of the WG agreed to provide short form papers (in many case with other colleagues):

- David Hughes
- Hjordis Lofroth
- Alister Smith
- Paul Hughes and Stephanie Glendinning
- Sarah Springman
- Yu-Jun Cui
- Harry Saroglou
- Joel Smethurst
- Kristine (to be invited by JAS)

It was also suggested that Network Rail, or Nick Slater from ITMSoil could be invited on their chalk cuttings (JAS to ask)

Need to ask Tom Dijkstra (TD) about maximum word count permissible; Journal rules are 1000 words + figures for a “photo feature”, but JAS notes that example previously send to JAS by TD looked significantly longer than that (~2000 words). JAS to circulate example paper, and to confirm maximum length with TD.

Deadline for short form papers: mid-June

All volunteers  
(see left)

JAS

JAS

JAS

<p>JAS, SG and PH offered to help with English in short form papers</p> <p>Existing Table 2 in paper is too long. Different options were discussed for breaking this into small parts, or writing in text form, but decision made to leave as a single table and try and reduce in length. Sebastian Uhlemann (SU), Alister Smith (AS) and Jon Chambers (JC) offered to work on doing this.</p> <p>A number of items were suggested as missing from the current review paper:</p> <ul style="list-style-type: none"> <li>• Different monitoring platforms (ground, surface, air etc.) – JC to write a paragraph</li> <li>• A section on monitoring standards – Harry Sarolgou (HS) to write a paragraph</li> <li>• Who are decision makers, how decision made, formal framework for decision making – PH to write a paragraph</li> </ul> <p>Other items that could be added:</p> <ul style="list-style-type: none"> <li>• JC suggested more clearly pulling out UAV monitoring</li> <li>• There is currently little on measuring temperature, with respect to permafrost, embankments that are on fire</li> <li>• Mention to the sensors catapult as a focal point for new sensors development.</li> </ul> <p>JAS to consider adding mention to these points on next revision of SOTA paper.</p> <p>Further significant points of discussion:</p> <ul style="list-style-type: none"> <li>• HL suggested that we could usefully capture more unpublished industry cases. All to ask industry contacts if they may be willing to contribute a case study paper. JAS to ask iSMART industrial advisory board.</li> <li>• Is the monitoring data that we already have being fully utilized to obtain understanding – currently there is poor collection/recording and bringing together of data. This is an important point, and could be used to strengthen one of the current conclusions.</li> <li>• SMS discussed need for expertise and experience. Deltares have been teaching farmers to identify and report potential hazards with dykes; similar in Switzerland with farmers trained on avalanche risk. Big decisions often have to be made under pressure of time – and this needs experienced personnel with judgement and confidence to make decisions, and an appropriate chain of command etc. In this context, data visualization remains very difficult and still needs work.</li> <li>• In conclusion (ii) it would be good to talk more about the rate of development, with injection of more excitement. Are comparisons to other applications, such as smart cities appropriate (smart cities may be more developed)?</li> </ul>	<p>JAS, SG, PH</p> <p>SU, AS, JC</p> <p>JC</p> <p>HS</p> <p>PH</p> <p>JAS</p> <p>All, JAS</p>
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<ul style="list-style-type: none"> <li>It is important to incorporate experiences across countries – these differ (uptake of different ideas, instrumentation, standards etc.)</li> </ul> <p>JAS to look to work in more on some of these in next revision of SOTA review paper.</p>	<p>JAS</p>
<p>Many thanks to those who have send back the SOTA review with comments/references – these are being incorporated into the next revision. Everyone else, please have a read through the current version of the document and add any comments, and in particular add references to relevant case histories etc. (Please see notes on the front page of SOTA paper for further details of things needed).</p>	<p>All</p>
<p><u>2. Next COST Action</u></p> <p>There will be time set aside at the October 2015 meeting to discuss a possible follow-on COST Action. Initial ideas suggested for something based around WG2:</p> <ul style="list-style-type: none"> <li>Geotechnical monitoring Action (other technologies and applications – possible focus on future needs)</li> <li>Remote sensing Action</li> <li>Slopes and climate change (SG to ask Chris Kilsby about climate change Action that he was considering).</li> </ul> <p>PH pointed out that there was more money available in the TUD area than in Geosciences.</p>	<p>SG</p>
<p><u>3. Final COST Action event</u></p> <p>PH explained that it will be over two days, in Paris, September 2016, with a principal aim to show the outputs from the Action. A number of suggestions were made for things that could be incorporated into the final event:</p> <ul style="list-style-type: none"> <li>Posters, possibly from ESR's. Poster presentations on sites/case histories.</li> <li>Trade show for instrumentation developers.</li> <li>Debates and discussion panels (as in some of the ICE branded conferences).</li> <li>Site visits? Yu-Jun says that there are no Paris Tech sites within a sensible travelling distance.</li> <li>Invite stakeholders and ask them to state importance of outputs and need for further work. Stakeholders should hopefully come following WG4 stakeholder event.</li> <li>USB pens with papers on (PH says that QJEGH papers should be Gold Open Access).</li> </ul>	
<p><u>4. Other</u></p>	

<p>A group Dropbox for WG review, papers etc. would be very helpful. JAS to set one up and circulate invitation to join.</p> <p>At the start and end of the sessions, two other dissemination events were mentioned:</p> <ul style="list-style-type: none"> <li>• TRA2016, Warsaw – 6<sup>th</sup> European Transport Research Conference 18-21 April 2016. <a href="http://www.traconference.eu">www.traconference.eu</a></li> <li>• 3<sup>rd</sup> Conference on Transport Geotechnics, early September 2016</li> </ul> <p>It would be good to put something into both of these; both have relevant sessions. Call for abstracts is pretty much now – and so would have to be quick. PH suggested that ESR’s could put something in.</p>	<p>JAS</p>
<p><b>Minutes of WG2 session – afternoon of 24 April 2015</b></p> <p><u>5. Potential cross-WG grant proposals, papers and other ideas for final event (the following tries to capture the reporting back of items from both groups made up of a mix of WG2 and WG3 participants)</u></p> <p><u>Papers</u></p> <ul style="list-style-type: none"> <li>• Using models (WG1) to model sites (WG2 &amp; 3) – this would provide cross interaction, but would require some work to be carried out. This could be a priority for final-year STSM’s?</li> <li>• Monitoring to manage risk – a set of case examples (WG2 &amp; 4)</li> <li>• Instrumentation across the scales – common problems encountered at laboratory and field scales (WG2 &amp; 3)</li> <li>• Field experiments (e.g. for measurement of permeability – these may not be currently picked up in either WG2 or 3’s SOTA Review).</li> <li>• Variations in climate and soil – a European comparison (cross Action).</li> <li>• Case studies of climate change related to slopes across Europe (cross Action?)</li> <li>• Instrumentation comparisons – comparing experimental results or experiences with instrumentation (WG2 &amp; 3)</li> <li>• Practice in the agriculture/soil science communities versus engineering (WG’s 2 &amp; 3?)</li> </ul> <p><u>Grants (COST Action, small, medium and large)</u></p> <ul style="list-style-type: none"> <li>• Improving the resilience of transport earthworks in Europe (a European version of the UK iSMART: would be a large grant).</li> <li>• Water impounding structures, dams and levees (a COST Action, or small–medium grant)</li> <li>• Transport impacts on structures – going beyond climate to consider train loading etc. (medium–large)</li> <li>• New materials for transport slopes. OR mitigation measures for slopes. Bacteria, resin and sticking things together; novel reinforcement, vegetation, lime (medium –large)</li> </ul>	

<ul style="list-style-type: none"> <li>• Early warning systems (would link together all WG's: large)</li> <li>• Cold regions and permafrost etc. (medium?)</li> <li>• Build a European test embankment (a European BIONICS?) For testing instruments, extreme events, field experiments (large).</li> <li>• Standards for infrastructure slopes (professional education)</li> <li>• Exchanging knowledge on climate change for slopes (COST Action?)</li> </ul> <p><u>Other</u></p> <ul style="list-style-type: none"> <li>• A modelling challenge with a prize. Could set a modelling challenge giving basic soil properties, initial conditions, and climate parameters, and ask people to try to calculate final water content/pore water pressures (or similar).</li> </ul> <p>Further opportunities will be explored – action on PH and WG leads (for WG2 and WG3, JAS and AMT) to investigate Horizon 2020 calls, and lists of existing COST Actions for grants going forward.</p>	<p>PH, with JAS and AMT</p>
<p><b>Next workshop</b></p> <p>Full Action workshop to be held in Slovenia, on 21-23 October 2015 (note 21<sup>st</sup> will be MC meeting)</p>	

Joel Smethurst 17/05/2015

**Appendix 1: Current list of participants in WG2 – updated 27 March 2015**

Participant	Affiliation	Email	Country	Research
Brencic, Mihael	Department of Geology	mihael.brencic@geo.ntf.uni-lj.si	Slovenia	Slope monitoring Landslide hazard Climate change
Callender, Paul	McFarland Associates, Queens University Belfast	paul.callender@mcfassoc.com	United Kingdom	Application of instrumentation
Dixon, Neil	Loughborough University	N.Dixon@lboro.ac.uk	United Kingdom	Monitored slopes Acoustic monitoring
Gheorghe, Razvan		Razvan_25_ageo@yahoo.com	Romania	Slope engineering
Grandjean, Gilles	BGRM	g.grandjean@brgm.fr	France	Geophysics. Monitored slopes including long datasets
Gunn, David	British Geological Survey	dgu@bgs.ac.uk	United Kingdom	Resistivity monitoring Asset management

Participant	Affiliation	Email	Country	Research
Hughes, David	Queens University Belfast	d.hughes@qub.ac.uk	United Kingdom	Monitored slopes Embankments on peat Laser scanning
Hughes, Paul	Newcastle University	paul.hughes@ncl.ac.uk	United Kingdom	BIONICS embankment Laser Scanning Wireless systems
Länsivaara, Tim	TUT	tim.lansivaara@tut.fi	Finland	Full scale testing Limit equilibrium Eurocodes
Lenart, Stanislav	Slovenian National Building and Civil Engineering Institute (ZAG)	Stanislav.lenart@zag.se	Slovenia	Slope and dam monitoring
Libric, Lovorka	University of Zagreb	llibric@grad.hr	Croatia	Resistivity measurements
Lofroth, Hjordis	Swedish Geotechnical Institute	hjordis.lofroth@swedgeo.se	Sweden	Monitoring, TC431
Lu, Chi Wei	Research Centre for Advanced Engineering Construction	cwlu@nkfust.edu.tw	Taiwan	Landslide monitoring
Lucas, Daisy	ETH Zurich	Daisy.lucas@igt.baug.ethz.ch	Switzerland	Field instrumentation for monitored slopes
Mafti, Raluca	Geological Institute of Romania	mafteir@yahoo.com	Romania	Geo-hazards and mapping
Michas, Nichos	Athens University	michas@tee.gr	Greece	Rockfalls and rock hazards
Anna Miskowska	Warsaw University		Poland	
Neata, Gheorghe		office@geo-serv.ro	Romania	
O'Kelly, Brendan	Trinity College Dublin	bokelly@tcd.ie	Ireland	Monitoring and pile stabilisation of slopes
Saroglou, Harry	NTU Athens	saroglou@central.ntua.gr; c.saroglou@imperial.ac.uk	Greece	Monitored slopes Optical fibres
Smethurst, Joel	University of Southampton	J.A.Smethurst@soton.ac.uk	United Kingdom	Monitored slopes Instrument development
Smith, Alister	Loughborough University	A.Smith10@lboro.ac.uk	United Kingdom	Monitored slopes Acoustic monitoring
Springman, Sarah	ETH Zurich	sarah.springman@igt.baug.ethz.ch	Switzerland	Monitored sites Full-scale testing Centrifuge modelling Prevention measures

Participant	Affiliation	Email	Country	Research
Uhlemann, Sebastian	British Geological Survey	suhl@bgs.ac.uk	United Kingdom	Monitored slopes ERT techniques
Van Esch, John	Deltares	John.vanesch@deltares.nl	Netherlands	Monitoring of engineered slopes
Wooff, Chris	Network Rail	Chris.Woof@networkrail.co.uk	United Kingdom	Large number of monitored sites Site repair Alarm levels