

Introduction

In October 2012 the Italian Ministry of Education, University and Research (MIUR), within the *Projects of Relevant National Interest (PRIN) 2010-2011*, co-funded the research project on “Landslide risk mitigation through sustainable counter-measures” involving nine Research Units (*University of Salerno, as scientific coordinator; Polytechnic University of Milan; University of Naples “Parthenope”; Polytechnic University of Turin; University of Perugia; “Mediterranea” University of Reggio Calabria; University of Basilicata; University of Genoa; University of Palermo*).

The main goal of the above research project consisted in identifying the most suitable strategies for mitigating the landslide risk to which people, structures and infrastructures, economic activities and environmental assets are exposed, according to *technical* requirements and taking account of environmental, economic and social *sustainability*, along with landscape compatibility (DPR 207/2010). This goal perfectly matches the Objective 1 of the Technical Committee TC307 of the International Society for Soil Mechanics and Geotechnical Engineering on the “Sustainability in Geotechnical Engineering” [BASU *et al.*, 2015; BASU and PUPPALA, 2015].

As for the *technical* issues, reference was made to the risk management process given by FELL *et al.* [2008] which includes three sequential steps (*i.e.* analysis, evaluation and mitigation of the landslide risk). As for the *sustainability* of landslide risk mitigation, an original methodological approach was adopted due to the scarcity of scientific literature on the topics to be addressed, the complexity of the goals to be pursued and the widespread diffusion of the landslide risk over the national territory. The activities embraced a concept of sustainability that refers to either *i) the landslide risk management system*, within a strategic perspective to be developed at national, regional and municipal level [CASCINI, 2014; 2015] or *ii) the landslide risk mitigation measure* to be designed at slope scale [FERLISI *et al.*, 2014].

Given the aims and scope of the Rivista Italiana di Geotecnica (RIG), this issue is focused on the *sustainability of the landslide risk mitigation measure* and includes five papers highlighting new perspectives for *i) properly identifying the areas where landslide risk mitigation measures are required, ii) applying newly conceived landslide risk mitigation measures and iii) updating models to improve the effectiveness of traditional landslide risk mitigation measures*.

In particular, the paper authored by SALCIARINI *et al.* [2017] firstly describes the methodology adopted to create a database of both physical and mechanical properties of soils in the Perugia Province. Then, for rainfall-induced shallow landslides that might affect a selected study area of the Perugia Province, probabilistic physically-based models are applied to predict the triggering areas on the basis of the available geo-referenced data, with the aim of practical application in Early Warning Systems.

The paper authored by MUSSO *et al.* [2017] focuses on the chemo-hydro-mechanical behaviour of active soils, mainly considering the effects of pore water salinity on their volumetric and shear strength behaviour. Theoretical issues are firstly addressed; then, experimental procedures together with laboratory test results for a bentonite and a natural illitic-smectitic soil from the Langhe area are discussed in light of the proposed theoretical framework and of other well-known phenomenological evidences.

The paper authored by DI MAIO *et al.* [2017] focuses on a very slow earthflow, in the residual shear strength conditions, involving a marine origin clay shale of southern Italian Apennines; the proposed intervention consists in soil improvement by KCl wells. The results of in-situ tests highlight that, locally, the ion transport is such that a few months after the beginning of chemical treatments the increase in salt concentration is noticeable and the soil surrounding the sliding surface is exposed to a solution able to increase its shear strength, as demonstrated by laboratory tests.

The paper authored by GIOFFRÉ *et al.* [2017] presents the results of a research aimed at analysing the behaviour of artificial obstacles impacted by extremely rapid landslides, such as debris flows. Considering that the estimation of the impact forces is of relevant concern for designing this type of sheltering structures, the paper provides a procedure that – making use of geometrical non-dimensional ratios – takes into account most of the engineering factors governing the problem.

The paper authored by GALLI *et al.* [2017] deals with stabilizing piles employed either to prevent the occurrence of failure mechanism (on the basis of Ultimate Limit State analyses) or to reduce the soil displacement rate in creeping mechanisms or under seismic actions. The paper guides the designer from the definition of the geometrical and structural properties of these systems toward a rational application of the design methods, by critically considering the structure performance.

As coordinators of the PRIN research project, we thank the Authors of the papers for the excellent work done and the Editorial Board of RIG that promoted this issue for a proper dissemination of some relevant outcomes of the project. In this regard, we believe that the Geotechnical Community is ready to take up the incoming challenges posed by the *sustainability of the landslide risk management system* and, accordingly, to assume a more and more incisive role in the society.

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References

- BASU D., MISRA A., PUPPALA A.J. (2015) – *Sustainability and geotechnical engineering: perspectives and review*. Canadian Geotechnical Journal, 52, pp. 96-113.
- BASU D., PUPPALA A.J. (2015) – *Sustainability: an emerging discipline within geotechnical engineering*. Proceedings of the XVI ECSMGE on “Geotechnical Engineering for Infrastructure and Development” – Edinburgh, Scotland, United Kingdom, 13-17 September 2015 – pp. 2487-2492, ICE Publishing, Thomas Telford Ltd., London.
- CASCINI L. (2014) – *Criteri di analisi e gestione del rischio da frana: dal Governo centrale alle comunità locali. Relazione Generale*. In: La geotecnica nella difesa del territorio e delle infrastrutture dalle calamità naturali. Atti del XXV Convegno Nazionale di Geotecnica, Baveno, 4-6 giugno 2014 – vol. I, pp. 103-150, Edizioni AGI, Roma.
- CASCINI L. (2015) – *Geotechnics for urban planning and land use management*. Rivista Italiana di Geotecnica, 49, n. 4, pp. 7-62.
- DI MAIO C., VASSALLO R., SCARINGI G., DE ROSA J., PONTOLILLO D.M., GRIMALDI G.M. (2017) – *Monitoring and analysis of an earthflow in tectonized clay shales and study of a remedial intervention by KCl wells*. Rivista Italiana di Geotecnica, this issue.
- FELL R., COROMINAS J., BONNARD CH., CASCINI L., LEROI E., SAVAGE W.Z. on behalf of the JTC-1 Joint Technical Committee on Landslides and Engineered Slopes (2008) – *Guidelines for landslide susceptibility, hazard and risk zoning for land use planning*. Engineering Geology, 102, pp. 85-98.
- FERLISI S., CASCINI L., SACCO C., SCARPELLI G. (2014) – *Prospettive di sviluppo per la Normativa Tecnica sulla mitigazione del rischio da frana con interventi strutturali*. In: La geotecnica nella difesa del territorio e delle infrastrutture dalle calamità naturali. Atti del XXV Convegno Nazionale di Geotecnica, Baveno, 4-6 giugno 2014 – vol. II, pp. 525-532, Edizioni AGI, Roma.
- GALLI A., MAIORANO R.M.S., DI PRISCO C., AVERSA S. (2017) – *Design of slope-stabilizing piles: from Ultimate Limit State approaches to displacement based methods*. Rivista Italiana di Geotecnica, this issue.
- GIOFFRÉ D., MANDAGLIO M.C., DI PRISCO C., MORACI N. (2017) – *Evaluation of rapid landslide impact forces against sheltering structures*. Rivista Italiana di Geotecnica, this issue.
- MUSSO G., COSENTINI R.M., DOMINIJANNI A., GUARENA N., MANASSERO M. (2017) – *Laboratory characterization of the chemo-hydro-mechanical behavior of chemically sensitive clays*. Rivista Italiana di Geotecnica, this issue.
- SALCIARINI D., TAMAGNINI C., RONCHI F., VOLPE E., FANELLI G. (2017) – *An approach for large-scale soil characterization for the application of non-structural landslide risk mitigation*. Rivista Italiana di Geotecnica, this issue.