

Established in 1986

SLGS NEWSLETTER

SRI LANKAN GEOTECHNICAL SOCIETY

A Member Society of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE)

A Message from the Editor

2013 November: No 5

Dear Readers,

The annual general meeting and the annual conference of SLGS was held on 30th September At the ICTAD Auditorium. The theme of the annual conference 2013 was "Geotechnics for Infrastructure Development" and three presentations on Geotechnical Engineering applications in infrastructure development were presented. The abstracts of the presentations are given in page no 4 and 5 of the Newsletter.

In addition, in page 1 and 2, Prof. T. A. Peiris share his experience after attending a workshop on landslide and debris flow monitoring in China. Dr. Asiri Karunawardhana presents an article on ISSMGE International Conference, which he attended in Paris.

Dr(Eng). L. I. N. de Silva - Editor Newsletter
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Landslide and Debris floor: Monitoring, Early warning and Mitigation.

JSPS (Japan Society for the Proportion of Science): Core-to-Core Program, Asia-Africa Science Platform

Prof. T. A. Peiris

Joint research program on "Landslide and Debris floor: Monitoring, Early warning and Mitigation" has been initiated by University of Tokyo, Japan and sponsored by Japan Society for the Promotion of Science JSPS). International participants for this joint program include:

- Japan - University of Tokyo and Chuo-Kaihatu Corporation;
- China - Institute of Mountain Hazards and Environ-

SLGS Executive Committee for the year 2013—2014

The same Executive Committee that served SLGS in 2012 - 2013 was appointed for the year 2013-2014.



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Taiwan - National Chiao Tung University and National Cheng Kung University
Sri Lanka - University of Moratuwa and SLIIT
Thailand - Kasetsart University
Indonesia - Institute of Technology Bandung

Main focus of the program is to indentify active landslide and/or debris flow sites and instrument them for monitoring and hence develop guidelines for early warning systems. The monitoring data will be available for collaborative research. Research may include and not limited to:

- Development of effective monitoring devises;
- Modeling the failure mechanisms;
- Study on threshold values (eg. Rainfall, rate of movement etc.) and hence develop ;guideline for early warning;

The first workshop was held in Chendegu, China from 23rd September to 30th September with participation of members of the joint research program. Total of about 30 participants attend the workshop and presented ongoing research activities which includes:

- Deformation and water seepage observed in a natural slope during failure process by artificial heavy rainfall
- A case of slope failure prevention by using a low cost tilt sensor monitoring during national highway cutting slope construction
- Measurement of pore water pressure in a ground, temperature and rainfall at a slope failure in mountainous area
- Integrated field monitoring and warning for rainfall induced deep seated slope failure
- Concurrent Dual-band Radio Transceiver System for Rainfall Rate Measurement
- Application of shallow-water models in the analysis of landslide motion
- Assessment of Mudstone Slope Stability Using Monitoring data and Failure Mode Analysis
- Multi-way landslide detection and warning system for remote community
- Multiple Scale Pre-warning Method and Identification on Threshold Factors for Rainfall induced Mountain Hazards
- Research on deformation characteristics of Hongmeicun landslide and pre-warning indicators of critical sliding
- Experimental Study on the Initiation Mechanism of Debris Flow

The workshop is followed by field visit to identify sites for instrumentation and monitoring. Following sites have been visited:

Wen Chuan earthquake (in 2008) affected region. Landslides were triggered during and after the earthquake. The basin is still a potential landslide and debris flow area during and after heavy rainfall. The area inside the watershed is approximately 363 km² with an averaged slope of 18°. The slopes on the two sides of the gullies have angles from 45~75°, and accordingly

it is easy for slope failures to occur. Averaged annual precipitation is about 1135 mm. About 80% of the precipitation distributes from May to September. The maximum monthly precipitation is about 595 mm, while the precipitation of one day was as high as 234 mm. However, an extreme event occurred in 8th June 2013 with the record rainfall of 750 mm in one day.

Real-time monitoring and pre-warning system was constructed in 5 mountain hazards sites (ref. Fig. 1). These sites include 3 debris flow sites and 2 landslide sites. The system monitors the behaviors of rainfall triggered mountain hazards with sensors, such as inclinometers, a low-cost and simple monitoring method for rainfall-induced landslides, and Pluviometers, pore pressure meters, water content meters, video monitoring system for both landslides and debris flows, and ultrasonic mud level meters, infrasound monitoring meters for debris flows. (ref. Fig 2) The data is transferred through wireless network.

Two sites have been selected for the joint research program. These sites will be instrumented (if required), monitored and the data will be available for further research.

Future Workshops and Study Visits

Sri Lanka have been requested to submit proposal for a workshop and field visit to be held in mid next year (May 2014).

Delegates from Japan, Taiwan and China will attend and make presentations. The workshop will be open for practicing engineers (SLGS expects to invite about 100 engineers). Workshop will be followed by field visit to a selected landslide site under study. National Building Research Organization (NBRO) will assist in providing access to the landslide and share available data.

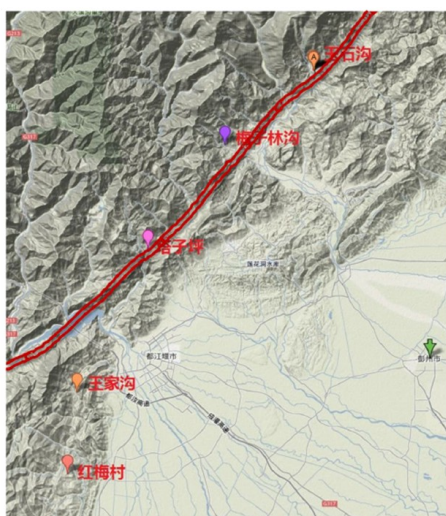


Figure 1: Landslide and Debris Flow sites

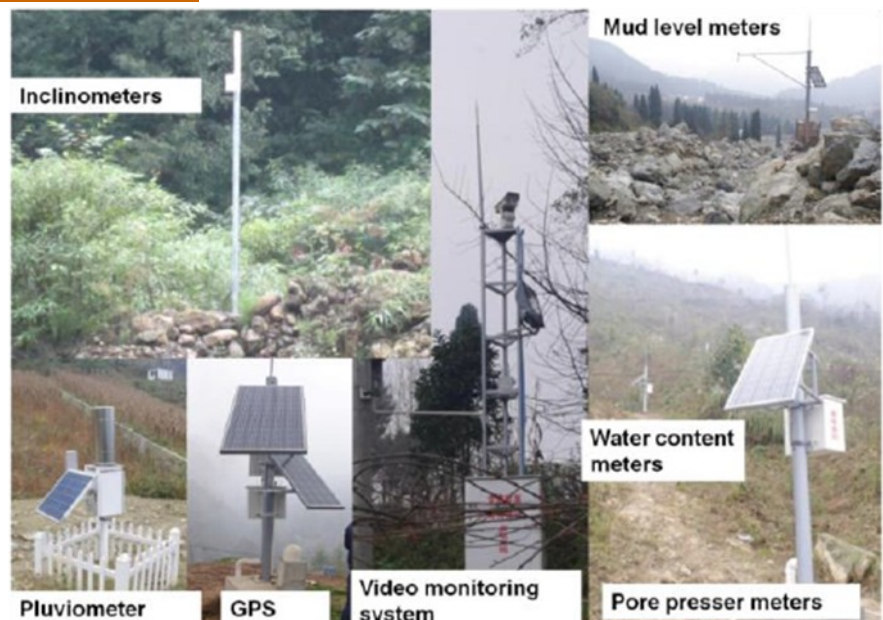


Figure 2: Instrument used for monitoring of Landslides and Debris Flow

The 18th International Conference on Soil Mechanics and Geotechnical Engineering (18th ICSMGE) was held in Paris, France, from Monday 2nd to Friday 6th September 2013. The main theme of the Conference was “**Challenges and Innovations in Geotechnics**”.

The Conference took place at the Paris International Conference Centre (Palais des Congrès) located at Porte Maillot, 1km West of the Arch of Triumph, very near the Champs-Élysées Avenue and the historical centre of Paris.

The conference commenced with the former president J. L. Briaud giving a presentation on “The State of the Society” in which a very interesting point was his 10 rules for success.

10. Chose the relentless pursuit of excellence as a way of life
9. Be curious. The discovery process is a fountain of youth
8. Work hard but balance your interests (fun, family , sports)
7. Make lots of friends. Nurture your public relations
6. Look for solutions and not who is to blame. Leave that to the judge
5. Be firm in your decisions but always be fair and polite
4. Treat others as you wish to be treated, you will lead by example
3. Communication is the best way to solve problems. Convince through logic and data
2. Surround yourself with smart people and role models
1. Go after your dreams with vision and perseverance

Thereafter, the 8th Terzaghi Oration was given by Susan Lacasse of the Norwegian Geotechnical Institute (NGI). The title of the lecture was “Protecting society from landslides – the role of the geotechnical engineer”. The lecture presented case studies of landslides, their causes and the way they were analyzed and treated. A very interesting case study was the Kattmarka landslide that occurred on March 13th, 2009 (which incidentally was Friday the 13th!) that was caused as a result of road construction. Main issues that led to the landslide were, among others, the limited geotechnical investigation and geotechnical design.

The Ishihara lecture was presented by George Gazetas from the National Technical University of Athens (NTUA). The presentation title was “Soil-Foundation-Structure systems beyond conventional seismic failure thresholds. He pre-

sented a novel approach of designing shallow foundations that are not designed to behave elastically in earthquake loading but to be able to work in extreme conditions and allow for uplift and bearing capacity slippage with acceptable limits of temporary and permanent deformations (settlements). This approach is contrary to current codes but it was shown that it could avoid structural damage and collapse.

In the conference, Manard Lecture was presented by J. L. Briaud on the title “The pressuremeter test: Expanding its use” in which he explained how to correctly utilize the PMT, how to execute the drillings and what the advantages of the pressuremeter test are. Furthermore he gave some reference values for preliminary design and some further extent of the test in liquefaction.

A. Sim of Soletanche-Bachy provided an excellent presentation regarding the construction challenges and difficulties for the new Bugis Station and associated tunnels for the Mass Rapid Transit in Singapore. Especially interesting were the methods used to overcome the passage of the tunnels and the station under or very near buildings.

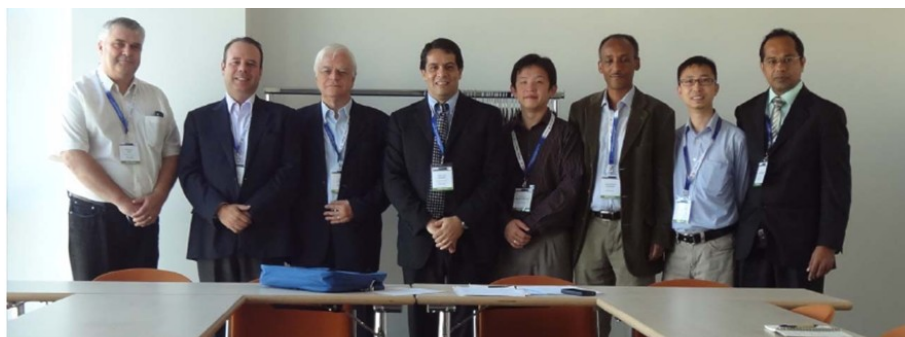
Professor R. Jardine of Imperial College presented the Bishop Lecture in which he presented a state of art of laboratory testing and the use in research and practice. The lecture covered driven piles in sand and the detailed laboratory evaluation of these sands in order to predict pile behavior in static and cyclic loading.

In addition to the above, there were 7 ISSMGE Honour lectures presented by the Technical Committees were held on the first two days of the conference.

The third and fourth days of the Conference were devoted to parallel sessions that included the discussion sessions and workshops. There were about 28 discussion sessions held to discuss the papers received to the Conference under different themes. In each discussion session, a general report and 6 selected papers were presented within a 1 ½ hour time period. Poster session also took place along with the Discussion Session. There were about 770 papers received from 70 member societies to the conference. In the last day of the conference, Technical visits were held. Also, the ISSMGE Technical Committee meetings were held during the conference period and there were discussions on the progress and future activities.

Meeting of ISSMGE Technical Committee on *Foundation Engineering in Difficult Soft Soils Conditions (TC-214)* at Palais des Congrès, Paris

September 04, 2013



From left to right: Wojciech Sas, Walter Paniagua, Gabriel Auvinet, José Luis Rangel, Chocolachat Rujikiatkamjorn, Berhane Gebreselassie, Ryan W. M. Yan, Asiri Karunawardhana.

Paris, September 04, 2013

The annual conference of SLGS was held on the 30th September at the ICTAD auditorium. Since there are several large scale infrastructure development projects currently in progress in the country, it was decided have the 2013 annual conference of SLGS on a timely theme “ Geotechnics for Infrastructure Development”. Three presentations on micro piling, tunneling and reinforced earth retaining structures were made at the conference. The abstracts of the presentations done at the annual conference are given below.

Micropile Foundation Systems for Railway Bridge Structures

K. L. S. Sahabandu

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Central Engineering Consultancy Bureau (CECB)

J. S. M. Fowze

Geotechnical Specialist,
Central Engineering Consultancy Bureau (CECB)

Tunnelling for Railway Infrastructure Development

C. J. Medagoda

Design Engineer,
Central Engineering Consultancy Bureau (CECB)

J. S. M. Fowze

Geotechnical Specialist,
Central Engineering Consultancy Bureau (CECB)

The Government of Sri Lanka undertook to replace and newly construct railway bridges in way of reinstating and developing the country's railway infrastructure .The Program included 8 Railway Bridges of which 5 of them were new ones at Kalutara North & South, Kelaniya, Ja-Ela, and Seeduwa.

Subsurface conditions at the new bridge sites demanded deep foundation systems. Given a wide range of options, Micropile foundation systems were selected as the appropriate foundation solution giving due regard to the working environment and requirement that the new bridges were to be constructed close to existing bridges.

Cement grouted, single steel tubes with 114.3mm/10mm or 127mm/12.5mm external diameter/thickness were generally adopted as micropiles. However, where weak organic and/or peat encountered at shallow depths, double steel tubes were proposed to avoid buckling failure which was governing the design. Geometric and strength properties of the outer tubes were 219.1mm/10mm ($f_{yk}=355\text{MPa}$ or $f_{yk}=560\text{MPa}$) while those of the inner tubes were 114.3mm/10mm or 127mm/12mm ($f_{yk}=355\text{MPa}$ / $f_{yk}=560\text{MPa}$) giving 4 types of micropiles. The allowable load bearing capacity of these micropiles were established as 1000 kN after verification by means of a static, maintained load test.

Accordingly, by implementing the finite element method (FEM), optimized micropile foundation systems including vertical as well as raked piles for the bridge structures were arrived at having modelled the soil-pile interactions realistically.

Construction techniques which were adopted to put up Sri Lanka's new set of major railway bridge structures notably after the colonial era were also presented with reference to land and river operations.

At its most basic, a tunnel is a passageway hollowed through soil or rock. The choice of tunnelling method is dictated mainly by cross-section and length, geological and hydrological conditions, limits of surface disturbance, local experience and time/cost considerations. The most common Tunnelling Methods could be classified as Classical Methods, Mechanical Drilling/Cutting, Cut-and-Cover, Drill and Blast, Shields and Tunnel Boring Machines (TBMs), New Austrian Tunnelling Method (NATM). The presentation discusses two tunneling cases for Railway Infrastructure Development adopting TBM and NATM methodologies. .

TBMs are used to excavate tunnels with a circular cross section through a variety of soil and rock strata. They can bore through anything from clay/sand to hard rock. Tunnel diameters can range from a metre (done with micro-TBMs) to 19.25 m to date. The case associated with TBM involves the construction of the Down Town Line (DTL3) of the Mass Rapid Transit (MRT) railway system in Singapore. The proposed length of the twin tunnels are 5km and the duration were the governing factors for the selection of the tunneling method. The tunnel with a diameter of 6.35 m, runs through the Kallang Formation (Soft Clay) and Old Alluvium (Sedimentary Formation). The design aspects of Bored Tunnel Segmental Lining are discussed under Geometric Design of Lining, Design Check for Segment, and Design Check for Ring for a selected section of DLT3/MRT.

The basic idea of the NATM method is that the ground, when properly treated can be used as part of the tunnel support. Precondition for this is the knowledge of the ground characteristics and its behavior during and after excavation. Use of the rock/soil mass as far as possible to take additional stresses resulting from excavation is significant, which implies that deformations should not be completely stopped by the support right after installation. But deformation should be kept below the critical level, where disinte-

gration (loosening) of the rock/soil mass occurs and monitor the behavior of the system to observe stabilization process and allow for adjustments. This method opted for a typical case based mainly on the tunnel

length, about 500 m, is discussed from the design and construction viewpoints including the Excavation for the horse-shoe shaped tunnel which is to run through a completely weathered Gneiss, Primary Support (Steel Ribs + Shotcrete) Design, Permanent Lining (Reinforced Concrete) and the Monitoring Plan.

Application of Geosynthetics in Railway Projects

Richard Ong

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This paper discusses on the use of geosynthetics in railway projects through three different case studies. Apart from using the case studies to illustrate the real life applications of geosynthetics in railway projects, this paper also presents the relevant background information on the use of geosynthetics in the construction of (1) foundation of a railway embankment using cellular foundation mattress, (2) reinforced soil walls and slopes for railways, (3) railway ballast and sub-ballast stabilisation using mechanically stabilised layer (MSL).

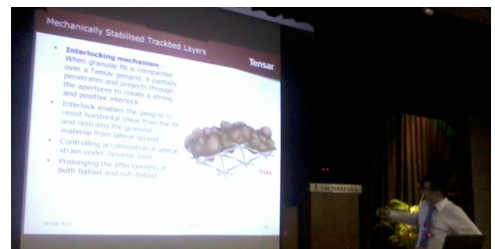
The first case study is related to the construction of a railway embankment over soft compressible deposits in Slovakia. The case study shows that the use of cellular foundation mattress together with prefabricated vertical drain (PVD) had enhanced the stability of the embankment and also reduced the total settlement. In addition, the use of cellular foundation mattress had also minimised differential settlement across the embankment.

The second case study is on the use of reinforced soil slope to repair a failed 36 m high cut slope beside a railway track in Malaysia. The repair work was carried out using an 8 m high reinforced soil slope with angle of 70° and re-profiling the failed slope. This case study illustrates the versatility of the reinforced soil slope constructed using high density polyethylene (HDPE) geogrids, where site won fill was used as fill materials. Furthermore, the use of steel mesh facing with closed turfing provided instant green to the repaired slope.

The last case study is on the use of MSL for sub-ballast stabilisation in a railway double-tracking project in Australia. It is shown that MSL can be used to enhance the bearing capacity over soft subgrade (i.e., sub-ballast stabilisation). This technique is beneficial to provide trackbed thickness reduction and overall costs reduction.

Based on the case studies presented, it is concluded that the application of geosynthetics in railway projects can be cost effective solutions to conventional construction methods.

Some Glimpses of the SLGS Annual Conference 2013 and the AGM



Top Left: Eng K. L.S. Sahabandu doing the presentation on micropile foundations

Top middle: Eng. C. J. Medagoda making the presentation on tunnelling

Top Right: Mr. Richard Ong presents on applications of geosynthetics in railway projects

Some participants at the Annual Conference 2013

Head table at the annual general meeting 2013



Forthcoming Conferences

- The 19th NZGS Symposium "Hanging by a Thread - Lifelines, Infrastructure and Natural Disasters (20-23 November 2013), <http://www.nzgs13.co.nz/>
- 10th International Symposium of Structures, Geotechnics and Construction Materials (26-29 November), www.uclv.edu.cu
- GEOTEC HANOI 2013 "Geotechnics for Sustainable Development"(28- 29 November), <http://www.geotechn2013.vn/>
- ISSMGE International Symposium on "Geotechnical Aspects of Underground Construction in Soft Ground" - IS-Seoul 2014 (25-27 August 2014)
- 8th International Conference on Physical Modelling in Geotechnics 2014 (ICPMG) (14-17 January 2014) ,<http://icpmg2014.com.au/>
- International Conference on Piling and Deep Foundations, Wednesday 21 May 2014 - Friday 23 May 2014, Stockholm,,Sweden, <http://www.regonline.com/builder/site/Default.aspx?EventID=1221506>
- 10th International Conference on Geosynthetics (10ICG),(21-25 September 2014), www.10icg-berlin.com
- 7th International Congress on Environmental Geotechnics, 10th November 2014, Melbourne Convention and Exhibition Centre,Melbourne,Victoria,Australia, www.7icg2014.com
- The 3rd International Symposium on Frontiers in Offshore Geotechnics (ISFOG), 10-12 June 2015, Oslo, Norway.www.isfog2015.no
- The 15th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering -New Innovations and Sustainability, Monday 09 November 2015 - Friday 13 November 2015, Fukuoka International Congress Center,Fukuoka,Kyushu,Japan , <http://www.jgskyushu.net/uploads/15ARC/>
- 3rd ICTG International Conference on Transportation Geotechnics, September 4-7, 2016, University of Minho, School of Engineering, 4800-058,Guimarães,,Portugal, <http://www.webforum.com/tc3>
- International Conference in Geotechnical Engineering - ICGE-Colombo 2015, Monday 10 August 2015 - Tuesday 11 August 2015, Colombo, Sri Lanka, www.slgs.lk

Forthcoming Events of SLGS

SLGS Project Day 2013

A competition among undergraduate research projects on geotechnical engineering that was conducted during 2012-2013 will be held on January 2014.

SLGS is planning to release a special issue of the SLGS Journal on " Soft Ground Improvement". Research papers are invited from the interested researchers. Papers will be peer reviewed before publishing

SLGS and ISSMGE Membership Fees

SLGS members are kindly requested to pay the membership arrears at your earliest. A notice indicating due fees is attached.

Please inform any changes in the contact details.

Membership Admission Fee	Rs. 200/=
Annual Membership Fee	Rs. 300/=
ISSMGE Fee	Rs. 1000/=

The SLGS Newsletter comes to you in volumes of four fascicles issued in February, May, August and November in each year. If you prefer to receive the newsletter by email, please send your email address to the editor, newsletter

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