Mainstreaming Slope Stability Hazard and Risk Management to Laos Practitioners in the Mountain Road Sector (SEACAP 21)

G Hearn and T Hunt, Scott Wilson Ltd, UK

Introduction

In 2006 Scott Wilson commenced a programme of slope stabilisation trials in the mountainous northern provinces of Lao PDR. This work was carried out in collaboration with the Ministry of Public Works and Transport as part of the South East Asian Community Access Programme (SEACAP), sponsored by the UK Department for International Development.

Much of the road network of Laos is located in hilly and mountainous terrain and, while the majority of the landscape is forested, landslides nevertheless pose an ongoing hazard to road operation. These landslides often coincide with periods of heavy rain; the climate of the country is monsoonal with a distinct summer wet season, with annual rainfall totals reaching over 4500mm in places. The slopes are often steep and the depth of weathering on many hillsides is often significant, thus creating a combination of factors that are conducive to slope instability.

Landslides on Lao roads cause frequent hold-ups to traffic, and this has a direct economic impact to road users and the wider community. The cost of landslide repairs is also high, and can account for between 50% and 80% of emergency maintenance costs.

Typical below-road landslide

The SEACAP Slope Stability Project

Through the Transport Sector Project, the World Bank is assisting the MPWT to move to a sector-wide approach in the planning and management of transport infrastructure. In this context, the World Bank requested the assistance of DFID in the development of a series of slope stabilisation trials.

The initial purpose of the project was to design and implement trials of slope stabilisation works with the maximum use of local resources, and to identify what

innovative techniques might be applied to help stabilise roadside slopes. The trials were undertaken on Road 13N and Road 7, both located in the mountainous region of the north. The trial sites comprised thirteen locations where the road had either failed due to landsliding from below or had been blocked or otherwise damaged due to slope failures from the slopes above. A combination of bio-engineering and geotechnical measures were designed and constructed. The bio-engineering comprised primarily grass and shrub planting, and trialled various techniques, either in isolation or in combination. The geotechnical measures involved various retaining and revetment wall types, drainage measures and surface protection schemes. Bio-engineers and civil engineers, employed through local consultants and seconded from the MPWT, assisted in the supervision of the works, carried out by local contractors.

Above-road remedial works using a toe revetment and bio-engineering protection

The success of this work led to an extension of the site trials to cover additional areas of road damage that took place during the 2008 wet season. Field investigations were carried out at six additional sites on Road 13N and preliminary designs for road reinstatement and slope protection were prepared for the MPWT.

The outputs of this work were disseminated via workshops and practitioner seminars in Vientiane, together with practitioner study tours to the trial sites. A Slope Maintenance Manual and a Slope Maintenance Site Handbook were prepared and issued in English and Lao, and are available of the SEACAP website (www.research4development.info/projects and programmes).

During the course of the project a separate study was undertaken into the feasibility of a National Programme to Manage Slope Stability. This study examined the incidence and damage caused by landslides along the Lao road network and assessed the resources and capabilities of the MPWT and related road management agencies to deal with landslide hazards. A number of recommendations were made for training and strengthening in the slope management sector, together with further implementation trials to act as training areas. The latter recommendation was partly addressed through the development of the additional trial sites in 2008, described above. The findings of this feasibility study are described in Hearn et al 2008.

The final element of the SEACAP 21 project involved the further mainstreaming of project outputs to Lao practitioners. This took place in 2009 and was completed in mid May. The mainstreaming was designed around the training of trainers from the National University of Laos and the MPWT, who have then proceeded to train practitioners in the subject of slope stability hazard and risk management. Six trainers were selected and were trained in the following subjects:

- Types of slope instability affecting the Laos road network
- Factors influencing slope stability in Laos
- Introduction to slope stability management
- Slope and roadside inspections and assessments
- Slope instability hazard and risk assessment
- Engineering geological assessments
- Remedial Measures: selection of options
- Remedial Measures: design
- Remedial Measures: construction
- Bio-engineering techniques of slope protection
- Integrated slope stability management

The training was carried out by members of the SEACAP team in English, involving specialists in civil engineering, geotechnics, geology and engineering geology, geomorphology, bio-engineering and road construction and maintenance. The training was based around the manuals mentioned above, and a site visit was made with the trainers to familiarise them with the slope stabilisation trials and related issues.

During the first two weeks of May the trainers were responsible for training 23 practitioners in the subjects listed above, in Lao. Most of the trainers came from the provincial offices of the MPWT, though some were selected from the MPWT headquarters in Vientiane and two came from consulting companies. The practitioner training commenced with a visit to the slope stabilisation trial sites and was followed by an intensive period of classroom training, which involved seminars, presentations, discussion groups and examinations.

Practitioner visit to trial sites

Formal classroom training

Overall, both the trainer training and the practitioner training were a success. The practitioners' knowledge and awareness in the subjects had significantly improved over the course of the training. They were each given copies of the manual, handbook and presentations and they will be able to disseminate these materials and what they

have learnt. The opportunity remains for further practitioner training to take place, thereby widening and strengthening the mainstreaming process.

References cited

Hearn, G J, Hunt, T, Aubert, J and Howell, J. 2008. Landslide impacts on the road network of Lao PDR and the feasibility of implementing a slope management programme. The First World Landslide Forum. Satellite Conference, Sendai, Japan, 11-12 November 2008.

For further information contact: gareth.hearn@scottwilson.com