NBRO

スリランカにおける降雨による高速長距離土砂流動災害の早期警戒技術の開発
Development of early warning technology for rain-induced rapid and long-travelling landslides in Sri Lanka

◆ Landslide Technical Forum
August 25 and 26, 2023

The National Building Research Organization (NBRO), in collaboration with the International Consortium on Landslides (ICL), has organized a Landslide Technical Forum under the project "Development of early warning technology for rain-induced rapid and long-travelling landslides in Sri Lanka (RRLL)."

The symposium was successfully held on August 25, 2023, at the Jasmine Hall of BMICH premises (Figure 1). This significant event was attended by renowned experts from Japan and NBRO scientists in landslide research and early warning systems.

The inauguration session started with a remarkable speech by project leader NBRO, Eng. (Dr.) Asiri Karunawardene, Director General of NBRO.

Figure 1: Group Photo of the Conference Participants at Landslide Technical Forum - 2023

Afterward, Ms. Yuri Ide, the senior Representative of the JICA Sri Lanka Office, addressed the audience (Figure 2). Further, Dr. Takashi Asaeda, Research Supervisor, Japan Science and Technology Agency (JST), delivered the greeting message (Figure 3). Also, the greeting messages were delivered by Mr. Athula Karunanayake, Director General of the Department of Meteorology (DOM) (Figure 4), and Mrs. Anoja Senevirathna, Director - Mitigation, Research & Development (Figure 5). Moreover, a brief introduction of the "Project RRLL" highlighting the achievements was presented by the Project Leader, Prof. Kazuo Konagai, at the end of the symposium's first session.

Figure 2: Ms. Yuri Ide, the senior Representative of the JICA Sri Lanka Office

Figure 3: Dr. Takashi Asaeda, JST Research Supervisor

Figure 4: Mr. Athula Karunanayake, Director General of the DOM

Figure 5: Mrs. Anoja Senevirathna, Director - Mitigation, Research & Development

The following three sessions mainly concentrated on the RRLL project's technical and social applications and shared all the essential findings.

Five presentations in Session 2 were about the core technologies vital for the RRLL Early Warning, precise one-day-in-advance prediction of rains in the mountains, and RRLLs.

The first presentation in Session 3 was the introduction of the Augmented Reality (AR) software that allows stakeholders an interactive experience that combines the real world (geographic information of pilot study sites) and computer-generated content (predicted rains and

RRLLs). The other presentations were about activities to refine the developed technologies and questionnaire surveys, the results of which will help develop an Early warning System in local communities, Divisional Secretariats (DS) divisions, DOM.

The presentations in Session 4 highlighted future tasks and things we should remember for sustainable and rational disaster prevention measures. They were about technology transfer and the increasing seismic activity witnessed on the island, which has never been in the World's earthquake-prone area.

After all sessions, Dr. Jayathissa, Project Manager and Director of LRRM Division NBRO, delivered the final remark on the first day of the symposium and welcomed all the participants to the next day's Mini-Symposium at the NBRO's main auditorium.

<u>Mini-Symposium</u>
Date: August 26, 2023
Venue: Main Auditorium, NBRO

The second day of the forum was for young Sri Lankan scientists who have been studying at Japanese universities and working with Japanese experts; all of these are vital for the RRLL Early Warning. The presentations of their proactive activities, comprising the heart of capacity building and sustainable technology transfer, are indeed what we can count on.

◆ Joint Coordination Committee (JCC) meeting
August 28, 2023

The JCC members shared a common understanding as follows:

(1) Achievements as of Aug. 2023, the 4th year of the 5-year project:

(1-1) Capacity development (Counterpart training in Japan)

● **Long-term training:**

1. Six researchers from NBRO were invited to Japan to pursue their doctor's degrees (4 students) and Master's degrees (2 students) in the fields of technologies involved in landslide risk assessments. They study at Kyoto University, Kochi University, The University of Tokyo, Tokyo Institute of Technology (renamed "Institute of Science Tokyo" in October 2024), and Yamanashi University.

● **Short-term training:**

2. Project members (from NBRO (6), CECB (1), and University of Peradeniya (1)) were invited to Japan to participate in the ICL – KLC conference held in November 2022 to discuss the research findings and future work to be carried out.

3. Two members (one from NBRO and one from DOM) were invited in March 2023 to the Tokyo Institute of Technology to learn and practice the current development of MSSG software.

4. Three members from NBRO went to ICL in March 2023 to learn and practice the ring shear apparatus and LS-Rapid landslide simulation software.

(1-2) Augmented Reality (AR) software is ready.

AR software allows stakeholders an interactive experience that combines the real world (geographic information of pilot study sites) and computer-generated content (rain and RRLL forecasts).

(2) To promote the further actions

Though the AR software is ready to use, refinement in each technology is required to predict rain and RRLL occurrences for better preparedness activities. The

NBRO researchers will do it while implementing it. They need to consider their achievements. Also, it would be helpful to examine the inventory of past RRLL events summarized in Project SABO (Output 1: Hazard and risk assessment).

◆ Group 3 Activities for introducing the developed technologies to local users

Groups 1 and 2 developed localized weather forecasting technologies, and AR was developed based on their provided data. Group 3 (G3) supports linking the technology (AR) with local government and people (Figure 6).

Figure 6: Linking technology and people

The weather forecast of AR is expected to be one of the information sources used to decide warning and evacuation. Therefore, the expected users of AR are local government officers and local people. Especially, local governments are essential for linking technology and local people. For the use of AR, G3 implemented the following interviews, discussions, workshops, and town watching activities.

Discussion with Assistant Director, Disaster Management Center (DMC)
Date: December 27, 2023
Venue: Kegalle District, DMC

The DMC District Office coordinates emergency services through the district police, district camp of the military, and Divisional Secretariats (DS). Since DMC is a key center for all kinds of disaster risk reduction, we discussed this with an Assistant Director, Mr. H.M. Anushka Chamile Bandara, and received the following comments (Figure 7).

- Hazard maps are already available; however, they are only utilized in some cases. Designated evacuation shelters are not enough. Each family should know its nearest and safe location with safe and easy access, since some vulnerable groups, including children, pregnant women, elderly people, sick people, and disabled persons, cannot evacuate to the far designated shelters in the dark mountain during the rain.

- Developing people's awareness is also needed. Local people often cling to their properties in poverty.

Figure 7: Assistant Director of DMC and G3 members at the DMC Office Kegalle

Session and workshop for local government officers
Since local government officers are expected to be the primary users of AR and the key link between the technology and the community, a session and a workshop were held as follows (Figures 8 and 9).

Session on Feb. 16, 2024, at DS Aranayake
• Total number of participants- 22

- Major participants- Kegalle D.S Office, Aranayake DS office, DMC, Kegalle, National Disaster Relief Service Center (Kegalle)
- Introducing the project

Figure 8: Group photo at the DS Office – Aranayake

Workshop on February 17, 2024, at DS Arayanake
- Total number of participants- 20
- Community people (Debathgama pallebage, Debathgama Udabage and Elagapitiya GN) Monk, Rathnajothi Temple, Ms. DO officer (Debathgama Udabage GN), Mr. Saman, Disaster Relief Officer (Aranayake DS office)
- Introducing the Project and the installed equipment to the community and the responsible parties.

Figure 9: Explanation by Mr. Ranjan Weerasinghe, NBRO

◆ Greetings from the project leaders

This SATREPS Project, with an implementation term from 2020 to 2025, develops a system for early transmission of information predicting torrential rains and landslides and for supporting risk assessment. It incorporates cutting-edge technology that predicts accumulated rainfall within a 500-meter grid.

Though the developed Augmented Reality (AR) viewing system can transfer crucial information about rain and possible landslide (RRLL) disasters predicted one day in advance, district administrative officers in charge of disaster management look at the AR screen must decipher the information required for residents' disaster preparedness, and tell it over the phone to the last mile where the WiFi reception is poor in torrential rains in the mountains. Simultaneously, the villagers should know where and when to evacuate.

As described in this Newsletter, we have been discussing efficient ways to implement the developed technology socially and came up with the idea of starting disaster prevention education conducted as a Training of Trainers (ToT) program, which engages master trainers (NBRO scientists) in coaching new trainers (village leaders and school teachers) who are less experienced with a particular topic of landslide disaster preparedness, and town-watching activities. They must be given in Sinhala so Sri Lankan stakeholders can probe proactively. Please stay tuned to the next issue of the Newsletter, which will report our ongoing social implementation activities.