

Engineering of Disaster Mitigation for Safe Early Warning System [Sensors / Instrumentation] and Decision Package for Landslide in the Himalaya Region of India

Ashok Anand

Associate Professor, Department of Civil Engineering, Roorkee College of Engineering, Roorkee, Uttarakhand, India



Abstract: Landslides are gravitational mass movements of rock debris or earth. They may occur in conjunction with other major natural disasters as floods, earthquakes and volcanic eruptions, expanding urbanization and changing land use practices have increased the incidence of landslide disasters. Landslides as catastrophic events include human injury, loss of life and economic devastation and are studied as part of the fields of earth, water and engineering sciences. The publication of integrated research on landslide processes, hazards, risk analysis, mitigation and the protection of our cultural heritage and the environment. a) Early warning system and evacuation b) New Technology, Expert and intelligent system c) Application of GIS techniques. D) Global landslide database. E) Monitoring including remote sensing and other. F) Non-invasive system. G) Land development and land-use practices. H) Landslide disasters in urban area and along critical infrastructure. I) Landslide related tsunamis and sciences

Keywords: EWS, GPS, LEWS, LH, RM, Landslide risk assessment, development of Early Warning System and control measures in landslide prone zones of Himalayas Region [INDIA]

1. Introduction

In many countries, economic losses due to landslides are great and apparently are growing as development expands into unstable hilly areas under the pressure of expanding populations. In spite of improvements in recognition, prediction, mitigative measures, worldwide landslide activity is increasing. A greater awareness of landslide problems has led to significant research in the subject. A considerable amount of work has been carried out worldwide to assess the landslide susceptible zones. In India, regional landslide hazard zonation maps of parts of

Himalayas have been prepared by a few organizations. However, no attempt has been so far made to prepare detailed hazard & risk map on large scale. In a global scenario advanced research for landslide early warning is now becoming popular. In India development of a near real-time landslide early warning system is an imperative task to provide an early warning. There are various techniques and types of landslide control measures available today. All such measures are site specific and they differ in different landslide scenario. **Globally** such measures have been designed and implemented as per the site condition. An integrated long term solution comprising of various control

Volume 9 Issue 2, February 2020

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

measures suitable for site specific landslide is an imperative task in the country's present disaster scenario.

A few laboratories of CSIR namely CSIR-CBRI, CSIR-CRRI, CSIR- CSIO, CSIR-4PI and CSIR-NEIST have initiated and made some significant contributions in the above mentioned areas of landslide disaster mitigation.



3. Scope of the Work

- 1) Site selection & detailed investigation.
- 2) Selection, procurement & installation of sensors and other facilities.
- 3) Field data collection, processing & establishing correlation with triggering parameters.
- 4) Evolving trigger threshold
- 5) Evaluation of early warning mechanism & its validation
- 6) Development of a working Landslide EWS
- 7) Structural analysis of proposed designs including modifications in the design alternatives and materials & construction techniques etc.
- 8) Field Studies to carry out comparative assessment of various organizations and to identify the gaps.
- 9) Collection of baseline data with respect to the present status of experimental site.
- 10) Development of process for mitigation of landslide

2. Objective

The aim of the proposed study is to Development of a region specific operational Landslide Early Warning System based on multi parameter trigger thresholds. The system will include sensing instruments, real time data transfer system, decision making mechanism & the multi-level alarm signal dissemination.



4. Deliverables

- Landslide Hazard and Risk Map
- GPS and Satellite Based Landslide Hazard Model
- Landslide Early Warning System

References

- [1] Gallus D. Abecker A. Classification of Landslide Susceptibility in the Development of Early Warning Systems.
- [2] CBRI: Roorkee.
- [3] Sarkar, S., Kanungo, D.P., and Mehotra, G.S., 1995. Landslide hazard zonation: a case study in Garhwal Himalaya, India. Mountain Research and Development, Vol. 15, pp. 301-309.
- [4] Jiang, G., Christie-Blick, N., Kaufman, A.J., Banerjee, D.M., and Rai, V., 2002. Sequence stratigraphy of the Neoproterozoic Infra Krol Formation and Krol Group, Lesser Himalaya, India. Journal of Sedimentary Research, Vol. 72, No. 4, pp. 524-542.
- [5] John M., Jha, V.K., and Rawat, G.S., 2007. Weight of evidence modeling for landslide hazard zonation mapping in part of Bhagirathi valley, Uttarakhand. Current Science, Vol. 92, No.5, pp. 628-638
- [6] Pareta, K., and Koshta, U., 2009. Soil erosion modeling using remote sensing and GIS: a case study of Mohand watershed, Haridwar. Madhya Bharti Journal of Physical and Natural Science, Vol. 55, pp. 57-70.
- [7] Sidhu, G.S., Rana, K.P.C., Sehgal, J., and Velayutham, M., 1997. Soils of Himachal Pradesh for optimizing land use. National Bureau of Soil Survey and Land Use Planning (NBSS&LUP), Soils of India Series, Vol. 5, pp. 38
- [8] Steck, A., 2003. Geology of the North-West Indian Himalayan. EclogaeGeologicaeHelvetiae, Vol. 96, pp. 147-196.
- [9] Burrard, S., and Heron, A.M., 1934. A sketch of the geography and geology of the Himalaya Mountains and Tiber. 2nd Edition, Calcutta, Government of India Press. pp. 335
- [10] Dai, F.C., and Lee, C.F., 2002. Landslide Characteristics and slope instability modeling using GIS, Lantau Island, Hong Kong. Geomorphology (Elsevier), Vol. 42, pp. 213-228.
- [11] Sah, M.P., and Bartarya, S.K., 2004. Landslide hazards in the Himalaya: policy and mitigation measures. In: Valdiya, K.S. (ed.), Coping With Natural Hazards. Orient Longman, pp. 165-179.

Appendix

- [12] Supported by Chinese National Programs for High Technology Research and Development.
- [13] Supported By the Key Laboratory of Surveying and Mapping Technology on Island and Reed State Bureau of Surveying and Reed State Bureau of Surveying and Mapping.
- [14] Supported By Key Laboratory of Advanced Engineering Surveying.