

COMMUNITY BASED PARTICIPATORY MODEL FOR NATURAL DISASTER PREPAREDNESS - LANDSLIDES

Eng. A A Virajh Dias & Eng. P R Wijewardana

Laboratory & Site Investigation Unit, EPC Division, Central Engineering Consultancy Bureau
(CECB)¹

Keywords: Roads, Landslides, Community, Participatory Process Oriented Planning, Hazard Mitigation, Disaster Management, Emergency, Knowledge Base System (KBS)

Abstract:

The community participatory method of approach is not ruled or specific. Success will always depend on "people's commitment" other than the "concept". Once a fruitful observation is entered, either as a new rule, step or change in the forms of preparedness because of newly recognized dependencies, the old knowledge must be correctly or completely updated or removed from the primary concept. This is a conceptual approach of observational method of assessment which can be applied when disaster strikes. The collective efforts of community participatory groups, volunteers' and local emergency service officials can be addressed to deliver the above message with an integration of preparedness into problems of everyday nature. To ensure that compassion and generosity of people are put to good use, the media should highlight various facts on what is needed and where to send it. Author suggests a more appropriate community participatory based information system which will support participatory process oriented planning, implementing, execution and monitoring for hazard mitigation. When planning interventions, prioritization is made on the basis of hazard, geographical location, vulnerable groups and nature of activities; co-operation with governments, NGO's and the private sector and volunteers. This may be a simplest model approach for mitigation planning including activities that prevent an emergency.

1. Introduction:

Landslides are often a secondary hazard related to other natural disasters. Human resource is the backbone of all other activities pertaining to development and economic growth of a country or a region. Infrastructure development and maintenance too need to be preserved against the same. Consequently, the investigations of slope instabilities have been increasingly integrated with broader aspects of hazard assessments and mitigation. Questions are commonly encountered in selection, diagnosis, evaluation, interpretation, prediction, monitoring and control. The efforts have neither reduced the frequency of disasters and resulting damage nor the level of vulnerability in the hilly region due to a variety of reasons. One of the main reasons is that various efforts lack strategy to integrate disaster management within the broader development context. Another is that most mitigation programmes rely on scientific data and advanced technology and are "hazard-centered" rather than "people-oriented," therefore less relevant to specific locations.

¹ No. 11, Jawatta Road, Colombo 5, Sri Lanka. Email : CBLAB@SLTNET.LK or virajh@mailcity.com

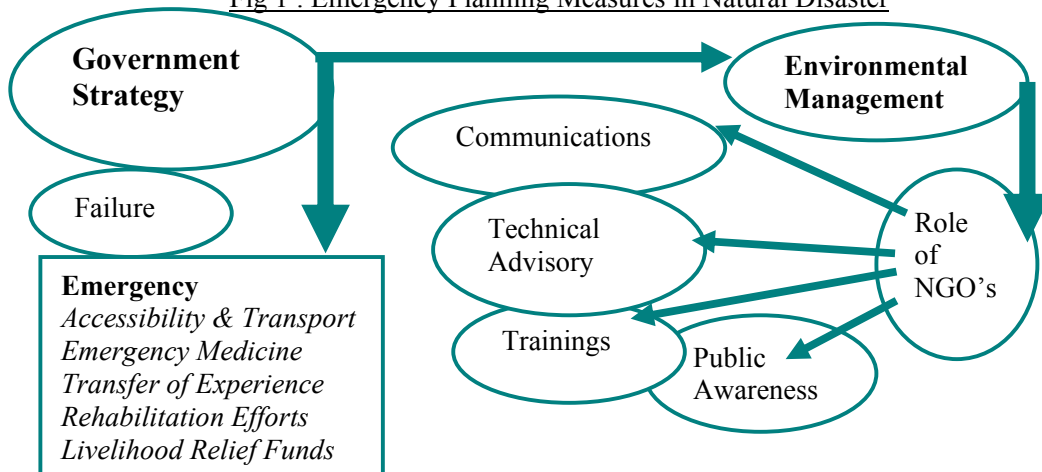
Most of the reported natural disasters in Sri Lanka are rain induced landslides and flooding. Between 1964 and 1991, floods are reported to have killed about 750 people and left about 1.3 million homeless. Landslides, which are often triggered by intense rains, are responsible for about 300 casualties and considerable losses to road and infrastructure; approximately about 10,000 sq km of the hill Country. Some statistics are given in Table 1 below.

Table 1: Landslides Occurrence against Landuse Patterns of Hill Country [Source: District Integrated Development Project, Nuwara Eliya, Sri Lanka]

Landuse Pattern	Nuwara Eliya Distric Area % Occurance of Landslides	Badulla District Area % Occurance of Landslides
Forest	28%	31.6%
Scrub land	16.4	16.2
Tea Cultivation	38.8	16.9
Chena & Tobacco	6.4	10.1
Paddy & other annual crops	5.5	9.4
Home gardens	4.8	15.8

To accommodate a rapidly growing urban population in hill country, Sri Lanka, the built environment has been transformed within the past two to three decades by reconstruction and destruction of traditional homogenous building stocks without consideration being given to landslide risk. The peripheral agricultural land, haphazard settlement, ignoring natural hazards without basic amenities, is converting the entire area into a disaster-prone zone. The lack of a systematic disaster planning implementing strategy is mainly responsible for most of the events. Now efforts have been formulating on design, research and implementation strategies which are specifically looking at landslide mitigations.

Fig 1 : Emergency Planning Measures in Natural Disaster



Authors pin point that some of the added advantages of community participatory programmes have successfully raised the capacity of society in vulnerable areas to prepare and manage plans for disaster in an emergency and risk reduction (Fig 1 & Fig 2). One primary observation is that a selected group of Local Communities should be empowered to plan and initiate their own development programmes, including mitigation of disaster with, for instance, devolution of power to rural committees through legislation. The public awareness is compulsory for better understanding and better response with the impact of disasters, both prediction and prevention.

2. Know Your Risk

The vulnerability of the people in the hill country Sri Lanka increases every year as a result of population growth and increasing rural-to-urban migration pattern. Landslides pose a permanent threat to Sri Lanka and economic underdevelopment accentuates the extent of losses. However, emphasis is on the physical process and infrastructure development, with less attention given to human components. Most of these programmes, though successful by their own criteria, are less tangible in having any impact on the society, not only due to lack of coordination and continuity of the mitigation work. The Local context of sustainable environment and community vulnerability have been largely ignored

Change in slope or geomorphology from naturally or man made events may cause disequilibrium between earth mass, transported material, flow debris, and sediments. The mechanism of disequilibrium events of terrain instability can be recognized with different type of movements as recorded in Table 2.

Table 2: Geomorphologic Disaster Proven Risk Elements in Landslides

Type of Movement	Type of Material in fall, flow or deposited		
	Bed Rock	Debris (coarse soil particles)	Earth (fine Soil, soil water mixd)
Fall	Rock fall	Debris fall	Earth fall
Topples	Rock topple	Debris topple	Earth topple
Rotational Slides	Rock slump	Debris slump	Earth slump
Translational Slides	Rock block slide Rock slide	Debris slide	Earth slide
Spreads	Rock spread	Debris spread	Earth lateral spread
Flows	Beadock flow	Debris flow Debris avalanche Block stream Soil creep	Wet sand flow Rapid earth flow Earth flow Dry earth flow(sand & fines)
Complex	Composite failures in rock including topple, fall and slump etc.	Slump and earth flow	Composite failures in soils including fall and sliding etc.

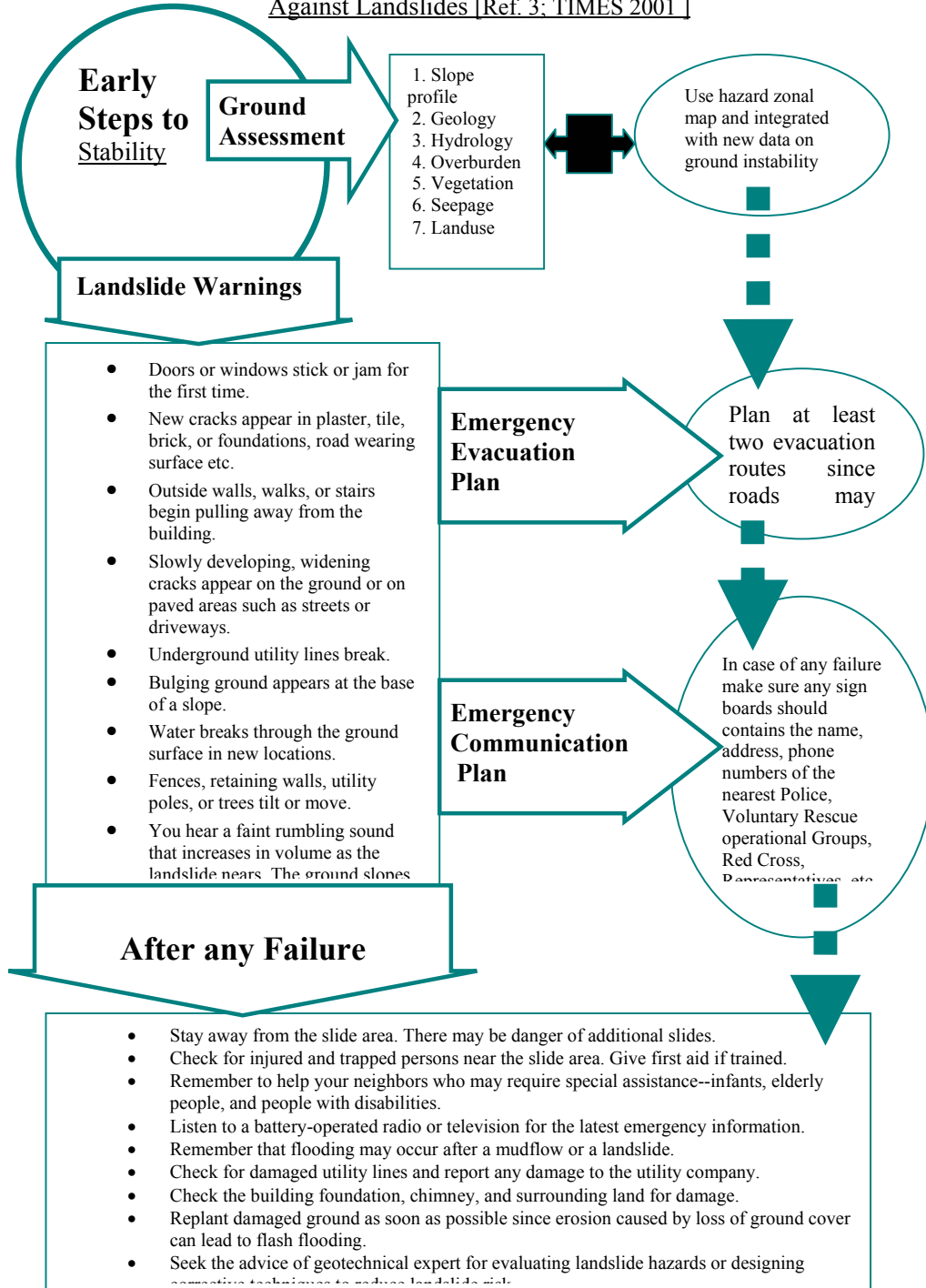
Rapid landslides are debris flows, debris avalanches and rock falls and rock avalanches. Slow, ductile toppling of rock masses commonly create large-scale mountain slope deformations. In some cases, toppling can initiate a brittle catastrophic rockslide. The failure behavior of landslides in clay soil and residual soil are very different from above. Some continue to exhibit intermittent, relatively slow deformations with limited mobility. In some instants suddenly developed into a catastrophic failure, extremely rapid flow slides with various combination of soils and rock. These may cause damming of large rivers in the course of a few minutes and projecting a wave onto the opposite bank and subsequent failures as well. Typical example of earth failure was recorded at Ocdagala mountain range, Mandaramnuwara, Sri Lanka in 1986.

3. Acceptable Risk

There is no simple approach for the determination of the potential risk of landslides. The concept of acceptable risk is an important one but there is currently no definition of acceptable risk associated with landslides or sensitive terrain. Even a landslide hazard integrated map still produces less accuracy compared to the present day victims. One reason is that regional planning measures are restricted to geomorphic data log rather than the inherent geotechnical contents of the ground.

The lack of clear definition regarding the “acceptable risk” is plainly evident in the terrain stability classification themselves. If detailed terrain mapping is available, the areas can be designated as having “a low, moderate or high likelihood of landslides”. Therefore, the acceptable risk concept in landslide area is valid only if it establishes a continuous vigilance monitoring unit as a disaster risk reduction and emergency planning against landslides (Fig 2).

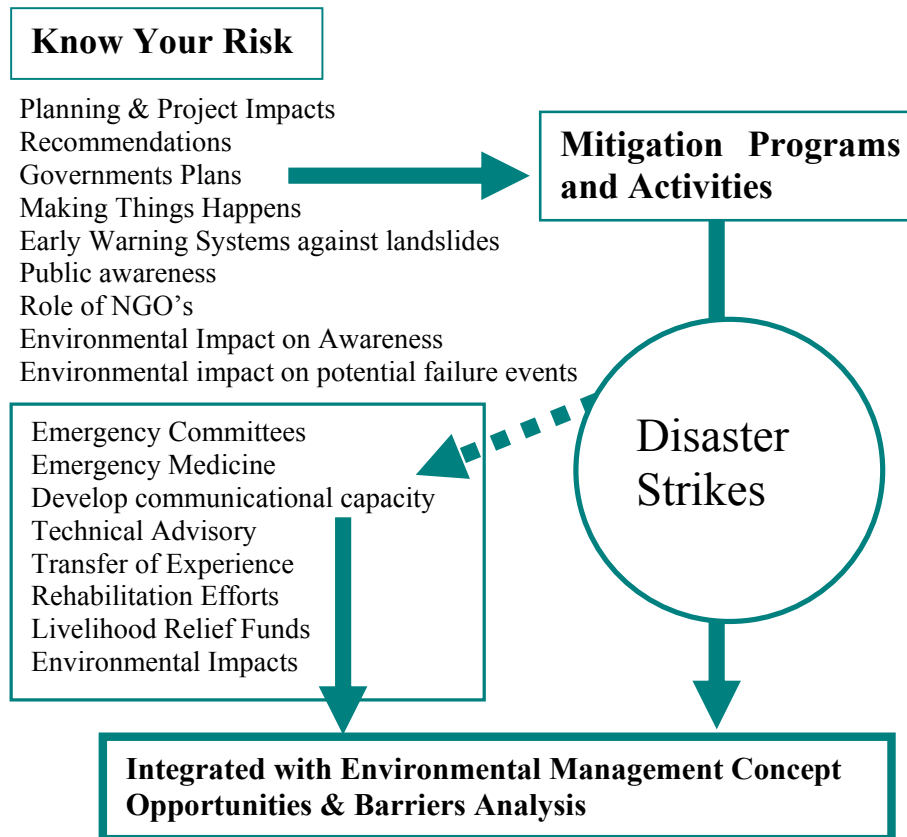
Fig 2 : Data Acquisition Model for Natural Disaster Risk Reduction & Emergency Planning Against Landslides [Ref. 3; TIMES 2001]



4. Strengthening Local Disaster Preparedness Structure

The growing complexity of relief appeals has resulted in major international policy reviews underlining the importance of linking relief, disaster preparedness and development. The UN World Conferences, the European Commission, and more specifically the European Community Humanitarian Office, announced their Action Programme for Disaster Preparedness. Considering the primary observations of above findings, the authors suggest a KBS Model (Fig 3) which can be forecasted and strengthen the local disaster preparedness structure.

Fig. 3: KBS Model

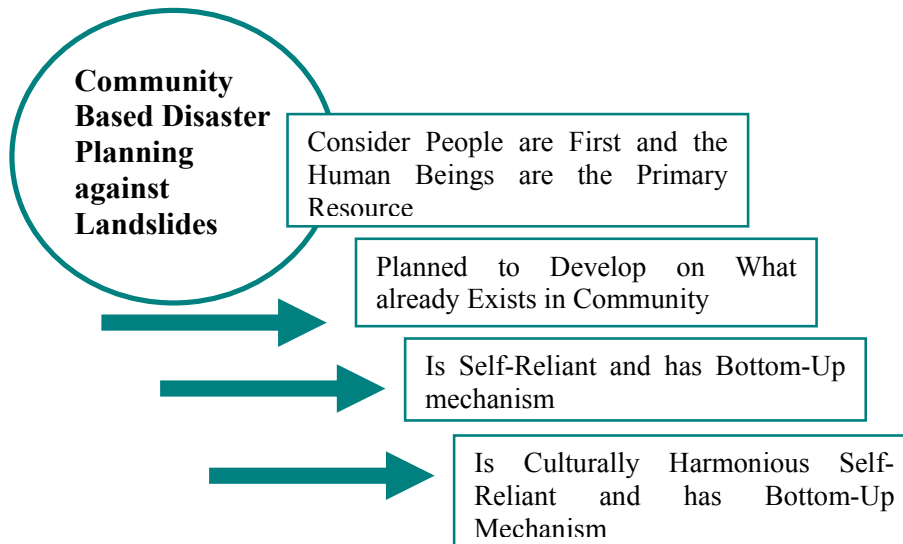


5. Making Things Happen

Many of the good concepts developed in the area of facing disaster and hazard mitigation have not reached the implementation stage successfully due to two reasons. One is validity of these concepts has not been tested through interaction with the community participation. Secondly, the policy makers bureaucracy attempts to implement the programmes without involving the effective community participation. The participatory oriented programmes (Fig 4) are always initiated from the grass roots level of the community, implemented within the community and benefit the community. Therefore, it is always strengthened by self reliance, empowerment, minimization of suspicion and fear, satisfactory mentality, reduction of emotional distress & mental unrest, consolidation of institutional supports and ultimately establishment of a sustainable society. Therefore, this will ensure a reduction in the loss of life from natural disasters events and ensure sustainable recovery. The volunteers and group of trained staff are required to express and initiation work, so that working with other grassroots community participatory groups, organisations could address the needs of vulnerable communities; those of greatest risk from

situations that threaten their survival or their capacity to live with a minimum of social and economic security and human dignity.

Fig 4: The Logical Approach of the Community Base Participatory Model



6. Community Participation and growing Empowerment

Community participation is a concept which respects the target group ideas and the confidence in a sense of ownerships. Therefore, beneficiaries are enhancing the sustainability. In addition, objective strategy mainly rest on people's participatory order, to ensure that vulnerable groups are fully represented in decision making through better definition and communication. This form of approach will enhance empowerment. These mechanisms have successfully raised the capacity of non governmental organisations such as Red Cross Society, Youth Rehabilitation Organisation, etc., in the region to prepare and manage plans for disaster preparedness and response risk reduction. It has also increased the interaction between National Societies and Community Participatory Groups. This shares the principles of;

- Sharing cost - beneficiaries contribute self capacity, material and money
- Increasing efficiency - beneficiaries assist in project planning and implementing
- Increase the Effectiveness - beneficiaries will look on outcome in due time
- Building beneficiaries capacity - beneficiaries share in management task or operational responsibilities
- Increasing community Empowerment - beneficiaries share power and increase their social awareness and influence over development outcome

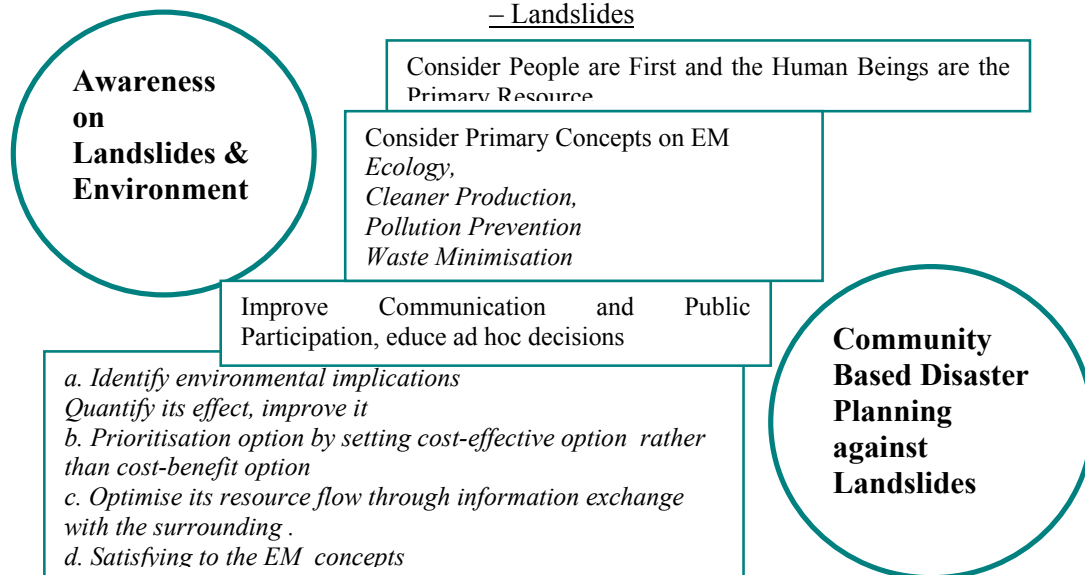
7. Role of NGO's

Implementation of NGO's should include disaster awareness and public education as well as community organization and community micro projects. When planning interventions, prioritization is made on the basis of hazard, geographical location, vulnerable groups and nature of activities; co-operation with governments, NGO's and the private sector; and integration of preparedness into problems of everyday nature. In order to increase efficiency of delivery services, it has been decided to decentralize authority, which require a long-term evolution of political structures.

8. Integrated with Environmental Management Concept

An integration with the environmental management (EM) concepts (Fig 5) can be developed by simplifying and integrating four known environmental management criteria which declares “the continuous improvement of process, product or services to reduce the use of natural resources, to prevent pollution at its source, to reduce the volume and toxicity of generated waste and consequently reduce the human and the environment”. Therefore, ecological stability; pollution prevention, cleaner production and waste minimization acts as the goals or objectives for disaster mitigation planning measures and improves environmental performances. Most instances ad hoc decisions have just managed an emergency crisis and do not obey the environmental disciplines or requirements. The significant observations are re-settlement, re-rooting of highways and rehabilitation of community, just after the event of a disaster. The effect of environmental threat can be minimized by adopting a system view of primary issues as in the log form assessment chart (Fig 5) given below.

Fig 5: Environmental Management Concepts which are applicable to Natural Disaster Mitigation – Landslides



Environmental Management Concepts / practices				
	Ecological Stability	Cleener Production	Pollution Prevention	Waste Minimisation
Aims	Promote sustainability	Waste minimisation	Reduced risk to humans and the environment	Reduction of quality or toxicity of hazadius wastes
Focus	Minimise the speding of environmental threat after the event	any industrial factories, hospital wastes within the landslide vulnerable areas and focus on protection in an emergency	Chemical storages, petroleum storages, fertilizer storages within the landslide vulnerable areas and focus on protection in an emergency	Individuals, industrial etc.

9. Opportunities & Barriers Analysis

Opportunities and barrier analysis will express the requirement of the continuous monitoring and auditing on conceptual planning and management. This will create an arena for attention on human beings during operation. Some parties always put economic benefit in the first in priority. In such instances, they have to reduce the cost component by applying not recommended techniques or no provisions for environmental sustainability. It is not the problem of lack of awareness, it is primarily due to ignorance. Also, environment is not an urgent issue in people's life when basic needs are still lacking in the developing or under developing countries in the world today.

10. Conclusion

The community participatory approach of disaster mitigation – landslides is to provide an opportunity for government and non government professionals in a country to understand the common problems in nature and develop a mitigation concept with broader idea. Some of the key areas of concern are livelihood relief, gender assessment and complexities in coordination. Therefore, the successor organization should broaden its contacts and activities to deal not only with governments and specialists, but all stakeholders at all levels. This means the local communities should be empowered to plan and initiate their own development programmes to some extent, including mitigation of disasters with, for instance, devolution of power to rural committees through legislation.

11. References:

- [1] «Pre Feasibility Study for Designing Major Roads in Landslide Area, *Volume 1 & Volume 2*», *Central Engineering Consultancy Bureau, June , 2000, Sri Lanka.*
- [2] Mendis, W ; Senior Professor, Department of Town & Country Planning, University of Moratuwa «Human Settlements Planning & Development in Areas Prone To Natural Hazard», *August, 2000, Sri Lanka.*
- [3] Dias, A A V, Goonasekara, U & Rupasinghe, N., « Natural Slope Instability Measures of Roads in Hill Country, Sri Lanka », *TIEMS 2001, 8th World Emergency Management Conference, Oslo, Norway from 19th to 21st June, 2001*
- [4] Dias, A A V ; « Stability Attribute on Discrete Boundary Shear Strength of an Earthslide-Lessons from the Watawala Earthslide, Sri Lanka »; *3rd Young Geotechnical Engineer Conference on Geotechnical Engineers in Asia; 2000 and Beyond, Singapore, 14-16 May 1997, Vol 1, pp 627-638.*
- [5] Bhandari, R K & Dias, A A V; « Rain Triggered Slope Movement as Indicators of Landslide Dynamics »; *7th International Symposium on Landslides;* 17-21 June 1996, Trondheim, Norway.
- [6] «Urban Environmental Management – Lessons Learned & Future Directions », *MEIP Workshop, 7th to 9th december, 1998, Colombo, Sri Lanka.*

12. Acknowledgment

The authors would like to thank the project team of the Pre Feasibility Study of Designing of Major Roads in Landslide Area, Central Engineering Consultancy Bureau (CECB) for their association and help extended at various stages. The views express in the paper are however those of the authors only. Our grateful thanks are due to Eng. H B Jayasekara, Chairman and Eng N Rupasinghe, Additional General Manager, Central Engineering Consultancy Bureau for the permission and encouragements. The all assistance received from the Mr. B M P A Mapa , Project Manager, Laboratory & Site Investigation Unit & the Staff is gratefully acknowledged.

The International Emergency Management Society
9th Annual Conference Proceedings
University of Waterloo, Canada, May 14-17, 2002