

Cultivation of Landslide Disaster Resilience Culture Throø School Environment

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ABSTRACT : In the past few years it was observed in the Kandy District both human lives and the property have been lost.

As an adequate prevention measures the landslide monitoring research division of the National Building Research Organisation (NBRO) and the senior geologist have studied thus devastated sites and other probable places of danger have been thoroughly investigated. This data have provided to all the parties concerned as a precautionary and remedial measures.

Primarily the affected schools and premises since 2009 have been examined and probable of such schools, as have been earmarked. Certain schools for the potential danger of landslides and by this year 2011, as no requisite measures had been taken since schools have to close either permanently or temporarily as the situation demand. When during heavy rain these steps should have to be taken.

Accordingly, geographically, topography and time span data those studied and data comprehensively / extensively tabulated. Further, the construction means and methodology and standard data etc, far more obtained. Furthermore, from the students, their social backgrounds too have been investigated.

Potential areas of landslides and the nature of structures and other useful data, for adequate disaster management both technical and geological methodology should be established. The school premises, adequate knowledge about disaster management should be in calculated for safety and well being of the all those concerned.

Meanwhile, the remedial steps that are to be taken to minimize the landslides disasters are very important. Furthermore, for the rest of the schools their location and steps to be taken in an extreme condition should be given (in this regard a pilot project has been carried out).

2. INTRODUCTION

Torrential rains during the last few weeks, that devastated the Kandy region caused naturally occurring landslides, thus damaging large number of human lives and property.

Subsequently, National Building Research Organisation (NBRO), Landslide Risk Reduction & Mitigation Division (LRRMD) promptly carried out in site observations and carried out extensive field trials to identify various locations and sectors those are prone to landslides.

Primarily the schools and school precincts that have been damaged since 2009 or devastated by

landslides have identified within the Kandy region. Accordingly, about 30 such schools (Table 1) were under observation and as of November, 2012, the same group of schools are still being repeatedly hit by natural calamities.

Quantity, the remedial recommendations, those were given to such schools never have been carried out or grossly over-looked. As a result of these unfortunate phenomena, certain schools had to be close down temporarily and some schools faced sine-die closure. Other possible alternative is to shift the Problem type Schools to safer locations. But this is not very practical solution.

A few selected schools those faced landslides were studied and various geo- scientific data were obtained. Further improper building erection methods and dilapidated building scenarios were witnessed. Details of student life styles and their family details, too were recorded for comprehensive analysis.

Certain schools buildings that experienced unfortunate landslides were by no means to be in their place. In certain extreme situations there were certain hillocks and gigantic trees those were really threatening potential land sliding at any time.

When all these vital parameters are taken in to consideration, the very concept of building a school and the well being of the students are essentially great. Protection of the lives of school children is a responsibility of the state. That is to provide a full-pledged education system that is well balanced academically and otherwise.

Geologists and learned professionals believe in closure of schools or any other institution for that matter, is not a panacea for all the problems. So, the question of paramount is to carry out necessary

and sufficient field trials and obtain experimental details for a comprehensive analysis to re-establish the schools in the said questionable locations with sufficient and technical reinforcements, hence landslide could be reduced.

To establish a school in a certain locations, conceptual design, geographical location, the attitudes and social parameters of the student-population, parent ó teachers cooperation for the development of school in general ..etc are to be carried out.

Further, bookish knowledge of school children about landslides should be transformed in to a practicable exercise, so that the students are not provided a monster ward, òLandslide ò to get scared. It should be a term accompanied in the school curriculum with practical solutions to combat, once it appears from somewhere.

In building schools the remedial steps to prevent or to minimize landslides should be considered in detail. This paper discussion such critical factors, with a very optimistic approach to cope-up with landslide syndrome.

2. OBJECTIVES

- To establish and identify the locations of schools that faced landslides and the use of map (Landslide Hazard Zonation Map ó LHZM) made by NBRO and predict the possible danger there by.
- To formulate as to why and how, the landslide (slippage) of soil , rock dislocation around schools premises and infer conclusions as to how these formations do occur.
- In the school premises proper surveying of land should be done and then to provide the requisite planning for development work.
- To establish a system to have landslides at minimum level or reduced, and then to develop a fresh frame work and to do the needed legal enactments, under a re-pealed new law.
- To carry out a detailed geological investigation and to design a system to minimize landslides and introduce this modal to other potentially vulnerable areas.
- Existing limited knowledge of landslide prevention at school level should be broadened and a tangible and practical method (s), such as cultivation of disaster mitigation knowledge should be widely

given to all the schools to make a strong awareness about landslide phenomena.

- Prevention of landslides in the schools is a tremendous beneficial for the education system and it is a good indication for the economic stability of the state, because of education nearly take 3 % of our Gross National Product (GNP).
- To observe global landslide phenomena and to learn advanced techniques of landslide prevention and handling will do us a ward of good. These methods definitely enhance our systems and pave a way to landslide free country.

3. OBSERVATIONS

- Landslide occurring since 2009, that affected certain schools in the heart of Kandy Town were isolated, in four (04) of such schools, the following observations were observed.

i). Gothami Balika Vidyalaya at the center of Kandy down ó town, does not indicate any natural risk with regard to landslides. On further investigations it was revealed that the school buildings were haphazardly erected and to worsen the situation no proper water drainage system was not installed.



Fig 01- Earth cut collapsed on November 2010 and caused to damaged back side wall of the school building.

Table 1.- Landslide and rock fall threatening schools around the Kandy District.

School Name	Divisional Sectary Division
Vidyartha Vidyalaya	Gagawata Korale
Gothami Balika Vidyalaya	Gagawata Korale
Sivanandan Tamil Collage	Gagawata Korale
Pushpadana Balika Vidyalaya	Gagawata Korale
Hilwood Collage	Gagawata Korale
Mahamaya Balika Vidyalaya	Gagawata Korale
Dharmaraga Vidyalaya	Gagawata Korale
Shri Sumangala Vidyalaya	Gangawata Korale
Haragama Vidyalaya	Gangawata Korale
Halouluwa Navodya Vidyalaya	Harispaththuwa
Bothota Kanishta Vidyalaya	Harispaththuwa
Shri Piyarathana Maha Vidyalaya	Harispaththuwa
Minigamuwa Maha Vidyalaya	Galagedara
Kasawaththa Muslim Kanishta Vidyalaya	Pujapitiya
Molagoda Maha Vidyalaya	Pujapitiya
Galkanda Kanishta Vidyalaya	Pujapitiya
Parakrama Kanishta Vidyalaya	Pujapitiya
Kali Mahal Tamil School	Akurana
Kdugannawa Kanishta Vidyalaya	Yatinuwara
Hindeniya Muslim Kanishta Vidyalaya	Ytinuwara
Peradeniya Pushpadana Vidyalaya	Ytinuwara
Peradenya Senior College	Ytinuwara
Devinuwara / Uda Aludeniya Vidyalaya	Udunuwara
Kurukuththala Muslim Vidyalaya	Gampola
Jinaraja Vidyalaya	Gampola
Gampola Buddhist Collage	Gampola
St. Josup Balika Maha Vidyalaya	Gampola
Yatiravana Vidyalaya	Pathadumbara

Landslide affected schools have been investigation since- 2009

- This can be a prime reason for earth-slip to occur.

- Often cracks are clearly visible on the wall of the school buildings (see Fig 02).



Fig 02 6 Ground movement warning signal could be identified through the cracks opening on the wall of the school

- Today the danger of landslide or earth cutting failure has risen to a higher level mainly because of the said factors.
- Although the many a buildings have sprung up, but at least minimum health facilities are not provided the children.

ii) Wategama Maha Vidiyalaya in the Divisional secretariat of Wategama.

- Collapsing a certain buildings by earth cut and the damage done is clearly visible (see Fig 03) (particularly damage caused to the chemistry lab).
- The large earth masses or lumps going up to heights of 100 feet or above, just behind the school walls. This situation is grave.
- School play ground and the access road is encompassed by large earth blocks (lumps) since 2009, so damaged buildings still lie at the same state and further earth cut are causing danger.



Fig 03 Completely damaged to Chemistry building, caused to collapsed unstable vertical earth cut due to torrential rainy period of Nov.2010



Fig 04- The height of the unstable soil cut still is casing to danger. As shown in period of November 2012.

iii) In Galkanda Kanishta Vidiyalaya on the way to Poojapitya via Ankumbura Since 2005, the school is threatened by potential landslides.



Fig 05- Natural rock and soil masses collapsed and caused to damage wall of the school building period of November 2010.

- The torrential rains in 2009, the earth blocks behind the school building, forced up the school building thus causing damage(see Fig 05).



Fig 06- Still natural landslide threat happened at the school premises when the period of November 2012.

- In 2012 rains dislodged and few earth lumps and some rocks, but no substantial harm were done to buildings (see Fig 06).
- The steeply sloped location (scarp slope topography) at the school land does not fit to build a school, and this is not an good Situation.

iv) Molagoda Maha Vidiyalaya in the district of Kandy on the way of Bokkawela.



Fig 07- Natural rock fall threatening exposed at behind of the school building and play ground, rock fall was recorded due to the rainy on November 2010.

- In 2010 it has been reported substantially large blocks of rock, earthen masses / lumps falling these causing trouble (see Fig 07).
- Further, Just behind the school ground, large rocks show a potential danger for the school.



Fig 08 - Unstable ground appearance is increasing and still landslide threat could be clearly visible. Picture taken on rain starts on October 2012.

- Although the buildings were not damaged, large rocks falling may cause life threats to students and other people and also to property.
- Particularly the construction pattern and irregular erection of buildings have aggravated the potential danger.

4. RESEARCH METHODOLOGIES

Certain places affected by landslides were studied for detail information and data tabulation. The field trials and observation were carried out as per recommendation of LRRMD, NBRO. The recommendations were thus made quite adequately with nearly accurate geographical data.

According to each and every school in question categorical study was carried out backed by geo-technical suitability and hence appropriate technology is thus introduced.

In this methodology the reduction of landslide danger is merely not a question of finance, but more realistically it is a cumulative combination of geological, morphological and in- fact with a touch of certain elements of the social fabric of the area concerned.

5. CONCLUSIONS

- In the after said cases, the studies revealed that building construction and engineering aspects of structural pattern have caused substantial damage.
- Now it is very obvious, Galkanda Kanshita Vidiyalaya and Molagoda Maha Vidiyalaya have buildings around those are technically questionable.
- In the construction of buildings, unstable geographical features, presence of large earth cuttings in the surroundings and the height of the buildings have caused grievous concern about safety and well being.
- During the landslide periods the schools may be closed temporarily, but this is not a permanent solution to the problem concerned.
- To do away with this bottle óneck, the buildings must be constructed and data should be highly reliable and established geological data pattern should be provided with.
- Up above the land adjoining Galkanda Kanshita Vidiyalaya, is situated at a scarf slope morphology land and the colluvium soil deposit.
- To establish proper management of landslides the inter relation, adequate cooperation is expected at school levels. This individual school methods and safety precautions should be exchanged for better well ó being of the schools and children in general.
- When the rains start, the schools with unstable geographical conditions may close down or move away for a while, but still landslide occurring is nest- changed.

- Hence, we emphasize, adequate steps should be taken to minimize the landslide and dismantling of rocks, at least to prevent landslide disaster to a minimum level.
- In establishing an academic institution such as a school, the design, geographical location and the factors as well being of the students, and also the future of the school should taken in to account.
- Thus these developments should be brought to the notice of respective authorities, so that these will be an useful investment in the country.
- Through the school curriculum and through the school system the concept of landslide management should be strengthened. Thus there can be sample projects of landslide management techniques from innovative schools, where other schools can learn a lesson.
- Particularly in the Molagoda Maha Vidiyalaya an early warning system may be developed to warn people about possible rock fall threat. This system can be developed to encompass a wider spectrum.

Each and every school should be studied in case by case and geological observations are to be done. After obtaining the requisite data in time, the near future contributing factors and their methodology is to be established.

6. RECOMMENDATIONS

Disaster management should not be limited to school works and it should inculcate to assure and practice in real situations.

This state should be upgraded to develop a national level of operation, particularly to introduce new technical concepts and structural theories applicable to questionable areas, particularly in the central province.

The Education Department and the NBRO jointly should carry out a nation wide programme to

educate the all the schools in the Island. Definitely for a purpose of this nature they can enjoy the state sponsorship.

Prior to building of a school, the requisite permission should be obtained from the NBRO . this should be an essential condition for all the buildings in the future.

The Ministry of Disaster Management is a gazette notification of 2011/01/01, directs NBRO to have the authority to work on technical expertise on buildings .. etc. if there is a strict code of conduct then the future of school buildings and even other construction will be greener.

The elementary planning and processing should be done in a methodical way, and modal schools should be introduced to areas where adequate steps and action here not taken place so far.

This pilot school curriculum programme will be beneficial and unique for all our schools in the future. This further enhances the regularity of hearing schools more opened for education purpose in the future.

This can be made compulsory for the planning of proposed buildings and people, even a governmental committee can be appointed to find the suitability of the buildings to be built. The committee should comprises of professional intellectuals in the relevant fields, where should be applicable . All these members should have proper academic qualification and long experience in the field.

ACKNOWLEDGEMENT

The author is thankful to Dr. Asiri Karunawardana, Director General, NBRO for encouraging to publish these findings and to thanks to Professor Kapila Dhanayake and Dr. Nanda Malalasekara for making suggestions to improve manuscript. He also wishes to thanks Mr. M.I.D.H Wijewickrama, Mr. R.M.S. Bandara, Mrs. Kumari Weerasingha and Mr. Kalum Senivirathna for their encouragement to publish this research paper.

Last, but not least, the principals of schools around the Kandy district are appreciated for their support extended to me at field during the data collection stage.