

Community Based Approach to Landslide Risk Reduction

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Abstract: Risk from landslide hazards in Hong Kong can never be reduced to zero, and cannot be reduced to the minimum achievable solely by the actions of the authorities and geotechnical practitioners. Partnership with the community is essential to successful hazard mitigation. In recent years, Hong Kong's Geotechnical Engineering Office has been undertaking a number of "community based" initiatives as one of our strategies in landslide risk management.

1 INTRODUCTION

Hong Kong is characterised by steeply hilly terrain, intense seasonal rainfall, and concentration of piecemeal development of typically fairly small lots on and close to hillsides. This has resulted in some 54,000 sizeable man-made slope features dispersed throughout many parts of the urban community, a large number of which pre-date the current geotechnical control on development and which have not been engineered to modern standards. In the past 50 years, over 470 persons have died in failures of man-made slopes and retaining walls. Other hazards include landslides and boulder falls from natural terrain. To reduce the 'global' risk from these hazards, the Geotechnical Engineering Office (GEO), under the policy authority of the Government's Works Bureau and through the statutory powers of the Building Authority, has progressively implemented a comprehensive slope safety system through the setting of safety standards, geotechnical input to land use planning and land disposal, statutory and administrative geotechnical controls on new development, as well as the safety-screening and upgrading of those existing man-made slopes posing the highest risk, and recommendations for clearance of squatters on steep hillsides who are exposed to high levels of landslide risk (Malone 1998). As a result, the overall landslide risk arising from old substandard man-made slopes has been reduced to less than 50% of the level at 1977 when the GEO was set up. It is expected that by 2010, the overall risk level will be further reduced to less than 25%.

Concurrent with this control-led and works-led approach, the GEO has developed a community based approach, which focuses on raising public awareness and knowledge, promoting trust and partnership with the community, and encouraging public participation to reduce risk further. The most difficult but essential first step in such an approach is for engineers as risk managers to make clear that they cannot deliver the perfect safety that both the community and the administration may say they want and expect, and

certainly not without active and informed participation by both owners and the wider community. Such a declaration requires ongoing public discussion on the nature of risk and uncertainty; engineers must be prepared to take up the challenge of public relations, and to engage in consensus building.

2 THE COMMUNITY-BASED APPROACH

About one-third of the 54,000 sizeable man-made slopes in Hong Kong are under private ownership, and the private owners are legally responsible for maintenance their stability. In the early 1990's, many private owners claimed that all slopes were government's responsibility or that, as laymen, they did not possess the required technical knowledge. The GEO has mounted a publicity campaign since 1992 to promote an understanding to private slope owners of the need for proper slope maintenance and periodic professional inspection to reduce the occurrence of landslides. This now extends to identification of maintenance responsibility and provision of technical information on all registered man-made slopes and retaining walls both by direct application and via the Internet; published standards and laymen's guidance on technical requirements and the employment of consultants and contractors; and a community advisory service which includes outreach to owners with particular difficulties.

To reduce the consequences of landslides to the community, the GEO established a Landslip Warning System in 1977 to warn occupants of vulnerable squatter settlements to evacuate and go to government shelters at critical times. This public warning has now been extended to cover pedestrians, motorists and the general public at large. GEO has mounted another public education campaign since 1996 to improve public awareness and understanding of this Warning, and of the personal precautions they can take to reduce their vulnerability to landslide hazards in times of

heavy rainstorms (Yim et al, 1999).

The community based initiatives of public education, public information services and community outreach undertaken so far are described below.

3 PUBLIC EDUCATION

3.1 *Public Education Campaign*

This campaign (Yim et al, 1998) has adopted a direct educational approach and includes a variety of activities :

- broadcasting of TV and radio announcements;
- wide distribution of printed materials and promotional items;
- year-round roving exhibitions with game stalls and colouring competitions for children at popular shopping centres;
- seminars, talks and courses;
- advertising at public waiting areas, and
- media promotion through press conferences, briefings, radio and TV interviews, and articles in the printed media.

3.2 *Partnership with the Media*

In many instances government personnel and journalists may be uncomfortable regarding one another as partners, but where they have common objectives in informing the public on safety issues, it is possible to achieve a level of mutual cooperation without compromising the freedom and independence of the press, or their role as 'public watchdogs'. Hong Kong has more than a dozen daily newspapers, two free-to-air terrestrial television companies, one cable television operator, several satellite channels and the world's first commercial video-on-demand system. About one in five residents tune in regularly to one of the 13 radio channels during the morning rush hour. Internet usage is also increasing rapidly, and a current estimate is that up to 60% of the total population may have direct access to the Internet. With this high penetration by dynamic mass media, specific messages can reach a large portion of the population within a very short period of time.

To maximize the media potential to communicate public safety information, the GEO has invested in organising office familiarization tours and on-site briefings for cadet and experienced reporters. Background materials on GEO activities and slope safety related information are delivered to the journalists and opinion leaders regularly. The GEO has sought to adopt a policy of helpfulness and transparency with the press, such that a basic level of trust has been established, and individual journalists have a good lay understanding of the technical, legal and administrative issues. They also have useful background material in their files and know who to

contact within the GEO for relevant information in a crisis situation. In this way, we have been able to develop a constructive relationship, and the press have been supportive and responsible in widely reporting our public safety messages.

To ensure GEO staff can put across relevant messages clearly to the public through the media and are encouraged to do so, training is provided to all of our engineers to improve their presentation and interview skills. We also monitor and analyze press coverage and conduct annual surveys of beat journalists to get their views on how we can further improve from their perspective. These efforts have often been rewarded by extensive, accurate and objective reporting of public safety information. The mass media and the GEO have, in effect, become informal partners in public education (Ho et al, 1998).

3.3 *Slope Safety Training*

Awareness without empowerment through knowledge is ineffective; owners and maintenance personnel need to know how to carry out the work, and they need a set of standards of good practice to follow. In 1995 the GEO published "Geoguide 5 - Guide to Slope Maintenance" (GEO 1998), a comprehensive technical guide for use by engineers and maintenance personnel. Almost 5,000 copies of Geoguide 5 have been sold so far. An abridged version of the Geoguide in simple language, the "Layman's Guide to Slope Maintenance" was also published and distributed free of charge to the public.

In its public education programme, the GEO covers a wide range of stakeholders by delivering general education lectures on slope safety at public venues and universities, seminars to slope owners, school principals and teachers, and professional bodies such as property managers, insurers, surveyors, bankers, engineers, etc. and courses to train slope maintenance personnel. We have produced a technical training video with an information kit on slope maintenance targeted at maintenance personnel, and also conduct a slope safety awareness course by video and interactive CD ROM for front line police officers and others to assist them to discharge their duties at landslide sites.

3.4 *School Education*

It is important and particularly effective to educate the younger generations, who are generally more observant and receptive to new information than their elders, overall have the benefit of better education, and who also act as enthusiastic communicators of safety information from 'authority figures' to their families. School education and student participation are important areas for effective promotion of public awareness. GEO has organized a number of school-based activities, such as students' visits, school project competitions, and school seminars. Starting from

1999, Hong Kong's secondary school geography syllabus has contained topics on landslides and slope safety. Publishers have approached the GEO to obtain information and improve their understanding of slope safety for the drafting of school textbooks. GEO also retained education experts to assist in preparing a teaching kit on slope safety, has issued free sets to all secondary schools in Hong Kong through the Education Department, and conducts seminars for teachers to assist their understanding of the teaching materials.

4 PUBLIC INFORMATION

Community empowerment includes provision to the public of comprehensive essential information which must be available at low cost or free, accurate, easily understood, easily accessible, through multiple channels and varied media. Information must be simple, concise and devoid of jargon.

4.1 Telephone Helpline

Since 1992, an enquiry helpline has been operated to provide general information on slope maintenance; an average of 200 calls are received each month. Customer feedback surveys show that full satisfaction of the service has been maintained at a high level of over 70%.

4.2 Slope Information System & the Hong Kong Slope Safety Website (<http://hkss.ced.gov.hk>)

In 1998 GEO completed setting up a geographical information system-based Slope Information System containing essential technical information on all 54,000 registered man-made slopes in Hong Kong (Lam et al 1998). The information is a valuable reference for slope maintenance and upgrading, and has been easily accessible by any member of the public via the Internet from the Hong Kong Slope Safety Website since 1999. On this bilingual Website, one can obtain a location map of the slopes in the vicinity of a specified building or street, or for any individual registered slope in Hong Kong. Also available are the technical data and photographs of the subject slopes. The Website has been expanded to incorporate more general slope safety related information such as slope safety messages, how to upgrade an unstable slope, seminars and talks, news on slope safety issues, and related publications. We are also currently developing an Internet course on slope maintenance for the lay public. The Website is intended to become a central hub of slope safety information serving the needs of all interested parties, from professional engineers to the lay public and school students.

4.3 Maintenance Responsibility

To reduce ambiguity in identifying owners for maintenance of slopes, the Lands Department with the assistance of GEO has undertaken a project called "Systematic Identification of Maintenance Responsibility of Slopes in the Territory" (SIMAR). The HK\$73.6 M project was to compile a register of slope maintenance responsibility for all man-made slopes, and will greatly facilitate slope maintenance by enabling quick and easy identification of the responsible parties. The SIMAR database was opened to public access in early 2000 and a publicly accessible bilingual Internet version has now been launched via a Lands Department Website (<http://www.slope.lands.gov.hk/smris>).

5 COMMUNITY OUTREACH AND PARTNERSHIP

Having raised public awareness and understanding of slope safety through education and information, there remains a need to work closely with the community, to understand the needs of various local community subgroups, and to encourage community self-participation in implementing landslide mitigation measures.

5.1 Partnership with the Community

GEO has been providing pertinent information to interested parties: property managers, bankers, loss adjusters, property agents, lawyers, insurers, surveyors, the Consumer Council, pressure groups, Legislative Council Members and District Councils, to discuss and work on matters of mutual interest relating to slope safety. These matters include property management issues, mortgages and insurance policies, guidelines for property buyers, etc. We have also developed a partnership with the Red Cross to provide safety advice to squatters as part of their disaster relief programme.

Many government departments also play important roles, including the Home Affairs Department, who assist in disseminating slope safety information through their extensive and penetrative public network; the Information Services Department, who assist with the development of good media contacts and the design, production and broadcasting of audio/visual public messages, and the Education Department, who organize student competitions, seminars for school officials, distribution of teaching materials and promotional items, and issue advisory circulars.

These professional and public bodies have their own established communication networks. By tapping into their resources, we are able to reach out to specific target audiences. Equally importantly, slope safety considerations are incorporated into the daily practices of these parties.

5.2 Community Advisory Services

A Community Advisory Unit (CAU) was established in GEO in April 1999 to assist private owners to discharge their responsibility for slope safety, with fruitful results. Activities include:

- (a) seminars for slope owners on matters relating to slope safety and slope maintenance;
- (b) a meet-the-public service to answer general queries and to provide information on slope safety matters;
- (c) outreach to private owners who have received statutory orders to upgrade substandard slopes, to offer advice on how to proceed with the necessary investigation and works; and
- (d) meetings with Owners' Corporations and Mutual Aid Committees to advise them on how to proceed with slope maintenance works and the standards they need to achieve.

Since the setting up of the CAU, it has provided services to over 1,800 members of the public on slope maintenance and slope upgrading issues. Regular surveys of CAU "customers" have been made and their satisfaction level exceeds 98%.

5.3 Quasi-legislative Means

In addition to the 'hard' approach of introducing new legislative control and sanctions, the GEO looks for emerging opportunities to initiate quasi-legislative means to enhance public awareness of and willingness to take up their landslide mitigation responsibility (Yim, 1999).

The following are some examples: GEO has initiated inclusion of "slopes and retaining walls" in the definition of "Common Parts" to be kept in good repair by the Owners' Corporation under the revised Building Management Ordinance (BMO). Lands Department requires developers to append Slope Maintenance Manuals to the Deed of Mutual Covenant (DMC). The BMO was also amended in 2000 to empower the Secretary for Home Affairs to publish in the Gazette a Code of Practice on building management and maintenance. The Code subsequently issued stipulates that Geoguide 5 should be adopted as the slope maintenance standard. Lands Department has also issued guidelines to require solicitors to include the slope maintenance clause in the Deeds of Mutual Covenant (DMC) for developments. A site plan showing the slopes to be maintained by the owners is also contained in the DMC. Developers are also required to include a site plan showing the slopes already constructed or to be constructed, and statements spelling out the owners' maintenance obligations in the sales brochures. GEO has also worked with the Hong Kong Law Society to advise its members to explain to their clients their slope maintenance responsibility.

As part of the Landslip Preventive Measures Programme, the GEO carries out "safety-screening" of 300 private slopes each year to assess whether they are

dangerous or liable to become dangerous. Dangerous Hillside Orders are issued to the responsible owners to require them to undertake investigation and any necessary upgrading works to substandard slopes. For substandard slopes which are not considered dangerous but require preventive maintenance works, non-statutory Advisory Letters are issued to the private owners advising them of the necessary investigation and maintenance works.

6 EFFECTIVENESS OF THE APPROACH

6.1 Public Opinion Survey

To obtain feedback from the public on the effectiveness of the community based approach, the GEO has engaged independent researchers to conduct annual public opinion surveys by telephone interview.

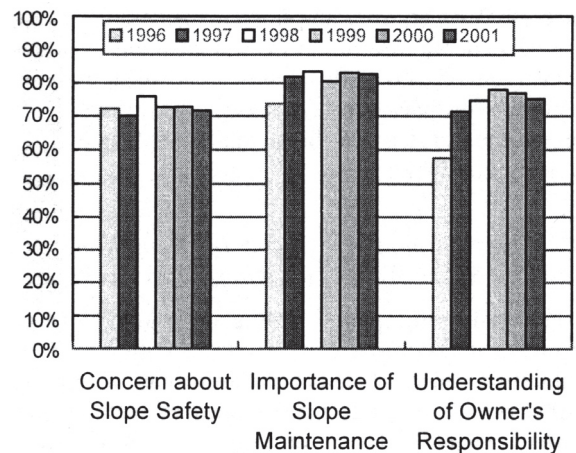


Figure 1. Awareness of slope maintenance messages

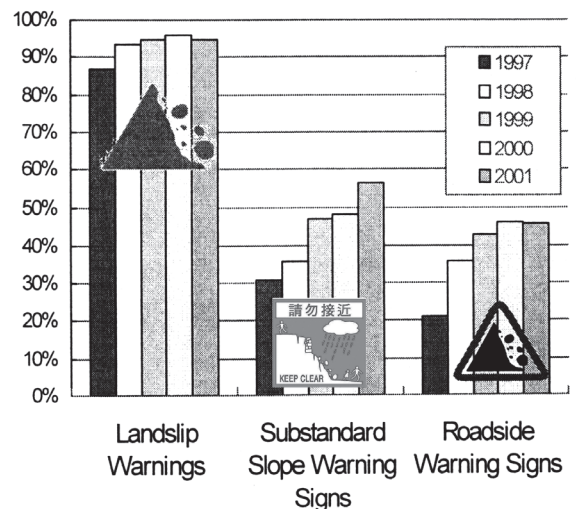


Figure 2. Awareness of Safety Messages

The public's awareness of both the need and responsibility for slope maintenance was low in the early 1990's. According to the survey results (Figure 1), there has been a general increase in public awareness as a result of the education campaign.

There has also been an encouraging rise regarding the awareness level of key messages relating to safety warnings, and a continuing ascending trend over the past five years. However, the levels of awareness of warning signs are still not satisfactory (Figure 2).

6.2 *Slope Maintenance Inspection and Interview Survey*

GEO has carried out annual field survey of a sample of private slopes since 1993 to assess the state of maintenance of private slopes and reflect the effectiveness of the slope maintenance campaign. After initial major improvement from a very low level, the percentage of slopes in fully satisfactory maintenance condition has remained static at 40-45% over the past five years.

To learn the reasons why this is the case, interviews with owners and management personnel were also carried out during the 1998 and 1999 inspections. The main findings are as follows:

- (a) the majority of the non-complying owners say they believe that their slopes are safe and do not require inspection and maintenance;
- (b) many say they do not know they are the owners of the slopes;
- (c) a substantial minority cite poor building management or organization;
- (d) only a small minority cite the lack of a statutory requirement to maintain slopes, i.e. they do not act because they are not legally required to do so and fear no sanction.

The survey results highlight the need to further step up public information and education to encourage owners to understand slope safety issues and initiate maintenance actions.

6.3 *Cost/Benefit of the Approach*

While the approach described in this paper may sound time consuming and costly, in reality a great deal has been achieved with a small budget and a small number of dedicated staff. The strength of the approach comes from greater organisational transparency and the preparedness of all staff to speak publicly about their work. The annual budget for the GEO's "community-based approach" amounts to no more than about HK\$2 Million, compared to a Government expenditure of about HK\$1.5 Billion per year on slope investigation, upgrading and maintenance, i.e. the community-based approach is costing little more than 0.1% of the 'engineering' approach, and has yielded substantial benefits as shown by the results of the public surveys. However, this is not to say that the community-

based approach can replace the engineering approach as a lower cost option. It is only acceptable to the community on the understanding that the government and the profession are already doing all they can to reduce risk to the minimum that is practically achievable by engineering means. If it were otherwise, the community may simply feel that the government was pushing its responsibilities onto private citizens.

7 IDEAS FOR FURTHER DEVELOPMENT

7.1 *Slope Safety Messages for Specific Sectors*

At present, except for advice to vulnerable squatter communities and special arrangements for schools, the campaign has covered only measures targeted at the general public in respect of the Landslip Warning and advice on personal precautionary measures. To further reduce risk and enhance effectiveness of the campaigns it may be helpful to develop more specific preparedness measures targeted at other specific sectors of the community such as road users or other vulnerable communities in particular areas. General effectiveness of the Warning may be improved by incorporating two or more severity levels, real time information on landslide occurrence, and simpler, more direct warning messages.

7.2 *Behaviour Surveys*

Public opinion surveys have limitations in that they do not measure public behaviour in real situations. Respondents may not act in accordance with precautionary advice, even if they show they are aware of and understand it. To fully evaluate effectiveness, we need to develop appropriate methods to survey the actual behavioural response of members of the public to landslide emergencies. A pilot desk study has recently been completed on behaviour of squatter village residents during Landslip Warnings.

7.3 *Study of Risk Perception*

We have always gauged landslide risk principally in terms of loss of human life. To the public, landslide risk does not necessarily refer to deaths alone. It could also refer to injury, property loss, traffic jams, school closure, fear, worry, sadness or other social problems. In 1998, the Hong Kong University Social Sciences Research Centre completed a pilot study on the public perception and tolerability of landslide risk for the GEO. Results indicate that the public may be more tolerant of risk to themselves than to the community as a whole. Risk perception associated with a wide variety of hazards depends on many complex factors in addition simply to average annual probable loss of life, and such studies provide useful insight to risk managers. This pilot study was limited to only 5 focus groups with a total of 34 respondents. More

focus groups with larger numbers of respondents are needed to provide baseline information on the public's perception of landslide risk, and to help us to assess and design our landslide risk reduction programmes to meet the public's needs.

7.4 *Motivating More Private Owners to Maintain Their Slopes*

The GEO will further step up advisory service to private owners through the following mechanisms :

- (a) launch an Internet course on slope maintenance;
- (b) distribute a Model Slope Maintenance Plan to Owners' Corporations and property management companies;
- (c) establish a new safety screening criterion for Dangerous Hillside Orders based purely on slopes with very serious maintenance defects;
- (d) step up advice to owners on less serious maintenance defects through advisory letters;
- (e) reach out to owners who have received advisory letters through the Community Advisory Unit.

When assisting private owners, they will be reminded of their responsibility to take necessary maintenance actions without delay. It is expected that this approach will be more effective and far less costly than seeking to compel through new legislation.

7.5 *Slopes As Assets*

Traditionally, many man-made slopes in Hong Kong have been protected by an unattractive, heat-reflecting 'hard' cover of soil-cement plaster or sprayed concrete to resist erosion and direct infiltration. Slopes are typically steep, and providing an erosion-resistant vegetation cover has been problematic in the past. However, recent advances in vegetating and landscaping steeper slopes (GEO 2000) can turn slopes from a liability into a major asset in improving the quality of the environment. Other innovative ideas include mounting solar power collectors and cultivating medicinal and food-producing plants or flowers on slopes. If owners can be encouraged to treat slopes as valuable assets, greater attention is likely to be given to their maintenance.

8 CONCLUSIONS

The community-based approach adopted by the GEO has emphasized transparency and partnership with the media and the community. GEO has used public opinion polls, field surveys, interviews and media audit to evaluate effectiveness. The results are encouraging, but further improvement is needed which will require bold or imaginative initiatives.

The cost of such an approach is modest in relation to expenditure on engineering works, but it requires that engineers should be willing to speak about their work directly to the community they serve, and in particular that they speak about risk.

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