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THE UNIVERSITY OF HONG KONG

**SLOPE MAINTENANCE AND REPAIRS WORKS
IN HONG KONG**

**A DISSERTATION SUBMITTED TO FACULTY OF
ARCHITECTURE IN CANDIDACY FOR THE DEGREE OF
BACHELOR OF SCIENCE IN SURVEYING**

DEPARTMENT OF REAL ESTATE AND CONSTRUCTION

BY

**IU LAI LING
HONG KONG
APRIL 2005**

DECLARATION

I declare that this dissertation represents my own work, except where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

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Date: _____

ABSTRACT

Over the years, there have been a lot of landslides happened in Hong Kong and some of them have even caused a lot of injuries and deaths. Hence, the relevant government departments are so concerned with the safety standard of slopes and the level of awareness of the public towards provisions of slope maintenance and slope repair works.

This piece of dissertation is to investigate whether there is any relationship between living locations, i.e. living next to or not next to slopes, and accordingly level of awareness of the property owners to carry out slope maintenance and repair works together with concept in slope safety. Literature review, questionnaires and interviews have been employed as methods for this dissertation.

The results of questionnaires have been proved that there is a significantly correlated between living conditions and level of awareness to carry out slope maintenance and repair works, as well as with slope safety. Interviews with representatives from firms responsible for slope maintenance and repair works and with representatives from relevant government departments have been conducted to explore the issue in a deeper and broader sense to furnish the findings cohesively. The effectiveness of various means of public education has been also studied. Data from various sources are analyzed and summarized.

Landslides are never able to be completely mitigated. Therefore, level of awareness of the public towards slope safety and slope maintenance should be sustained and public education should not be neglected.

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April 2005

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CHAPTER 1 INTRODUCTION

1.1 Background

Hong Kong is an island with a lot of hills, creating a scarcity of large areas of open space available for building structures. Thus, many construction works have been carried out near to the hills, i.e. next to the slopes. If there is any slope failure near to the populated area, a great damage and loss of lives and properties may be resulted.

Over the years, news about the slope failures causing loss of human lives and properties had been published, especially during the seasons of heavy rainfall. Most of these deaths resulted from the man-made slopes, i.e. cut slopes, fill slopes and retaining walls created by the process of hillside development since the 1940s. One of the most recent significant cases is the Kwun Lung Lau landslide on 23 July 1994 in which 5 deaths, injuries and properties losses were recorded. In addition to that, according to the government geotechnical engineer announced in 1997, there were more than 470 people killed in landslips in Hong Kong since 1948 who could be saved if adequate and effective precautionary measures had been taken. In 1970s, more than 20 people died in landslips every year on average. Although the fatality rate has been lowered down to 3 per year, it is not good enough. Hence, slope safety is a very essential long term issue in the society. Management, maintenance and repair work of slope should be focused on and highly emphasized.

It is undoubtedly that prevention is always better than cure. In Hong Kong, the responsibility for the maintenance of slopes rests with the owner or the party assigned. Ownership of the slopes can be conferred by

lease documents issued by the Lands Department which may include a clause relating specifically to maintenance responsibility for an area outside the lot boundary. However, owners may be also liable for maintenance of land adjoining their lot, without such responsibility being stated in the lease document, for instance, they may need to cut into adjoining land which may render them responsible for slope maintenance under common law. Therefore, owners or parties required to maintain land must undertake regular slope maintenance inspection and works usually through an agent. For private lots which have been developed and held in multiple ownerships, the Building Management Ordinance applies and the responsibility for slopes within common areas will rest with the Incorporated Owners.

Unfortunately, the community usually does not have a clear concept of its responsibility of maintaining slopes and some of them are even ignorant of their responsibility. The awareness of the community over slope maintenance and problems seems insufficient although the Geotechnical Engineering Office of the Civil Engineering and Development Department has propagated a lot of slope safety messages over the past years. Slope failures cannot be completely mitigated.

1.2 Aim

This study aims at investigating the current practice and problems of slope maintenance and repair works carried out in Hong Kong.

1.3 Objectives

The objectives of this study are as follows:

1. To find out the adequacy of the public on knowledge and awareness of their responsibility in slope maintenance, and;
2. To explore the problems in maintaining slopes, whereas solutions and suggestions will be given, and;
3. To investigate factors leading to failures of owners to repair and maintain the slopes.

1.4 Methodology

It is hypothesized that the failure of slope maintenance and repair works by the property owners is directly related to their level of awareness of slope safety which is affected by their living location.

In order to prove the hypothesis mentioned above, several methods will be used to investigate:

- i. A questionnaire will be designed and distributed to two types of people. One type will be those who live near to the slope while the other type is not. The questionnaire will be focused on their level of awareness of slope safety and slope maintenance responsibility.
- ii. Another set of questionnaire will be devised giving to firms responsible for carrying out slope maintenance and repair works. The objective of this questionnaire is to explore the actual works done by them and their opinions towards level of awareness of

owners towards slope safety and slope maintenance.

- iii. Interview session will be conducted with two streams of parties. The first session will be carried out with firms who have completed the questionnaires to generate a deeper understanding according to their given answers. Another session will be interviewing with relevant government departments to see their works regarding to slope safety and slope maintenance and their opinions to level of awareness of owners.

1.5 Structure of Dissertation

This dissertation is divided into several chapters. The first chapter will include the background study, the aim, the objectives, methodology and structure of the whole paper to give an overview of this dissertation.

The second chapter will be the literature review on various stakeholders to the slope maintenance and repair works while literature review on public education and programmes will be introduced in the following chapter.

The fourth chapter will outline the methodology of the research to be carried out and the rationale behind. In the fifth chapter, the results of questionnaires will be presented using the charts and tables together with the analysis and interpretation of the results. The findings obtained from interviews will be demonstrated in the sixth chapter.

Last but not least, a conclusion with limitation of this study and recommendations for future research will be devoted in the seventh chapter.

CHAPTER 2 LITERATURE REVIEWS: STAKEHOLDERS

Chapter Introduction

In this chapter, literature of this part will be reviewed under six sections.

Definitions of terms will be given out in the first section which is followed by various slope protection methods. The third section will be discussed slope maintenance. Owners' responsibilities will be introduced in the fourth section while the Geotechnical Engineering Office will be brought in the fifth section. The last section will be dealt with Buildings Department.

2.1 Definitions

2.1.1 Slope

The meaning of slope may be a slight difference in different aspects. From Webnox Corporations (2003), the more appropriate meanings to geological aspects are as follows:

1. an elevated geological formation;
2. any ground whose surface forms an angle with the plane of the horizon;

Besides, according to the biology dictionary in the same website, there is an engineering interpretation in which the slope is expressed as horizontal distance over vertical distance, for example, if the slope is described as 7 to 1, it means that it has 1 unit as vertical unit with 7 units for the horizontal one.

2.1.2 Enhanced Maintenance Works

According to Hong Kong Geotechnical Engineering Office (2003a), the term enhanced maintenance works is defined as any simple slope improvement works by using standardized and empirical engineering works to reduce the rate of slope deterioration and achieve quicker enhancement to slope stability. Slope surface protection, drainage and

support measures are the common examples which do not require any detailed ground investigation and analytical design as these are only based on experiences.

2.1.3 Routine Maintenance Works

Hong Kong Geotechnical Engineering Office (2003a) states clearly that these are the conventional maintenance works, for instance clearance of accumulated debris from drainage channels, repair of cracked slope surface cover, etc., which are carried out routinely to slopes or retaining walls.

2.1.4 Prescriptive Measures

Hong Kong Geotechnical Engineering Office (1996) explains it as pre-determined, experience-based and appropriate conservative modules of works set to a slope or retaining wall to improve its stability or reduce the risk of failure, without conducting any detailed ground investigation and design analysis before. These measures include conventional, conservative details in design, as well as attention to specification and control of materials, workmanship, protection and maintenance procedures.

2.2 Slope Protection Methods

Nowadays, people in Hong Kong are more concerned with the conservation of environment. Hong Kong is a small piece of land but it incorporates with a lot of high rise concrete buildings. So, Hong Kong is named as “Forestry of Concrete”. In viewing of this, the government departments have been also considered the application of green features to various aspects to add a green environment to the society and bring about a fresh and healthy environment to people in Hong Kong. Slope surfaces are one of the targets.

According to Hong Kong Geotechnical Engineering Office (2003b), there are three areas when considering the choice of slope protection methods:

i. Permeability

The lower the permeability of the surface protection of the slopes, the greater effect is in reducing infiltration.

ii. Durability

It is very common that the surface materials are subject to temperature change, wetting and drying effects or poor bonding of the protection to the underlying materials. As a result, cracking and spalling may be resulted and hence, the effectiveness of the protection may be minimized. Therefore, in order to secure durability, the choice of material type, thickness of surface and quality of workmanship during construction

cannot be ignored.

iii. Strength

By checking against the material specification, the strength of the surfacing material can be measured so as to resist erosion by running water effectively because the strength can also affect durability and permeability indirectly.

The most common types of slope protection methods will be introduced in the following paragraphs.

2.2.1 Vegetative method

It is the most satisfactory type of slope protection method in which grassing or shrub or tree planting will be used. This method can aid erosion control and give an environmental friendly aspect to the society. The effect of vegetation on slope stability is a complex interaction of mechanical and hydrological factors that are very difficult to quantify because the hydrological factors in turn depends on the many elements of the hydrological cycle on, below and above the ground surface. In practice, shrubs and trees will be planted on top of the grassing to achieve a long time slope surface protection. Appropriate vegetation management techniques are required to assist the natural succession process.

However, this method is constrained by several factors related to the time

of planting and the steepness, location and material composition of the slope.

2.2.2 Hydroseeding

It is done by spraying a mixture of grass seed, fertilizers, fibrous materials, emulsion binder and fresh water onto the slope. In addition to that, a colouring agent may be added to ensure an even distribution on the surface. It is then followed by compaction and trimming processes.

This method can save time and require less labour force to finish. But it can only be carried out by an approved specialist contractor and hydroseeding requires a couple of weeks for growth. Moreover, it is unsatisfactory for acidic soil.

2.2.3 Turfing

The turf is a piece of existing grass in an approximately 300mm square form with sufficient topsoil to ensure proper growth. Then it will be bedded firmly by rolling or beating. After that, it will be further secured in the position by two bamboo pegs with 250mm long.

Although it is easy to implement, it is too labour intensive and it requires a long time for growing. Besides, it is unable to address the minor instability problems of the presence of numerous joints. If the soil is

acidic, the roots of turfs may be affected unless topsoil is sufficient maintained.

2.2.4 Chunam

It is one of the simplest methods and once it was popularly used in Hong Kong. Due to environmental reasons, it is rarely chosen nowadays.

It is a cement-lime stabilized soil acting as a plaster to protect the surface from erosion and infiltration. The ratio of the mixtures should be properly controlled. The cement and lime are firstly mixed dry and then an appropriate amount of water will be added. The amount of water should be consistent with the required workability that it should not be too much which will result in shrinkage and cracking or it should not be too less which will make the cement and lime difficult to mix together and apply in use. In order to prevent excessive reflection of sunlight, some colourants may be added on top of the chunam to reduce glare and give discomfort to people.

It should cover the entire slope area except where openings are required for drainage weepholes. Sometimes, a retaining wall may be recommended to provide at the bottom of the slope. It is also reminded that the effectiveness of chunam in preventing infiltration decreases with age. It is now usually used in temporary slope protection due to the water problem and boring appearance.

2.2.5 Sprayed Contrete (Gunitite)

It is the commonly used protection method on rock cut slopes in Hong Kong in which it sprays mortar or concrete onto the large surface area by using pressurized air to transport the dry mixtures to the spraying nozzle at where water will be added. The dry mixture consists of 4mm sharp sand down to fines and Portland cement and sand.

In order to facilitate the operation, a protective screen may be used to prevent any excessive rebound of materials so as to save material costs. It can also be minimized the loss by adding excess of fines. Besides, water should be applied to protect the sprayed surface from having excessive water loss during curing process.

It can provide a satisfied bonding with the materials and it is relatively impermeable with a low water-cement ratio if it is properly applied. It is very useful for curved surface. Moreover, it is quicker and cheaper compared with chunam method.

2.2.6 Stone Pitching

It is one of the slope surface protections by incorporating masonry blocks which is widely adopted in Hong Kong. Each stone pitching with typical thicknesses of 200mm to 300mm is supported by a thin concrete layer and is placed by hand.

It is the most durable and effective method for erosion control and it has a good looking appearance which can enhance the visual quality of the environment.

One thing is reminded that it is better to apply the stone pitching on a layer of free-draining material and to provide weepholes at the base of the structure and between blocks at intervals to give a convenience in seepage observation and inspection.

Any new slope formed is already enhanced with the slope protection methods discussed above. For the existing slopes, some of them are already under maintained and repaired and the provision of these slope protection methods is also employed.

2.5 Slope Maintenance

It is always said that carrying out regular slope maintenance can reduce the likelihood of landslides. Lo et al (1998) has studied the effectiveness of slope maintenance towards the likelihood of landslides. In the paper, it mentions that during 1994 and 1995, there were 617 landslides in which 270 of them were lack of slope maintenance as being a contributory factor in causing such failures. These 270 landslides were triggered by heavy rainfall.

The signs of inadequate slope maintenance of these 270 landslides

included blocked or damaged drainage channels, damaged impermeable surface cover or poorly maintained vegetation. Although records show that the inadequate slope maintenance will only cause small-scale failures, these small-scale failures are liable to become an unfavourable setting and it will lead to a major landslide as a consequence after accumulation of these small-scale failures.

In the later years, the Housing Department has carried out a comprehensive maintenance system for slopes that it managed. These slopes were regularly inspected and maintained and so, they were served as a reference to study the effectiveness of slope maintenance to the likelihood of failures. The result shows that the percentage of failures due to inadequate maintenance has reduced to 10% from 44% recorded before. As a result, it can be deduced that even though adopting routine slope maintenance cannot totally mitigate landslides from happening, it still can reduce the overall likelihood of failures in the future.

It can be seen that carrying out regular slope maintenance can make sure that the slope is in a safe status and protect people from future landslides. Any minor failure should not be neglected or ignored as addition of various kinds of minor failures can trigger off a serious landslide which will in turn cause loss in money, loss in properties and even loss in human lives.

2.4 Owners' Responsibilities

In order to facilitate the management, control and administration of the commonly parts of a building, the owners may establish an Owners' Corporation under the Building Management Ordinance (Cap. 344) or owners' committee under the Deed of Mutual Covenant, if any, of the building. Then, either parties are entitled to have right to employ a property management company to carry out the daily management, control and administration of the common parts on behalf of the owners in a good state and serviceable repair and clean condition according to the Deed of Mutual Covenant of the building, if any.

Slope within the same lot as the building is also regarded as one of the common parts of the building. As a result, lot owners are responsible for slope repair works, slope inspection and slope maintenance. This covers slopes within the owned lots, together with slopes and adjoining land if it was cut into or formed as part of the development, if it could pose a potential hazard to the development, or it was specified in the lease conditions. For the owners, they include individual flats in a multi-storey building and any persons holding premises directly from the Government under lease, license, etc.. Therefore, the owners should refer to the land lease, for instance, Government lease, Government grant, conditions of sale, conditions of exchange, etc., to check the boundary of the lots that they are responsible.

According to Home Affairs Bureau (2001), there is a clear guideline of routine maintenance inspection for slopes:

1. clearance of accumulated debris from surface channels and slope surface;
2. repair of cracked or damaged surface channels or pavement;
3. repair or replacement of cracked or damaged slope surface cover;
4. unblocking of weepholes and outlet drain pipes;
5. removal of any vegetation causing severe cracking on slope surface and surface channels;
6. re-grassing of bare slope surface;
7. removal of loose rock debris and undesirable vegetation from rock slopes or around boulders;
8. repair of missing or deteriorated pointing in masonry walls.

In addition to above, the owners should arrange regular checks for underground water mains which are installed near the slopes or retaining walls according to legislative measures introduced in 1996. Whenever any leakage is discovered at underground water mains or storm water drains, inspection and remedial works should be carried out immediately without any hesitation.

All the routine maintenance inspections mentioned above should be conducted at least once a year suggested in a pamphlet produced by Hong Kong Geotechnical Engineering Office (2004b). Moreover, any required

maintenance works should be completed before the wet season in April and the owners should arrange inspections to the drainage channels and clear any rubbish after a heavy rainstorm or a typhoon to prevent any blockage to the drains that may lead to slope failures.

In Buildings Department (1999), the Geotechnical Engineering Office has launched a study programme to identify slopes which are dangerous or liable to become dangerous in 1978. The Building Departments will serve Dangerous Hillside Orders to request the private owners to upgrade or repair the slopes under Section 27A of the Buildings Ordinance.

The Buildings Department (2002) recommends appointing an Authorized Person by the owners to coordinate the required maintenance, inspections or repair works and comply with the administrative requirements of the Buildings Ordinance and Regulations. A Registered Contractor can be also engaged. A Geotechnical Engineer is suggested appointing whenever any necessary to carry out the investigation. However, it is still highly advised to carry out an Engineer Inspection for maintenance on the slope at least once every 5 years to seek for any slope safety problems so as to deal with the problems at the early stages.

A Dangerous Hillside Order consists of two stages denoted in Hong Kong Geotechnical Engineering Office (1999b). The first stage is the owners are ask to carry out an investigation and submit slope works proposals to the Building Authority for approval. It is usually two months to initiate

the investigation and three to six months to conduct it and report to the Building Authority but the durations are still subject to change depending on the scale of works. After the approval of the proposals, another Order will be served in the second stage to carry out the works within a specified time.

Under Section 32A and 33 of the Buildings Ordinance, if the owners ignore the Dangerous Hillside Order and do not carry out any investigation by the date specified, the Building Authority will conduct the investigation and it will recover the costs and supervision charges from the owners if any subsequent works are done. Besides, anyone who fails to comply with the Order without a reasonable excuse, the BA may consider triggering prosecution under Section 40(1B) of the Buildings Ordinance.

2.5 Geotechnical Engineering Office

There are various offices under the Civil Engineering and Development Department. The Geotechnical Engineering Office is mainly responsible for a wide range of geotechnical engineering activities which comprises four branches, namely Island Branch, Planning and Standards Branch, Mainland Branch and Landslip Preventive Measures Branch.

In the Slope Safety Division under the Island Branch, there are 4 sections: Existing Slopes Section, Community Advice and Education Section,

Public Information unit and Slope Screening Section.

The Existing Slopes Section will update and maintain the Catalogue of Slopes which can be found in a computerized Slope Information System. This system can provide a fast online examination and analysis of the spatial relation between slopes and surrounding topography.

The Community Advice and Education Section has two main functions. The first one is community advisory taken up by the Community Advisory Unit which will be discussed in the later section. The second function is the educational side involving the running of a public education and publicity campaign on slope safety to the general public. This part will be also gone in deep later.

The Public Information Unit will mainly handle with enquires raised out by the media and the general public relating to the policy and work on slope safety and other activities of the Geotechnical Engineering Office. It is always working together with the Secretariat Press Office of the Environment, Transport and Works Bureau to release out information to the media.

The last one, Safety Screening Section, deals with a number of consultants to carry out geotechnical studies on those man-made private slopes prior 1977 so as to identify any substandard features for follow-up actions, such as issuing Dangerous Hillside Orders to the private owners

of dangerous slopes. These studies will be triggered off according to the ranking priority order and features will be grouped and studied on an area basis.

2.6 Buildings Department

As mentioned before, the Buildings Department will be also responsible for slope safety. There is a Slope Safety Section under the Buildings Department to carry out the relevant cases. The major concern by Slope Safety Section is slope safety. So, whenever there is anything affecting the safety condition of the slope, Slope Safety Section will enforce Section 27A or Section 27C of Buildings Ordinance (Cap. 123) to issue Dangerous Hillside Orders to the owners of the subject slopes.

Under Section 27A or Section 27C, owners will be served an order in writing to carry out necessary procedures specified in the order. The owners are required to submit proposals of works to be done based on the findings of the investigation. The order will be only cancelled when the owners fulfill the works stated in the proposals and all the works are approved satisfactorily by the Building Authority.

In case of owners neglecting the order served, the Building Authority will carry out the works first because slope safety is the first major concern and so, any dangerous situation affecting to buildings should be removed. Any cost incur will be recovered from the owners.

CHAPTER 3 LITERATURE REVIEWS: PROGRAMMES & EDUCATION

Chapter Introduction

In this chapter, there are four sections.

Firstly, Hong Kong Slope Safety Management will be introduced followed by Landslip Warning. The third section will be talked about public education concerning with slope safety and slope maintenance done in Hong Kong. The last section will include community advisory unit which is a way for communication among public with government departments.

3.1 Hong Kong Slope Safety Management System

Hong Kong is a small piece of land with around 1,100 square kilometers housing a population of 7 million. However, only about 15% or 165 square kilometers is developed land while the remaining is woodland, country park areas or lightly developed area.

According to Malone (1998), the landslips have contributed the death of more than 470 people in Hong Kong since 1948 till 1996. These landslips are usually resulted from the collapse of man-made slopes, i.e. cut slopes, fill slopes and retaining walls triggered off by the hillside development since the 1940s. Over the past 50years, there has been a drastic increase in population growth which has led an intensive urbanization of the lower portions of the hill-slope areas. The fatal landslips were usually due to inadequacies of hillside development works in the post-war decades and lack of subsequent maintenance of constructed slope works.

As there was a number of serious landslides happened in the 1970's, especially the one happened in Sau Mau Ping Resettlement Estate in 1972 and in 1976, the former Governor established an Independent Review Panel on Fill Slopes which consisted of overseas geotechnical experts. These experts recommended setting up a central policy body to regulate the whole process of investigation, design, construction, monitoring and maintenance of slopes. As a result, the Geotechnical Engineering Office has been set up in July 1977 aiming at prevention of landslide disasters.

Over the past years, a comprehensive Slope Safety Management System has been developed and implemented to solve some special and unique landslide problems in Hong Kong so as to reach the highest standard of slope safety.

Under this system, there are several key components as follows according to a keynote paper by Chan (2000):

1. Improving slope safety standards, technology, and administrative and regulatory frameworks;
2. Ensuring safety standards of new slopes;
3. Rectifying substandard government slopes;
4. Maintaining all government man-made slopes;
5. Ensuring that private owners take responsibilities for their slope safety;
6. Promoting public awareness and response in slope safety through public education, publicity, information services and public warnings.

3.1.1 Improving slope safety standards, technology, and administrative and regulatory frameworks

The Geotechnical Engineering Office has established the geotechnical standards to provide guidance for the standards of practice that should be adopted for the design, construction and maintenance of slopes and site formation works in Hong Kong. Examples are a series of Geoguides and

Geospecs. These publications can allow the profession to use common, up-to-date and comprehensive geotechnical standards which are the most appropriate and compatible to Hong Kong conditions. There are also some Geotechnical Engineering Office Reports on Research & Development work in the Geotechnical Engineering Office, past few years' reports on forensic investigation of major landslides in Hong Kong, etc. published to share the experience, results of research and development and lessons learnt from landslides to enhance the level of geotechnical competence with various professions.

3.1.2 Ensure safety standards for new slopes

In order to achieve captioned objective, the Geotechnical Engineering Office has maintained over 60 professional geotechnical engineers with technical support staff to check the adequacy of all slope works, site formation works, earth retaining structures and deep excavations which are designed and constructed either by the private sector, or public organizations or government departments. Upon just mentioned, the Geotechnical Engineering Office will also carry out regular internal and external audits and continuous quality improvements. Over the past years, the Geotechnical Engineering Office has implemented a series of initiatives to improve the performance of quality-assured checking system. The latest ones are to increase the number of inspections of active construction sites and set up a comprehensive computerized district information system. Recently, the Geotechnical Engineering Office also

provides information at the land use planning stage to diminish any possible landslip risk and facilitate safe and economic developments at the earliest stage.

3.1.3 Rectify substandard government slopes

Before the establishment of Geotechnical Engineering Office, any safety standard measures of old slopes are in doubt. Hence, the Government has induced a new programme called Landslip Preventive Measures Programme afterwards. The New Priority Classification System in the Landslip Preventive Measures Programme has been conducted to systematically rank old slopes in an order of priority according to their probability of failure and the consequence of failure. For those smaller slopes that not covered by the Landslip Preventive Measures Programme, maintenance department, such as Highways Department for roadside slopes, Housing Department for public housing estates, etc., will take an active role to improve these slopes through various prescriptive measures or enhanced maintenance. For squatter areas located on steep hilly landscape or affected by slopes, the Geotechnical Engineering Office has recommended the Government to clear these areas in the early 1980's.

3.1.4 Maintain all Government man-made slopes

In order to provide a minimum standard for maintenance of government slopes, the recommended standard of good practice for slope

maintenance – Geoguide 5 (GEO) has been published. All departments responsible for particular slope maintenance are also clarified and identified and they need to arrange Engineer Inspection. A lump sum of money (around \$300 to \$400 million in 2000) has been spent on slope maintenance a year and expenditure will increase when departments implement their maintenance programmes in full force.

3.1.5 Ensure that owners take responsibility for slope safety

It is very clear that the government should maintain government slopes while private owners manage their own private slopes. Thus, it is very important to ensure the private owners to alert their responsibility and initiate to maintain private slopes and upgrade those which are classified as substandard. The Government, as a result, will carry out safety-screening of private man-made slopes to establish prima facie evidence for serving Dangerous Hillside Orders to the private owners under provisions in the Buildings Ordinance which has been discussed in the previous section. They are statutorily required to investigate and carry out any necessary slope upgrading works, as well as repairing underground drains and water pipes which may affect the stability of adjacent slopes for discharge of the Dangerous Hillside Order. However, under the current system, it is voluntary actions for private owners to perform private slope maintenance and there is a discussion on whether it should be enforced as mandatory slope maintenance.

3.1.6 Public awareness promotion

Starting from 1992, the Geotechnical Engineering Office with the assistance from Information Services Department has carried out a systematic publicity campaign on slope maintenance to convey two main messages: Inspection and maintenance are needed to keep slope safe; Action lies with the owners. Throughout the effort by the Geotechnical Engineering Office over the years, it is reviewed that over 70% of the public are now more aware of the importance of slope maintenance and the owners' obligation to maintain their slopes by survey conducted by the Hong Kong University Social Sciences Research Centre (Chung & Pang, 1999). Various public education campaigns on slope safety together with personal precautionary measures have been taken by the Geotechnical Engineering Office since 1996. The Geotechnical Engineering Office has also conducted school education to students and has prepared an education toolkit to secondary school to facilitate the promotion and education on slope safety. Apart from these, the Geotechnical Engineering Office has also provided the public with free comprehensive information on slopes through a computerized Slope Information System and in the Hong Kong Slope Safety Websites which will be discussed in more details in a later section. Besides, parties responsible for maintenance of slope works in the Slope Catalogue are also available for free inspection in the Slope Maintenance Information Centre of the Lands Department. A Community Advisory Unit in April 1999 has been set up which will be also explored in a greater details later.

At last, the Geotechnical Engineering Office has worked up with the Hong Kong Observatory to issue Landslip Warning to warn the public of the likelihood of many landslips in times of heavy rain. It is an automatic rain gauge network to provide real time rainfall data to facilitate the issue and cancellation of the Landslip Warning to give the latest information to the public in a right time.

Over the years, the Geotechnical Engineering Office has regularly reviewed and enhanced the performance of the Slope Safety Management System through the research and developmental work, the detailed investigation of serious landslides and implementation of post-mortem improvement measures. A Quantitative Risk Assessment approach was adopted by the Geotechnical Engineering Office which was the first to apply this technique to manage landslide risk in the world. By 2000, it has been observed that the risk of old substandard man-made slopes has been reduced to less than 50% of the risk that existed in 1977. It is also expected to further reduction to less than 25% of the risk in 1977 by the end of 2010.

Since 1995, a Slope Safety Technical Review Board, consisting of geotechnical engineers with high international standing in the geotechnical field, has been appointed to give advice on technical aspects of slope safety.

3.2 Landslip Preventive Measures Programme

For increasing the stability of substandard government and private man-made slopes, the Government has established a long-term programme, named as the Landslip Preventive Measures Programme since 1976. Under the Landslip Preventive Measures Programme, old man-made slopes are identified and selected for study in a priority order based on a risk-based ranking system which takes account of the relative likelihood of fatalities induced by slope failures. There are two levels of study in the Landslip Preventive Measures Programme which are Preliminary Studies and Detailed Studies.

A Preliminary Study comprises a site reconnaissance in which the consequence of failure is assessed and a subjective judgment of the preventive measures is made. This study aims at identifying those slopes which may require a Detailed Study.

A Detailed Study is a stability assessment of an existing slope to decide whether upgrading works should be enforced. It is based on a review of background information on the slope, examination of the slope history and characteristics from a study of aerial photographs, site observations and geotechnical stability assessment and even a ground investigation, if necessary. If it is a private slope, a statutory Dangerous Hillside Order will be issued by the Buildings Department. After the study, there will be a report produced which may recommend upgrading works for public

slopes, any further investigation and/or upgrading works for private slopes requested by the Dangerous Hillside Orders served to the private owners, any other specified action or any other conclusion.

Whenever the Geotechnical Engineering Office has found any Government slope under current safety standards, upgrading works will be recommended. From information note Landslip Preventive Measures Programme published by Hong Kong Geotechnical Engineering Office (2004c), the upgrading works may be assessment of the geographical and groundwater conditions, likelihood of failures, detailed design and construction. Prescriptive design approach may be taken without detailed ground investigation, laboratory testing and stability analyses. Apart from the upgrading works, aesthetic concern is also taken into account. The Geotechnical Engineering Office usually uses a vegetation cover whenever possible while hard surface cover, such as chunam or sprayed concrete, is the last resort when other methods are found not practical. If the hard surface cover is also impractical, other measures will be implemented to improve the appearance of slopes, for instance, use of planters, stone pitching, colouring, etc..

Under the “Landslip Preventive Measures selection”, government and private slopes will be chosen for detailed studies and/or upgrading works. In order to increase the output of the Landslip Preventive Measures Programme and fulfill the public’s high expectation of slope safety together with traffic and environmental constraints, a Business Process

Re-engineering Project has been implemented by an in-house team of the Geotechnical Engineering Office in 1999. Through the recommendations made under the Business Process Re-engineering Project, various changes have been carried out, namely development of an improved combined ranking system for selection of slopes, fast-tracking of the letting of consultancies, enhancement of management and updating of slope data, integrated action through the “lot-by-lot” approach for private slopes and “local area” approach for Government slopes. The whole selection process is always under a regular review and whenever necessary, any further improvement will be made as well. In addition, there are 4 categories that are out of the scope of the Landslip Preventive Measures Programme:

1. slopes affecting squatters that can be dealt with through safety clearance of squatters under the Non-development Clearance Programme;
2. slopes owned by the Housing Authority which is financially autonomous;
3. slopes with maintenance responsibility legally resting on the Kowloon and Canto Railway Corporation and the Mass Transit Railway Corporation;
4. slopes affected by development projects scheduled to commence within the following 5 years.

For those slopes that are within the scope of the Landslip Preventive

Measures Programme, the Landslip Preventive Measures Committee will be responsible with no discharge.

In order to implement the Landslip Preventive Measures Programme successfully, there are several aspects considered. The first one is Landslip Preventive Measures site safety which is very vital, especially for working on steeply-sloping ground to rectify potentially unstable slopes. To reduce the accident rate, a closer monitoring of site safety matters, promoting safety awareness to project personnel, strengthening the control of Landslip Preventive Measures contractors, encouraging designers to specify construction methods which should contain the least hazard and undertaking design of the major temporary works rather than leaving this totally to contractors are the main initiatives. Fortunately, the overall Landslip Preventive Measures accident rate has maintained well below the limit set by the Environment, Transport and Works Bureau after the effect of these initiatives.

The second one is quality assurance. In 1997, the Quality Assurance System covering all the activities under the Landslip Preventive Measures Programme has obtained ISO 9001 Certification and it has awarded ISO 9001:2000 Certification in 2002 gradually after a continuous improvement culture and update quality documents regularly concerning new technical and administrative developments. Various types of audit are also carried out to ensure the design and project management of Landslip Preventive Measures works complying with the established

procedures and standards, such as Compliance Audits, Technical Audits, Consultancy Audits, Construction Site Safety Audits and Auditing for Prevention of Substandard Works. Undoubtedly, landslide investigation will be taken in advance to identify causes of failures so as to improve practice and avoid any similar occurrence. Besides, the Landslip Preventive Measures consultants are required to submit a Quality Site Supervision Plan for approval before commencement of work. During the works contract period, the Geotechnical Engineering Office staff will also carry out spot checking of the general compliance of the supervision plan.

The third one is slope landscaping and greening. As mentioned before, the Government is now trying to make man-made slopes as natural as possible to reduce visual impact and bring about the natural environment to the community. The use of soil nailing is one of the measures to reduce vegetation clearance on the slope and stabilize the slope structure at the same time.

The fourth one is cost effectiveness which is always highlighted in any project. In order to enhance the cost effectiveness of Landslip Preventive Measures design and construction, improving the prescriptive design guidelines of soil nails and carrying out design review are the unexhausted examples.

Nowadays, environmental protection is a hot issue and so, the Geotechnical Engineering Office also pays attention to mitigation of

environmental impacts, for instance, noise, dust and polluted runoff during the construction works by adopting the applicable elements of the ISO 14001 environmental management system. The elements include systematic setting of environmental policy, planning, implementation, monitoring, corrective actions and management review. The enhancement of public relations management is another means to deal with the public's environmental concerns proactively.

The last one is exploring and employing new technology and new products. It can take the advantages of innovative technology development and fulfill the aim of cost effectiveness at the same time. As a result, the Landslip Preventive Measures works can be well implemented.

Originally, the Landslip Preventive Measures Programme was designed to implement for 5 years only from 1995 - 2000. However, in 1998, it has been lengthened to 10-year Extended Landslip Preventive Measures Project which will deal with substandard slopes between 1994 – 1998 to further boost up the level of Landslip Preventive Measures output in terms of upgrading of old slopes affecting developments and major roads. This new project aims to upgrade 250 substandard Government slopes and to carry out safety-screening studies on 300 private slopes which is about five times the output more than that of the original programme. Consultants together with in-house staff are also employed to undertake the 10-year Extended LPM Project.

3.3 Public Education

Apart from various measures taken for slope safety and maintenance, public education cannot be neglected and ignored. Yim et al (1998) mentioned that although the Government is the key player in the fight against landslip hazards, the involvement of general public is also highlighted in keeping their slopes safe and in equipping themselves with adequate slope safety knowledge by letting them to know how to take simple but effective personal precautionary action to secure themselves.

Unfortunately, it is very common that the public gets used to take for granted that the Government is the sole one who wholly responsible for reducing landslip risk. Thus, they simply forget or are even unwilling to take any action on their parts. There are two approaches, namely “Soft” and “Hard” sides. The “Soft” approach will be about instilling a correct concept and knowledge of slope safety to the public by direct educational process, such as publicity campaign on slope maintenance since October 1992 and public education campaign on slope safety in September 1996. For the “Hard” approach, legislative control and possible sanctions are examples so as to require the private slope owners to take appropriate and suitable action to improve and maintain stability of their slopes. General speaking, two important objectives in enhancing slope safety in Hong Kong are:

1. to reduce landslides by reminding the private owners to maintain

their slopes;

2. to reduce the consequences of landslides by promoting precautionary measures during heavy rain.

Besides, there are a few main messages in different public education campaigns and publicity on slope maintenance by the Geotechnical Engineering Office since 1992. According to an information note Public Education on Slope Safety by Hong Kong Geotechnical Engineering Office (2004d), there are 4 focuses:

1. Maintaining their own slopes which means the private owners should be reminded that they have such responsibility to maintain private slopes while the Government to maintain government slopes;
2. Keeping slopes safe;
3. Lacking maintenance is a major contributory factor to many landslides in Hong Kong;
4. Safe slopes save lives

These 4 areas aim at fulfilling the first objective that just mentioned above. For the second objective, it is carried out by ongoing public education campaign to educate the public on personal precautionary measures during times that landslides are likely to occur. In the same important note that stated before, the key messages are:

When the Landslip Warning is hoisted:

1. Canceling non-essential appointments, staying at home or remaining in a safe shelter;
2. Avoiding to walk or standing close to a steep slope or retaining wall, especially those carrying landslip warning signs;
3. Motorists should avoid driving in hilly areas or on sections of road with standard traffic warning sign 487 until the rain has eased;
4. Those who live in squatters at risk should go to safe shelters;
5. Giving immediate and appropriate response to signs of landslide danger

What's more is there are 4 types of landslip warning signs and they are:

1. Private slopes served with Dangerous Hillside Order;
2. Government slopes pending upgrading works;
3. Slopes affecting squatters included in the Non-development Clearance Programme;
4. Slopes along busy roads with a history of landslips

In order to carry out the objectives and messages, a range of various public education activities on slope safety have been promoted since 1992 to every sector of the community. There are classified into 10 areas:

1. Announcement in the Public Interest (APIs)

- Production and regular broadcasting of animated 30-second television movie and similar radio announcements;
2. Media briefings
 - Press conferences, briefings, radio and TV interviews, and articles in printed media are used;
 3. Distribution of promotional materials
 - Printed materials and promotional leaflets (such as “Keep Your Slopes Safe”), posters, wall-charts, guidebooks, slope maintenance promotional videos, bookmarks, etc. are produced and distributed to the community, especially Owners’ Corporations and Mutual Aid Committees of residential buildings, building management companies and schools adjacent to slopes;
 4. Exhibitions
 - Year-round roving exhibitions with game stalls for children at popular with high frequency of people flow shopping centres and housing estates;
 - During summer of 2002, a two-month exhibition called “Discover Soil and Slope” was held at the Hong Kong Science Museum and some supporting activities, for instance, field trips, “Building the Highest Slope” competition, are carried out. There are also some images of display panels and exhibits can be viewed at and downloaded from the Hong Kong Slope Safety Website.
 5. Seminars

- Some regular seminars on slope maintenance and slope safety precautions are given to schools so as to raise the knowledge in slope maintenance starting from the younger age. Talks are also arranged for Owners' Corporations and Mutual Aided Committees and other relevant parties;

6. Hotline

- For further increase the awareness of people on general awareness on slope maintenance and slope safety, Slope Safety Hotline (2885 5888) in the government Integrated Call Centre has been set up since March 2002;

7. Promulgation through the internet

- The bilingual Hong Kong Slope Safety website (<http://hkss.cedd.gov.hk>) has been created and undergone continuous improvement over years. In the website, it aims at providing information on three areas: slope safety, slope maintenance and slope greening. It also provides technical information on all 57,000 registered man-made slopes in Hong Kong. Recently in July 2002, a new information system has been uploaded in the subject website, namely "Slope Safety Island" which offers slope information with lots of pictures, graphics and videos. In addition, there is a part called "Slope Safety College" enclosed in "Slope Safety Island" contains an internet training course on slope maintenance with Beginner, Intermediate and Advanced levels to cater for different viewers' needs.

8. Advisory Services

- In April 1999, in order to enhance and reinforce private owners' awareness, acceptance of their responsibility for slope safety, and provide a customer-focused service to assist them in understanding the technical and procedures in processing upgrading and maintenance works, the Community Advisory Unit has been set up.
9. Focused efforts on targeted groups or areas
- Apart from organizing general activities to the public, the Geotechnical Engineering Office also carries out some promoting activities on targeted groups to widespread and strengthen the messages on slope safety and slope maintenance. For instance, a set of bilingual education tool kit has been produced and distributed to over 500 secondary schools for students to learn about slope safety and bring the knowledge back to their families. Even for some government departments, especially for those from maintenance departments, a training kit is also produced and distributed to them to enhance their understanding towards slope safety and slope maintenance and reinforce the importance of good slope maintenance practice. These are the unexhausted examples and there still have many other activities provided for targeted parties.
10. Partnership with non-government organizations
- For facilitating the effect of slope safety messages to different sectors of the community, the Geotechnical Engineering Office also works with different non-government organizations, such as

Hong Kong Association of Property Management Companies.

Except those mentioned above, the Geotechnical Engineering Office also works closely with the Hong Kong Association of Property Management Companies to promote the awareness of slope maintenance among professional property managers. It will issue some technical circulars and guidance notes to help the property managers arrange for slope maintenance work. At the same time, the Geotechnical Engineering Office has also communicated with various sections, for examples, bankers, insurers, property agents, etc., to discuss the matters of mutual interest relating to slope safety. Besides, the Legal Advisory and Conveyancing Office of the Lands Department has issued guidelines to require solicitors to include the slope maintenance clause in the Deeds of Mutual Covenant for developments under the Consent Scheme. A site plan showing the location of the slopes to be maintained by the private owners should also be included in the Deeds of Mutual Covenant. Moreover, the Legal Advisory and Conveyancing Office's guidelines also requires the inclusion of the site plan showing the slopes already constructed or to be constructed with statements stating out the obligations of owners of slope maintenance in the sale brochures for new flats. At the same time, the Hong Kong Law Society has advised its members to include slope maintenance clauses in all new Deeds of Mutual Covenant.

In addition to various means of public education on slope safety and slope

maintenance, the Geotechnical Engineering Office will produce annual survey of “State of Maintenance of Leafleted Slopes” and invite the Social Sciences Research Centre of the University of Hong Kong to conduct a public opinion survey to review the level of public awareness of the importance of slope maintenance. Over the years, it is undoubtedly that more owners are now more aware of the importance of slope maintenance and their obligations to maintain slopes within their own property. Although the owners are now more willing to do routine maintenance work, there is still a lot of resistance to do so, such as the high maintenance cost. Frankly speaking, the overall situation regarding maintenance of private slopes is improving but still far behind from satisfactory level.

As mentioned in the early part of this section, there is “Hard” approach. Under existing Buildings Ordinance, there is no statutory power to require the private owners to take any action for their own slopes, unless the slope has been served a Dangerous Hillside Order. There is a proposal to introduce statutory requirements to compel the private owners to undertake regular inspections and maintenance of their slopes according to Yim et al (1998). The proposed system is to require the private owners to employ a qualified geotechnical engineers to carry out regular inspection of their slopes and to fulfill the works recommended in Geoguide 5 – Guide to Slope Maintenance. Then the geotechnical engineers will be required to issue a certificate to the owners who will in turn submit it back to the Government. There are some possible sanctions

for non-compliance. Prosecution, fixed fines, blocking building or property transactions are unexhausted examples.

Experience over the years shows that the landslide problem in Hong Kong cannot be solely solved by the Government itself, but with the contributions by various stakeholders, including private slope owners, the general public, the media, the resource distributors, the politicians and the profession. The stakeholders should assist the slope safety through their action to properly maintain their own slopes, to report signs of landslip danger, to report through the media the slope safety information and emergency awareness messages, to take personal precautionary measures during Landslip Warning periods and to reflect on community needs and expectations by politicians.

3.4 Community Advisory Unit

As mentioned before, there are various means to provide information on slope safety and slope maintenance to the general public. One of them is called the Community Advisory Unit. The key message is to enhance public understanding of slope safety and to reinforce private owners' awareness of their slope maintenance responsibility through providing advisory and information services.

Hong Kong Geotechnical Engineering Office (2004a) has raised out four main areas of the Community Advisory Unit as follows:

1. Slope safety and maintenance seminars and talks;
2. A meet-the-public service;
3. meeting with private owners or their representatives to deal with the Dangerous Hillside Orders;
4. meeting with Owners' Corporations and Mutual Aided Committees.

With the assistance of the Home Affairs Department's Building Management Resources Centres, District Offices, etc., the Community Advisory Unit is able to reach out the community by organizing seminars and talks on slope safety and slope maintenance matters. In order to have a close contact with the public, a regular programme called "Meet-the-Public" services is devised to answer concerns and give slope and related information to the public. Whenever necessary, the Community Advisory Unit will offer advice on how to carry out investigation and implementation of the slope works to compile with the Dangerous Hillside Orders satisfactorily. For the last area, the Community Advisory Unit will provide a face-to-face advisory service to private slope owners, Owners' Corporations, Mutual Aided Committees, etc., on how to undertake slope maintenance works. If it is necessary, the Community Advisory Unit will organize relating seminars for Owners' Corporations and Mutual Aided Committees on slope maintenance and slope safety matters.

CHAPTER 4 METHODOLOGY

Chapter Introduction

In this chapter, methodology of this study will be discussed. Various methods will be introduced together with advantages and disadvantages. There are four sections in total.

Firstly, research questions will engage the first section. The second section will talk about various research methods while the third chapter will be about relationship between research methods adopted.

4.1 Research Questions

Over the years, there has been a number of landslides happened in Hong Kong which has caused a significant number of deaths and hurts. In viewing this occurrence, the Geotechnical Engineering Office has carried out a series of public education campaign to promote the message of regular slope maintenance and repair works to the community. Besides, knowledge in slope safety has been also spread over the community, too.

Although the number of landslides happened in Hong Kong has declined in recent years, the level of awareness of owners to slope maintenance and repair works is not satisfactory. According to a survey conducted by the Social Sciences Research Centre of the University of Hong Kong together with the Geotechnical Engineering Office in 2000, 72.9% from 1,631 respondents were concerned with slope safety problem mostly due to landslide incidents happened before with a percentage of 77%. However, a majority 45% of 365 respondents did not have any idea about the last time of maintenance with 10% for those who have already forgotten the time of last maintenance. It is even worse that half of the respondents did not aware of the type of maintenance work done (Chung and Pang, 2000).

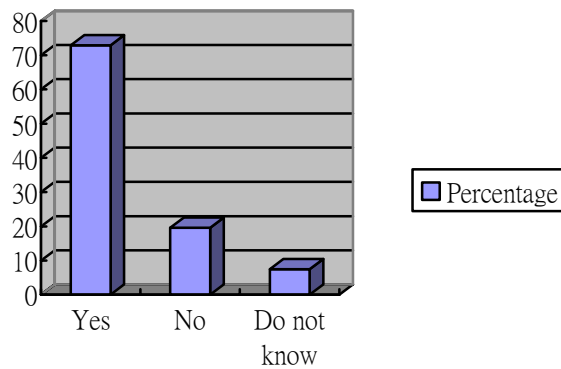


Fig. 4.1 Bar chart showing the number of people who were concerned with slope safety problems in Hong Kong in 2000 (Total = 1,631 people)

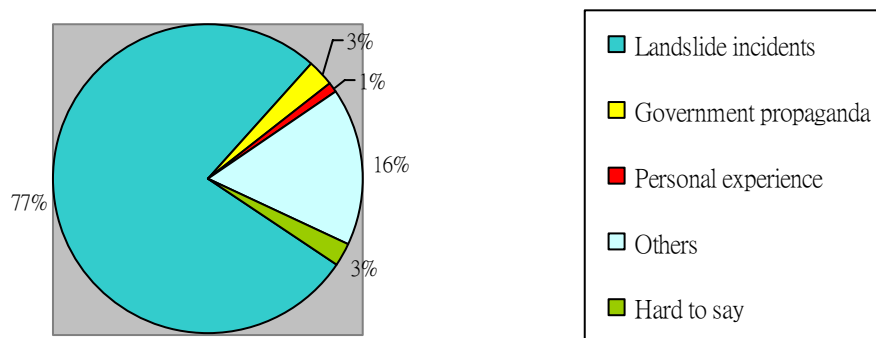


Fig. 4.2 Pie chart showing the reasons of concerning with slope safety problems in Hong Kong in 2000 (Total = 1,188)

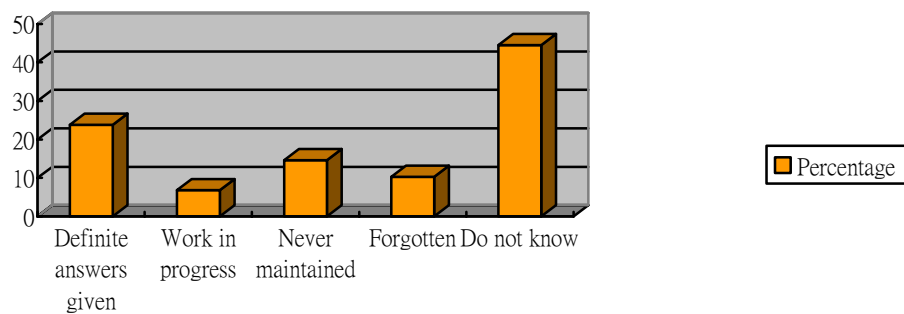


Fig. 4.3 Bar chart showing the awareness of slope maintenance work for those who live near slopes or retaining walls in 2000 (Total = 365)

Furthermore, the receptions of slope maintenance and slope safety measures have been also studied in Chung and Pang (2000). It reveals that 77.1% of 1,635 respondents knew that the owners should have the responsibility to maintain slopes within private lots. In addition, a slightly more than half of the majority has heard of some promotion activities regarding to landslip warnings and slope safety campaigns. Although there are 96% of the respondents who knew that landslip warnings would be hoisted during heavy rainfall, only 48% of them were aware that these signs had been erected on slopes which were below safety standard.

Message / Information	Level of awareness
“Keep you slope safe”	83.2%
Property owner’s responsibility	77.1%
Layman’s Guide to Slope Maintenance	15.2%
Slope Maintenance Hotline	15.8%
Promotion of landslip warnings	65.4%
Hoisting of landslip warnings during heavy rainfall	96.4%
Landslip warning signs on slopes below heavy rainfall	47.7%
Having seen road side landslip warning signs	45.8%

Table 4.1 Table showing the level of awareness of messages and source of information in 2000 (Total = 1,631)

Besides, in reviewing the effectiveness of conveying the message of “Keep your slope safe” and promoting the Layman’s Guide to Slope Maintenance, the former one shows a significant decrease even though it keeps a relatively high percentage while the latter one still maintains a

very low percentage. It can observe that though the property owners aware the necessary to keep their slopes in a safe condition, their knowledge in how to maintain the slopes in a good condition and the procedures in maintaining the slopes is inadequate. They also not aware the existence of Slope Maintenance Hotline as it keeps a very low percentage which is more or less the same as the one in Layman's Guide to Slope Maintenance.

To conclude, the research questions are as follows:

1. Is the level of awareness of the owners towards the slope maintenance and repair works affected by their living locations?
2. Is there any relationship between the level of awareness of the owners towards the slope maintenance and the form of property management organizations?
3. What factors/barriers leading to the owners fail to maintain slopes even though they have knowledge in the relevant aspect?
4. What are the possible measures to tackle the obstacles and barriers?

In order to search for the answers for the questions mentioned above, several research methods will be engaged, namely literature review, questionnaires, interviews and case study. Each of them will be explored in details in the later sections.

4.2 Research Methods

In order to explore the level of awareness of the owners to slope maintenance and repair works and slope safety in Hong Kong, several methods have been devised for the research as follows:

1. To review and study literature articles relating to slope safety system in Hong Kong, slope protection methods, public education carried out by the Government, and
2. To design and hand out questionnaires to the owners and contractors for collection of their knowledge and opinions in slope maintenance and slope safety, and
3. To conduct interviews with contractors to have a further investigation based on their answers given in the questionnaires, and
4. To analyze the findings obtained both from questionnaires and interviews, and
5. Case studies of prior slope failure cases will be also studied to explore any common or significant factors leading to the landslips.

Each method will be explained in details, such as functions, strengths, shortcomings, etc., in the following sections.

4.2.1 Literature Review

After setting up the hypothesis for the study, a literature review should be

followed which is a very important step for a whole dissertation. It aims to review the professional literature to see what others have already written about the topic that the researcher tends to do according to Royse (1999).

Literature review can let the researcher to get familiar and learn as much as possible about the topic before the start of the study. It can help the researcher find or confirm the research interest and possible findings within a theoretical framework. What's more is it can even provide data for the researcher to compare with his/her own findings.

After carrying out adequate literature review which is relevant to the research problem, the researcher will have a clear concept and so, research question may be refined or modified. When writing up the literature review, personal opinion or comment should not be included as it should be a collection or summarization of literatures done by others in a relating subject area.

As long as completing the literature review, data collection process can be put forward. One point should be highlighted that the literature review should be subject to change or update from time to time when the researcher finds that he/she has found something missing in the later stages.

4.2.2 Questionnaires

There are various research methods in which the use of questionnaires and structured interviews are the mostly emphasized for data collection in quantitative analysis. These two methods are both highly structured ways to collect data from a relatively large pool of samples

A questionnaire, usually named as postal questionnaire approach, is referred as self-administrated questionnaire, according to Bryman (1989), because the respondents are only required to finish the questionnaire on their own without any face-to-face contact with the researchers. The most common way to distribute and collect the self-administrated questionnaires is by post.

4.2.2.1 Pros and Cons of questionnaires

In Bryman (1989) and Gillham (2000), both of them have also raised out some advantages and disadvantages for using self-administrated questionnaires.

Advantages for using self-administrated questionnaires:

1. Low cost in time and money: It is relatively cheaper than conducting face-to-face interviews, especially when a large pool of sample size is needed and if the respondents are geographically dispersed. The postal fee for giving out and returning post is much less expensive

and requires much less time than conducting interviews because the interviewers need to spend time and money on travel from place to place.

2. Easy to get information from a lot of people in a short period of time: If it is efficiently organized, large scale of responses from questionnaires can be received within one to two weeks only as the respondents from indifferent geological locations can fill in the questionnaires in a short period of time and return back to the researchers.
3. Lack of interviewer bias: A number of researches show that the characteristics of interviewers, such as gender, age, appearance, race and social status, have some effects on the respondents to answer questions during the interview. As a result, the characteristics of interviewers and of respondents may combine to produce abnormal effects on the questions. Bias and deviations will be produced. But for the self-administrated questionnaires, only the respondents here answer the questions and so such sources of errors can be eliminated.
4. Standardization of questions: If the questions are clear and unambiguous, bias arising from non-standardization can be eliminated.

Disadvantages for using self-administrated questionnaires:

- i. Risk of low response rate: It is a common problem in postal questionnaires since the respondents do not have responsibility to finish the questionnaire indeed. They usually find it as a waste of

time or lack of interest to do the questionnaires. Gillham (2000) states questionnaires typically attract a response rate of around 30 per cent and if the response rate is over 50 per cent, it is already generated a good response. Bryman (1989) supplements that even though if a cover letter explaining the aims and importance of a piece of research, a reply-paid envelope and guarantee of confidentiality and anonymity are enclosed with the questionnaires, it does not help in much the response rate. He also mentions that the response rate is around 21 per cent to 25 per cent for postal questionnaires.

- ii. Degree of ambiguity of questions: Sometimes, the questions in the questionnaires are unclear and unambiguous which make the respondents difficult to give answers. As there is no interviewer or researcher next to the respondents to clarify the questions, the respondents will get confused and ignore the questions. Besides, the format of questionnaire should be easy to follow and user friendly.
- iii. Uncertainty of identity of respondents: Although it is restricted the identity of respondents, it is still difficult to control who will answer the questionnaires because the questionnaires are done without the existence of the researchers. As a result, there may be a variety in the roles and statuses of respondents and it may induce unavoidable errors.
- iv. Wording problem: Some researches have shown that slight difference in wording or in questionnaire framework may bring out

radically different levels of agreement or disagreement, or a different selection of answers. Fortunately, this effect can be minimized by prior pilot testing or by cross checking the trend of the responses.

- v. Impossible to check seriousness or honesty of given answers: It is difficult or even impossible to verify whether the respondents will give the answers seriously and honestly.
- vi. Lack of control over order in answering questions: Respondents usually read over the whole questionnaires before answering the questions. Hence, their answer of early questions may be influenced by their knowledge of the later ones. Thus, the result may be affected.

Therefore, it is very important to decide and draft what questions to be set. Generally, there are two types of questions commonly adopted in questionnaires which are open-ended questions and close-ended questions.

4.2.2.2 Types of questions

The open-ended questions are those questions without any constraint in giving answers according to Crano and Brewer (2002). Royse (1999) explains that this type question can enable respondents communicating without having to choose from a set of prepared response categories. It is more suitable for the researchers who want to carry out direct interviews

with the respondents after collection of questionnaires. However, open-ended questions require much more time to finish and so, few respondents are willing to elaborate their answers and a poor response rate may be resulted. At the same time, the researchers may receive greater details. Besides, Gillham (2000) adds that one to two open-ended questions can be a good way of finishing a questionnaire, otherwise it may give a feeling to respondents that their opinions or experiences are only used to fit the straitjacket of prescribed answers.

The close-ended questions are the ones which have already equipped with predetermined response set as said by Royse (1999). It has a great advantage over the open-ended questions is the respondents are more willingly to answer as it does not require much time to think of what response they should give and they do not need to write much. Thus, the response rate is relatively higher than that of open-ended questions. It can also incorporate close-ended questions that allow for ratings rather than just giving out choices of “Yes”, “No”, or “Agree”, “Not agree”, and so on.

Nevertheless, the adoption of both open-ended questions and close-ended questions is highly recommended so as to produce a more comprehensive result.

In this study, both questions are adopted in two sets of questionnaires. For the one set for the owners, there are 23 close-ended questions with 3

open-ended questions. There are 6 close-ended questions together with 6 open-ended questions in the questionnaire sent to the contractors. Both set of questionnaires also include questions with ranking order so as to explore the level of importance of factors leading to failure to carry out slope maintenance and repair works. Besides, as the educational level of the owners may not be high enough to understand the provision of English language, Chinese statements are equipped next to the English wording in the same questionnaire to the owners. However, as the contractors are the professionals, Chinese translation is not required.

4.2.2.3 Sampling

Sampling can define the quality of the respondents so as to facilitate the data collection and ensure the sample collected can well represent the population. Royse (1999) explains that the notion behind sampling theory is a small set of observations, i.e. sampling units, which can tell the researcher something about the larger population. It works as a trend can be induced within a large population from a small number of individuals. Certainly, a larger sample can produce a greater confidence and it is more precise in estimating the “true” level of support or nonsupport for the study. If the sample is large enough without any bias in the selection of the individual sampling units, the pattern found in the sample will greatly fit with what the researcher may find if he/she is able to contact everyone in the total population.

As there are two sets of questionnaires, two samples should be chosen. This study aims at investigating the level of awareness of owners towards the slope maintenance and repair works and slope safety and thus, two major groups are selected, i.e. owners living next or near to the slope and owners not living next or near to the slope, so as to explore whether the living location will affect their perception to slope maintenance and slope safety. Another set of sample will be simply the contractors responsible for carrying out geotechnical works.

It is very normal that any researcher may wish to eliminate the bias from the study. Royse (1999) dictates that bias is an outside event that tends to produce some distortion from what is actually occurring or present, causing the researcher to make erroneous conclusions about reality. A bias questionnaire can merely give information but it does not be able to reflect a true picture or representation of the issue that the researcher is investigating. Bias can be eliminated or minimized by choosing samples closely to the larger population being studied. In this study, there may be a potential bias that the respondents filling in the questionnaires may not be actual owners, such as simply the occupants. Undoubtedly, it is quite difficult to totally mitigate this effect as it is impossible to control who will fill in the questionnaires without the presence of researcher. Hence, the researcher can only try hard to give as much as background information of the study to ensure the respondents clearly to understand that their sincerity and participation are important and vital to the scope of the study. Another potential bias is the respondents may not be the

contractors but the secretaries will answer the questionnaires. As a result, the researcher can direct the questionnaires to the managing directors or even the chairpersons of the firms with a covering letter to explain the aim and scope of this study explicitly to make sure that the quality of respondents will fit in the sampling.

4.2.2.4 Devise questionnaire process

Before determining what kinds of questions to be asked, literature review on the prior related surveys conducted by the Geotechnical Engineering Office to pick up similar approach to draft the questionnaire. After drafting the first version of the questionnaire, it has been revised after the consultation of the supervisor. Another set of questionnaire to contractors has been also developed. Both set of questionnaires will employ open-ended questions and close-ended questions as mentioned in the previous section. Besides, the format of questionnaires is easy to follow and adopt simple language. A covering letter has been written up which will be sent out together with the questionnaires. Gillham (2000) suggests that a covering letter can enable the respondents to be clear about what the researchers are trying to find out and why, then they will be more likely to respond appropriately and helpfully. It is because if the respondents are puzzling about the purpose of questionnaires, they will certainly decline to answer or misunderstand the purpose of the study. Apart from that, the covering letter will state clearly that the researcher will guarantee the confidentiality of the data collected and ensure that the

data collected will be solely used for academic purpose to make sure the privacy of respondents will be highly protected so as to encourage the response rate. Last but not least, name, contact number and e-mail address are provided in the covering letter for any enquiries.

Questionnaires to owners are distributed various estates in Chai Wan and in Kwun Tong. Questionnaires to contractors are posted by mail with paid returning envelopes.

There is another way to distribute the questionnaires which is the internet questionnaires. Although it can greatly enlarge the number of respondents and it is time and cost effective, the quality of respondents is even difficult to control. It is because it is impossible to trace back whether the respondents are the representative populations to the study and hence, the quality of the result may be polluted. In view of that, conducting questionnaires through the internet is avoided.

4.2.2.5 Data analysis methods

The purpose for data analysis is to take the raw data, such as completed questionnaires, produced in the data collection and summarize it. It is believed that patterns, trends or relationships may be discovered from the raw data. This can enable the researcher to prove whether the hypothesis set is valid and draw conclusion from the research.

In this study, two methods of data analysis will be employed.

4.2.2.5.1 Use of statistics

Statistics is a method to organize and interpret the numerical information.

It can be distinguished into several steps as follows:

1. Tallying
2. Calculation of means, proportional ratio and total scores
3. Correlations
4. Presentation by charts and tables

The first step is tallying in which data is grouped, edited and entered. It is usually in form of numbers or percentages.

Mean is definitely the average result of the data which can allow the researcher to understand the average response for one particular variable according to Royse (1999). Proportional ratio can observe the respective weighting of each factor. Ranking can be obtained as a result. Total scores can show the aggregate contribution of that particular factor.

One way to examine whether there is any relationship between variables is using the correlation. The strength of relationship can be demonstrated by the correlation coefficient which is a statistic ranging from -1.00 to +1.00. For a perfect correlation, any movement within one variable will

be matched with the same amount of movement of another variable which will give +1.00 as the correlation coefficient. If there is none correlation among variables, 0.00 will be the correlation coefficient. The positive sign shows there is a direct relationship while the negative sign shows that it is an inverse relationship. By squaring the correlation coefficient can observe the strength of the relationship between two variables. Royse (1999) explains that if the correlations are smaller than 0.20, it will be described as slight or inconsequential. Those between 0.20 and 0.40 will be interpreted as small or low correlations. Correlation coefficients between 0.40 and 0.70 are moderate correlations and those above 0.70 will be said to be a strong correlation.

Charts and tables will be one way to show the results of the data which are easier to present and compare among the variables.

4.2.2.5.2 Use of scales

One of the comparative stimuli scaling techniques is ranking order described in Crano and Brewer (2002). In rank order scaling, respondents will be asked to order a number of stimuli along a defined choice dimension. The data obtained can be constructed an equal-interval scale of respondents' judgments. This method can avoid two potentially serious problems compared with pair comparison approach. Firstly, the respondents will make their own judgments at once in one operation, judgmental intransitivity will be physically impossible. In other words, if

A is ranked over B while B over C, so A must be ranked over C in the rank order approach. Secondly, it can even avoid some of the administrative work that may be involved in pair comparison, especially when there are a large numbers of stimuli to be compared.

Besides, it can produce comparative judgments and the relative differences between stimuli are arranged on a scale of equal intervals. In addition, it is valid to assume that all respondents will produce the same pattern of choices if their judgments are perfectly reliable because responses to stimuli are pooled over respondents and so, differences between respondents can be ignored. Although there may be some violations, it can be offset if the violation is not too extreme.

4.2.3 Interviews

Another common method is conducting interview which has been briefly introduced at the very beginning of this chapter. There are two main categories of interviews which are personal interview and telephone interview.

Bryman (1989) distinguishes between these two methods of interviews. Personal interview, which is also named as face-to-face interview, has an advantage over the telephone interview that the researcher and respondent are in direct contact. Royse (1999) adds that the researcher can even read facial expression and moods of respondents during the personal interview.

Visual aids can be also employed to help respondents to answer the questions. However, personal interview will require the researcher to take travels to the respondents. Time and money will be incurred. Moreover, there are some studies to show that the response rate of accepting to be interviewed is not satisfactory. Conversely, Crano and Brewer (2002) further say that the quasi-anonymity of the phone conversation seems to promote more honest answers to sensitive questions. Hence, a higher response rate will be resulted. Moreover, a research done by Rogers, et. al. (2000) reveals that the telephone interviews in general even appear to produce results similar to the more formal personal interview. Bryman (1989) points out some advantages by adopting telephone interviews. Telephone interview is cheaper and quicker to conduct. The effects of the personal and social characteristics of interviewers on respondents' replies are unlikely produced. However, it is reminded that the telephone interviews should be brief and clear. So, there may be a phenomenon that the researcher cannot obtain any extra relevant observational material from telephone interview.

Royse (1999) together with Crano and Brewer (2002) also agree that a possibility of bias may be associated with the telephone interviews, which is the inability to interview persons who do not have telephones. Therefore, it may underestimate the result produced by the telephone interview as the population of poor has been excluded.

In this study, telephone interview with contractors has been engaged.

After receiving finished questionnaires from contractors, a telephone interview will be followed up to explore the issues in a deeper detail based on the finished questionnaires. Therefore, a short and brief interview will be enough. In addition, the bias mentioned above is eliminated in this study because the telephone interviews will be only conducted with contractors who are the professionals and they must have telephones in their offices. There will be also face-to-face interviews with government departments because it can handle much more questions with representatives from relevant government departments, especially after analyzing data obtained from those questionnaires.

4.3 Relationship between methods adopted

It is admitted that each research method has its own advantages and disadvantages which have been discussed in the previous sections. Besides, there are several dimensions to an adequate picture of any human activity as the real world is much more complex than the researcher assumes. Hence, Gillham (2000) suggests by using a range of methods, a more adequate and clear picture can be obtained. This multi-method approach for the research can enrich the research findings and has an effect of cross-validating so that a more comprehensive picture can be illustrated. Bryman (1989) adds that employing several sources of data can allow data in relation to a number of different topics to be addressed and the validity of evidence from particular methods to be checked by other sources. He also mentions that this cross-checking of

information among data got from different sources can reveal some matters that cannot be directly observed from each source. For instance, although using questionnaire can obtain a lot of information at one time, it may not be enough to generate a full picture of the issue. Hence, it can be equipped by conducting an interview in which more information with deeper sensibility can be obtained according to the questionnaire. In this case, a more all-around and detailed work can be produced.

In this study, literature review is firstly performed. After finished adequate amount of readings, two sets of questionnaires will be devised based on the information and facts observed from the literature. Then the questionnaires will be sent and collected for analysis purpose. Interviewing with contractors will be conducted to go in depth according to their answers given in the questionnaires. Besides, interviews with relevant government departments will be also carried out to see their views from another category of stakeholders. After analyzing the findings, a conclusion will be drawn up. As a result, a triangular relationship will be created among literature, questionnaires and interviews.

CHAPTER 5 DATA ANALYSIS

Chapter Introduction

In this chapter, data obtained from questionnaires will be analyzed and interpreted of the findings and implications.

There are four main sections. The response rate will be calculated in the first section while the second section will present the data got from questionnaires to owners in which correlation will be employed to explore whether there is any relationship among factors. The third section will be data obtained from questionnaires to firms. Lastly, conclusion will be done in the last section.

5.1 Response Rate

Two sets of questionnaires have been distributed to the owners and contractors respectively. 280 sets of questionnaires have been sent to the owners and in return, there are 145 completed questionnaires received. Hence, the response rate is 51.79% which is already a good response according to Gillman (2000). For the contractors, 26 letters were postal mailed to the companies and 5 responses have been received. It counts 19.23% of the response rate.

In the following parts, data obtained from two sets of questionnaires will be systematically analyzed and demonstrated in form of charts and tables respectively. Each finding will be described and explained the phenomenon.

5.2 Owners' Questionnaires - Findings and Implications

In this part, data from questionnaires to owners will be interpreted in groups to generate a clear concept.

5.2.1 Basic Information

There are 145 sets of questionnaires to owners received. Two districts have been chosen for testing, i.e. Chai Wan and Kwun Tong. These two districts also comprise housing estates next or next to slopes and so, they

are fit to the testing. Form the chart shown below, there are 95 people living in Chai Wan while 50 people living in Kwun Tong.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chai Wan	95	65.5	65.5	65.5
	Kwun Tong	50	34.5	34.5	100.0
	Total	145	100.0	100.0	

Table 5.1 Living location distribution of the samples

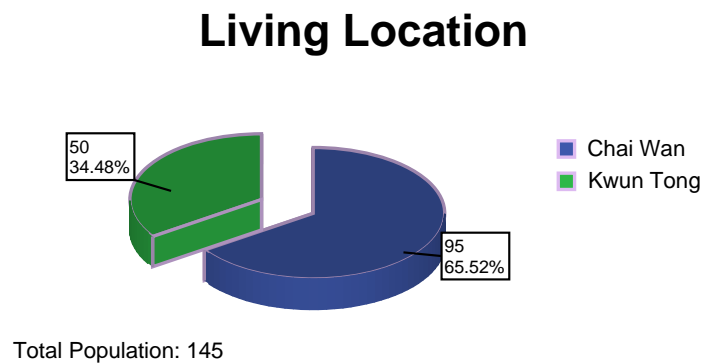


Fig. 5.1 Living Location

In Hong Kong, there are various types of housing. In the questionnaires, four choices have been given: private housing, public housing, squatters and others. The distribution of types of housing is described as below:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Private housing	82	56.6	56.6	56.6
	Public housing	46	31.7	31.7	88.3
	Squatters	1	.7	.7	89.0
	Others	16	11.0	11.0	100.0
Total		145	100.0	100.0	

Table 5.2 Types of housing

From the chart, it can demonstrate that people living in private housing is the largest population while only one person living in squatter. There is a small amount of people living in “others” classification and most of the people in this category are living in Home Ownership Scheme. The pie chart will show a clearer distribution.

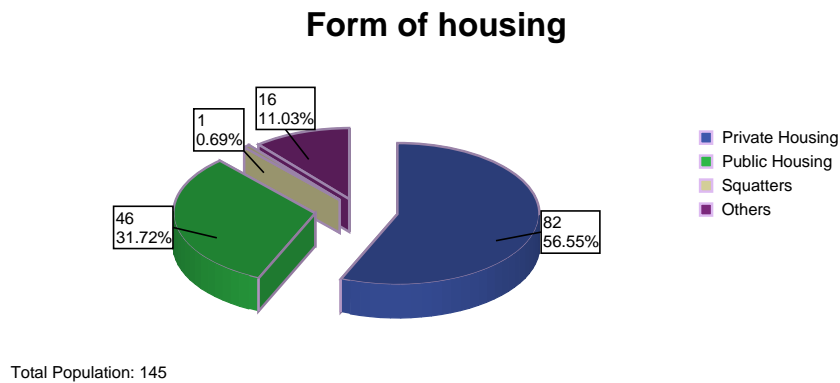


Fig. 5.2 Types of housing living in by samples

Undoubtedly, different types of housing will be managed by different varieties of property organizations. Hence, several categories have been stated, namely public housing management, owners’ corporation,

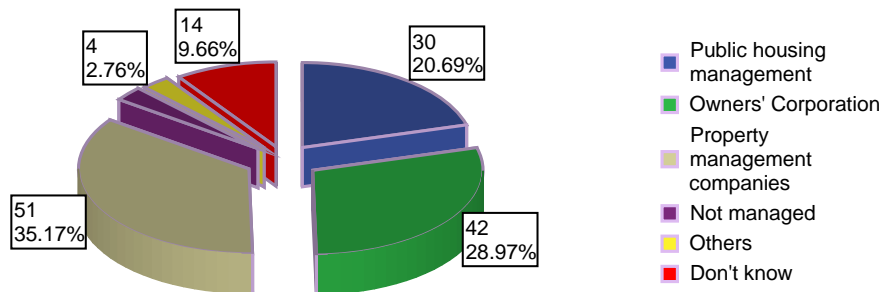
property management companies, not managed by organization, others and don't know.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Public housing management	30	20.7	20.7	20.7
	Owners' Corporation	42	29.0	29.0	49.7
	Property management companies	51	35.2	35.2	84.8
	Not managed by organization	4	2.8	2.8	87.6
	Others	4	2.8	2.8	90.3
	Don't know	14	9.7	9.7	100.0
	Total	145	100.0	100.0	

Table 5.3 Form of organization managing properties

From the questionnaires collected, 35.2% properties are managed by property management companies which is the largest majority in the sample size followed by owners' corporations. It is surprisingly that 10% of sample sizes do not know what forms of organizations to manage the properties that they are living in. It can be observed that some owners still do not aware what institutions manage their properties. It is maybe because as long as there is nothing bad happened or any side effect to their properties, they will not care which organizations to manage the properties. Although the majority knows which organizations to carry out the management of the properties, it may not really represent their knowledge correct since according to the answers they gave, a few of them might give two answers. It is quite confusing. This error can be minimized by verify the types of organizations correctly.

Form of organization to manage the properties



Total Population: 145

Fig. 5.3 Types of organizations to manage the properties

Except the classifications of living locations, the samples have been divided into two groups, i.e. those living in next to slopes and those not living in next to slopes.

From the table shown below:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	65	44.8	44.8	44.8
	No	80	55.2	55.2	100.0
	Total	145	100.0	100.0	

Table 5.4 Distribution of samples living or not living in next to slopes

It shows clearly that 45% of 145 respondents are living in buildings next to slopes while 55% goes to those not living in buildings next to slopes. Each encounters nearly half of the population size.

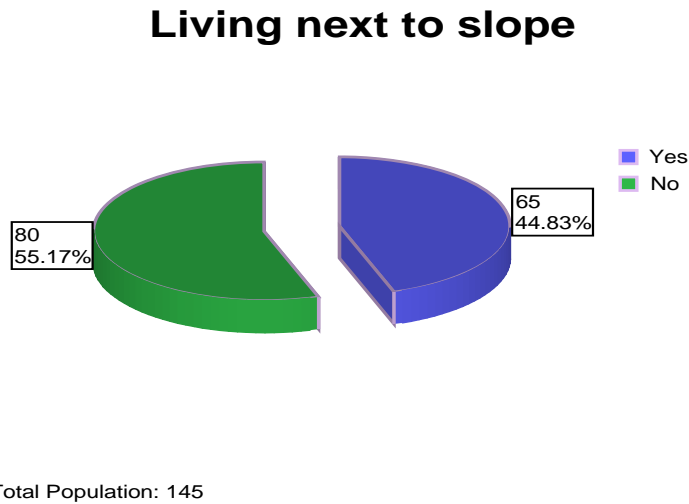


Fig. 5.4 Distribution showing the population living/not living next to slopes

5.2.2 Responsibility

One of the purposes of this study is to investigate whether the owners aware their responsibility to carry out regular slope maintenance and repair works, if necessary. Therefore, a few questions have been set to fulfill this purpose.

Concerning about whether the owners know the responsibility to maintain the slopes next to their buildings, from the table shown below, it can be observed that only 41.5% aware that the ownership of the slopes next to their buildings.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	27	41.5	41.5	41.5
	No	38	58.5	58.5	100.0
	Total	65	100.0	100.0	-
Total		65	100.0	-	-

Table 5.5 Number of owners knowing the responsibility to maintain slopes next to their buildings

But when they were asked to state the names of ownership of the slopes, mostly failed to state it clearly. For those who have stated, their answers are usually it is the government to own the slopes and only one to two persons stated that the ownership should be rest on the owners among 27 respondents answering “Yes” category. Hence, it can deduce that among these 27 respondents, they may not really know who own the slopes situated next their buildings.

Number of people knowing the ownership of the slopes next to their buildings

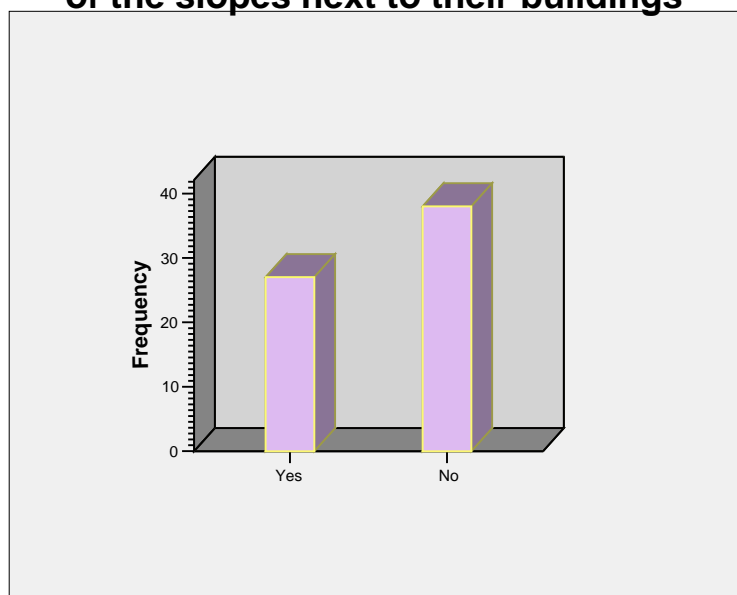


Fig. 5.5 Bar chart of knowledge in ownership of slopes next to respondents' buildings

After asking whether they know who possess the ownership of slopes next to their buildings, they were firstly asked to state who they thought should have responsibility to carry out slope maintenance and then they were further asked for the reasons to their given answers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Owners	18	27.7	27.7	27.7
	Government Departments	43	66.2	66.2	93.8
	Nobody	2	3.1	3.1	96.9
	Others	2	3.1	3.1	100.0
	Total	65	100.0	100.0	-

Table 5.6 Perception in knowing who has responsibility for slope maintenance

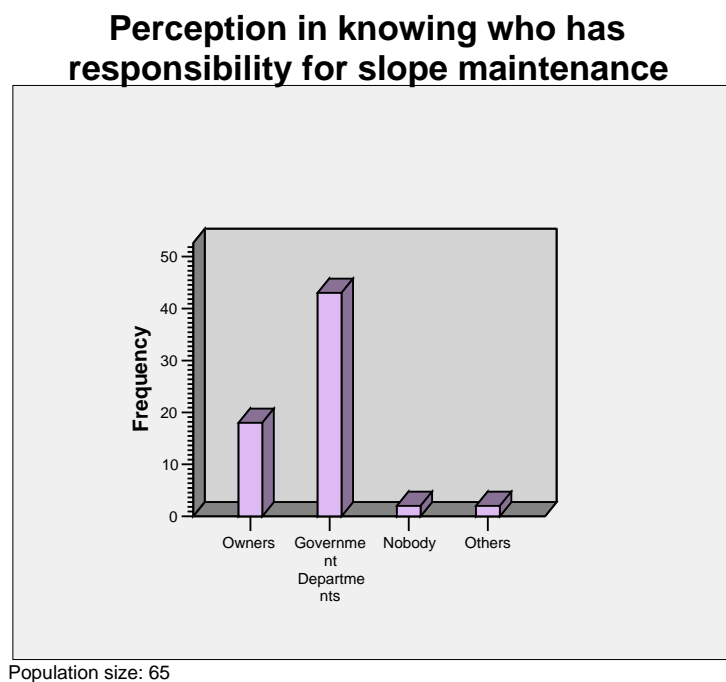


Fig. 5.6 Perception in knowing who they thought to carry out slope maintenance

From the table and chart demonstrated above, it is easily to figure out that most of the respondents thought that it should be the government

departments to have responsibility to carry out regular slope maintenance, i.e. 66.2%. They usually stated that the responsibility should be rested on the Civil Engineering and Development Department while a trace amount mentioned it should be the Highways Department or Buildings Department to take up this responsibility. It can show that the general perception of the responsibility to carry out slope maintenance is on the Government. It may be largely because the general community has an idea that most of or even all the slopes in Hong Kong are belonged to the Government and because they usually see many slope works in progress are stated belonged to the Civil Engineering and Development Department in their daily lives. Therefore, they do not aware or even do not have a concept that the slopes within the private lots are privately owned by the property owners.

As stated in the previous paragraph, the respondents were asked to give reasons for their answers in the last question. The table and chart below show that nearly 70% of respondents think that it is due to have such responsibility to do so while 13.8% of respondents aware that it is a statutory provision stated in the lease or contract. It is interesting to find out that only a half of respondents who chose “Owners” category in the last question think that there is a binding provision stated in their leases or contracts. It can reveal that although the respondents know the owners should have the responsibility to carry out slope maintenance, they simply think that as they are the owners, they have this responsibility. They do not alert there may have some provisions stated in the leases or

contracts. It may be deduced that the respondents do not actually have a full knowledge of what have been written down in the leases or contracts. They just treat the leases or contracts as evidence that they possess the named premises. They may not have a perception that there is an enforcement of any clauses stated in the leases or contracts, until they come up with any problems concerning with these contractual documents. As a result, it may be figured out that the respondents do have enough understanding in basic law knowledge and their rights towards the premises. Moreover, there is a considerable amount of respondents who even do not know the reasons why they gave the answers in the last questions. It may be because they were confused when they were thinking who should have the responsibility to carry out slope maintenance. Again, it can be observed that this portion of respondents in fact do not know or are puzzled who should conduct slope maintenance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have responsibility	45	69.2	69.2	69.2
	Statutory provisions in lease/contract	9	13.8	13.8	83.1
	Do not know	8	12.3	12.3	95.4
	Others	3	4.6	4.6	100.0
	Total	65	100.0	100.0	-

Table 5.7 Reasons for answers given in previous question

Reasons for given answer in Question 6

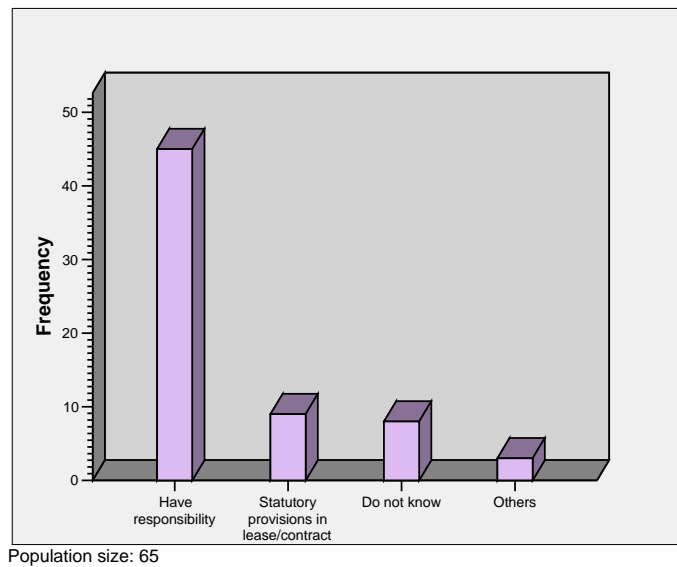


Fig. 5.7 Bar chart showing reasons for answers given in previous question

The next question is to explore whether the respondents think that the property owners should possess responsibility for slope maintenance within private lots.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	47	32.4	32.4	32.4
	No	98	67.6	67.6	100.0
	Total	145	100.0	100.0	

Table 5.8 Table to show the distribution of knowledge on whether the owners should be responsible for slope maintenance within private lots

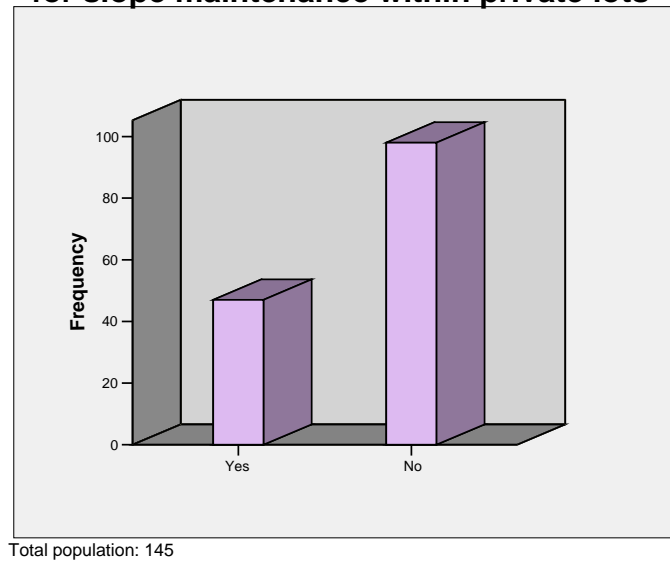
Whether the owners should be responsible for slope maintenance within private lots

Fig. 5.8 Bar chart showing the response on whether the owners should be responsible for slope maintenance within private lots

From the above, it can be shown that 67.6% encounter for answering “No” category when the respondents were asked while the rest goes to “Yes” category. Most of the respondents who answering “No” category think that slopes’ ownership should be the government and so, it should have the liability to carry out the slope maintenance. In addition, some also point out that the property owners only buy the flats and hence, they think that the provision of slopes’ ownership is none of their business and the government or other relevant parties will take up the responsibility for them. It can be deduced that the general perception is the respondents think that they are only the buyers or lessees and the government is solely the party to own all the slopes in Hong Kong and so do the responsibility to carry out slope maintenance. Their behaviour can be treated as taking for granted.

5.2.3 Slope Maintenance

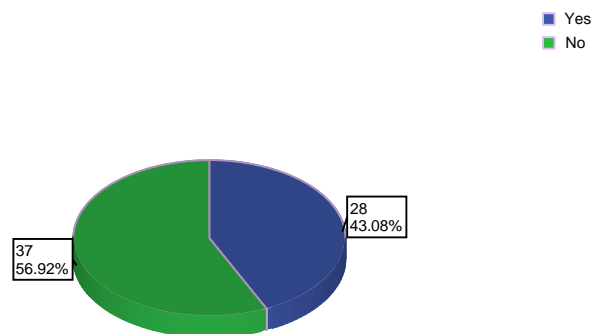
After identifying the basic information of respondents, respondents living next to slopes would be asked to answer some questions relating to slope maintenance.

Firstly, they were asked to figure out whether the slope has been once maintained or repaired. 43.1% of respondents said the slopes had been once maintained or repaired while the rest goes to “No” category.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	28	43.1	43.1	43.1
	No	37	56.9	56.9	56.9
	Total	65	100.0	100.0	

Table 5.9 Table showing whether respondents know the slopes have been once maintained or repaired

Number of respondents knowing whether the slopes have been once maintained or repaired



Population size: 65

Fig. 5.9 Respondents in knowing the slopes have been once maintained or repaired

Then, these 65 respondents were asked to categorize the reasons of not carrying out slope maintenance. There are seven choices for them for ranking to show the level of importance of each reason and to explore which factor is the most important to the respondents.

In order to show the ranking, scoring system will be used. For this question, there are seven choices and the one which is the most important will be ranked as 1 and so on. Hence, if a particular reason is ranked as 1, it will be scored 7 marks. The following table will display the intended system clearly.

Ranking	1	2	3	4	5	6	7
Score	7	6	5	4	3	2	1

Table 5.10 Scoring system

The following table will demonstrate the quantity of each ranking given by respondents.

Reason/Ranking	1	2	3	4	5	6	7	Total
A	17	23	13	7	3	2	0	65
B	7	4	10	18	8	18	0	65
C	11	13	19	6	8	8	0	65
D	1	3	7	16	24	9	5	65
E	2	2	9	13	16	21	2	65
F	27	20	7	5	3	3	0	65
G	0	0	0	0	3	4	58	65
Total	65	65	65	65	65	65	65	-

Legend:

- A: It is too expensive
- B: It's difficult to collect enough money from property owners
- C: The property owners do not have a perception to do so
- D: The slope is safe
- E: It's meaningless and useless to do so
- F: It's none of my business
- G: Others (Please state)

Table 5.11 Quantity of ranking assigned for each reason

Reason	Total scores	Mean scores	Proportional ratio
A	363	5.585	0.200
B	255	3.923	0.140
C	314	4.831	0.173
D	219	3.369	0.120
E	215	2.867	0.118
F	379	5.831	0.208
G	75	1.154	0.041

Total scores: 1820

Total Proportional ratio: 1.000

Table 5.12 Total scores, mean scores and proportional ratio for each reason

The result of the ranking of reasons has been demonstrated in the tables shown above. In table 5.12, total scores, mean scores and proportional ratio are displayed. The level of importance of each factor is hence deduced as the following table.

Ranking	Factor	Proportional ratio (= 1.000)
1	It is none of my business	0.208
2	It is too expensive	0.200
3	The property owner do not have a perception to do so	0.173
4	It is difficult to collect enough money from property owners	0.140
5	The slope is safe	0.120
6	It is meaningless and useless to do so	0.118
7	Others	0.041

Table 5.13 Ranking of factors

It is clearly to show that the major factor leading not to carry out regular slope maintenance since the respondents think that they do have this responsibility to do so. So, they do not have incentive or even ignore it. The second major factor is they think that it is too expensive to carry out slope maintenance. In fact, the cost of regular slope maintenance is far less than that of slope repair. However, the respondents do not have a general idea of the cost of slope maintenance and they think that it may be a waste of money to employ consultants or engineers to conduct inspection or maintenance on the slopes which are in good conditions. The general public usually has a concept that they will take action accordingly when there is an accident or a problem happened. They rare

take any precautionary measure to prevent any loss in the future. They only receive the information that put right in front of them. The proportional ratios for these two factors are very near to each other, so it can see that both factors affect the perception of respondents the most. The third major factor goes to “The property owners do not have a perception to do so” which is quite reasonable and consistent with the first two major factors. Because of these thoughts, they tend to not have any perception to carry out slope maintenance. Although some of the property owners may have perception to do so, the residential buildings in Hong Kong are multi-ownership in nature. Therefore, the cost of slope maintenance should be shared among the occupants living in the same building. For those who do not have this perception to conduct maintenance, they may not be willing to give contribution. As a result, “It is difficult to collect enough money from property owners” will be resulted as the fourth factor. Consequently, it can see that the first four factors are inter-related to each other.

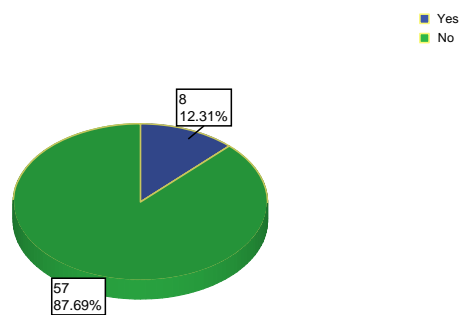
After that, the respondents were asked to whether they knew the time for last slope maintenance or repair works carried out. If they said yes, they were asked to state the time.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	8	12.3	12.3	12.3
	No	57	87.7	87.7	100.0
	Total	65	100.0	100.0	

Table 5.14 Table showing respondents whether they know the time for last slope maintenance / repair works carried out

From the table and pie chart shown here, it is astonishingly that 87.7% of respondents cannot figure out the time for last slope maintenance or repairs works. Even among 8 respondents who chose “Yes” category, only 2 respondents were able to state out the time. It can show that the respondents do not aware the slope maintenance or repair works carried out on the slopes next to the buildings. Their perception towards it is extremely low.

Number of respondents knowing the time of last slope maintenance/repair works carried out



Population size: 65

Fig. 5.10 Pie chart showing respondents' knowledge in time of last slope maintenance / repair works

After asking them to figure out the time of last maintenance done, they were asked to identify what had been done during the slope maintenance. Multiple answers were allowed.

	Overall upgrade to improve slope stability	Repair to surface protection	Clearing of vegetation	Slope inspection by professional geotechnical engineer	Clearing of surface channels	Others	Do not know
Frequency	2	16	13	3	1	2	38
Percentage (Base: 75)	2.67%	21.33%	17.33%	4.00%	1.33%	2.67%	50.67%
Percentage (Base: 65)	3.08%	24.62%	20.00%	4.62%	1.54%	3.08%	58.5%

Table 5.15 Kinds of slope maintenance work done

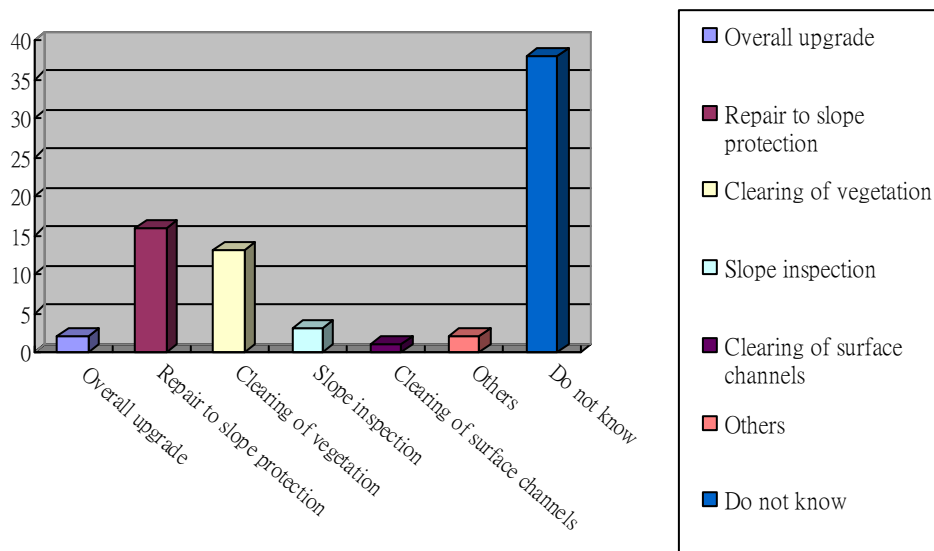


Fig. 5.11 Bar chart showing frequency of each kind of slope maintenance works

There is 58.5% (base = 65 respondents) of respondents do not know what kinds of slope maintenance works have been conducted. It can show that respondents do not pay much attention to or even ignore slope maintenance works because for instance, repairing slope protection is the most easily observable work and during maintenance work, it will be usually conducted. But only 24.62% (base = 65 respondents) of

respondents have once noticed. Their awareness towards slope maintenance works is very weak.

Respondents were invited to identify what difficulties might come across with carrying out slope maintenance. Ranking would be employed and so, scoring system will be referred as the one described before.

Difficulty/Ranking	1	2	3	4	5	Total
A	12	0	0	12	41	65
B	27	17	14	7	0	65
C	16	29	17	1	2	65
D	7	13	26	9	10	65
E	3	6	8	36	12	65
Total	65	65	65	65	65	-

Legend:

A: No difficulty

B: Difficulty in raising money

C: Poor building management

D: Lack of administrative and technical supports

E: Others

Table 5.16 Quantity of ranking assigned for each difficulty

Difficulty	Total scores	Mean scores	Proportional ratio
A	125	1.923	0.129
B	253	3.892	0.261
C	251	3.862	0.259
D	193	3.015	0.199
E	147	2.262	0.152

Total scores: 969

Total Proportional ratio: 1.000

Table 5.17 Total scores, mean scores and proportional ratio of difficulties

After calculating the total scores, mean scores and proportional ratio of difficulties, the subsequent table will rank the difficulty in chronological order.

Ranking	Difficulty	Proportional ratio (= 1.000)
1	Difficulty in raising money	0.261
2	Poor building management	0.259
3	Lack of administrative and technical supports	0.199
4	Others	0.152
5	No difficulty	0.129

Table 5.18 Ranking of difficulties

From table 5.18, the major difficulty that may come across is “Difficulty in raising money”. It is very normal as if the owners do not think that they have this responsibility to carry out slope maintenance, they must refuse to give any contribution. Hence, it will be very difficult to raise money and the slope maintenance work may be eventually set aside. The second major difficulty is “Poor building management” which may be for the reason that some forms of organizations may not aware the importance and the need for slope maintenance and at the same time, the owners do not have an idea about the slope maintenance. Therefore, when the respondents were put in front of these difficulties, they were awaked this factor. The third one is “Lack of administrative and technical supports” since most of owners tend to be lower educational level, so their knowledge in administrative and technical aspects is fragile and they are not sure about administrative and technical supports. Generally, a very small portion of respondents thought that there was no difficulty in

carrying out slope maintenance which can reflect the fact that when carrying slope maintenance, many conflicts must arise causing slow progress or even ignore the slope maintenance finally.

5.2.4 Landslip Warning

In this section, questions in the questionnaires are based on the Landslip Warning issued by the government during the rainfall and the landslip dangers.

The respondents were asked whether they had heard of Landslip Warning and then they were further asked whether they would pay special attention to media, i.e. television and radio broadcast, to see whether the government had issued any Landslip Warning. To facilitate the analysis, a cross-tabulation between two sets of data is generated as shown below.

		Special Attention		Total
		Yes	No	
Landslip Warning	Yes	34	46	80
	No	0	65	65
Total		32	111	145

Table 5.19 Cross-tabulation between hearing of Landslip Warning and paying special attention to media for Landslip Warning during rainfall

From the above table, it can be seen that there are 80 respondents (55.2%) the Landslip Warning while the rest has not heard of this warning. However, there are fewer respondents (32 respondents, 22.1%) who will pay special attention to the media to see whether the government has

issued the Landslip Warning. It may be concluded that although the respondents have a preliminary knowledge of Landslip Warning, they may not have knowledge of what Landslip Warning is or its meaning. They may not think that this warning has any direct connection with them, especially those who do not live near to the slopes because they may think that the Landslip Warning is none of their business. Although there may be a danger to have a landslide, they will not be affected. So, they will not pay much or special attention to the warning.

When the Landslip Warning is issued, the respondents were asked what they would do and this question is allowed for multiple answers. The data is shown below.

	Stay away from slopes	Stay at home/Go to safety places	Listen to the broadcasting of TV or/and radio	Nothing to do/no special actions/no solution	Do not know	Others
Frequency	78	171	40	68	32	4
Percentage	19.8%	43.5%	10.2%	17.3%	8.2	1%

Table 5.20 Actions of respondents when Landslip Warning is in force (Base: 393)

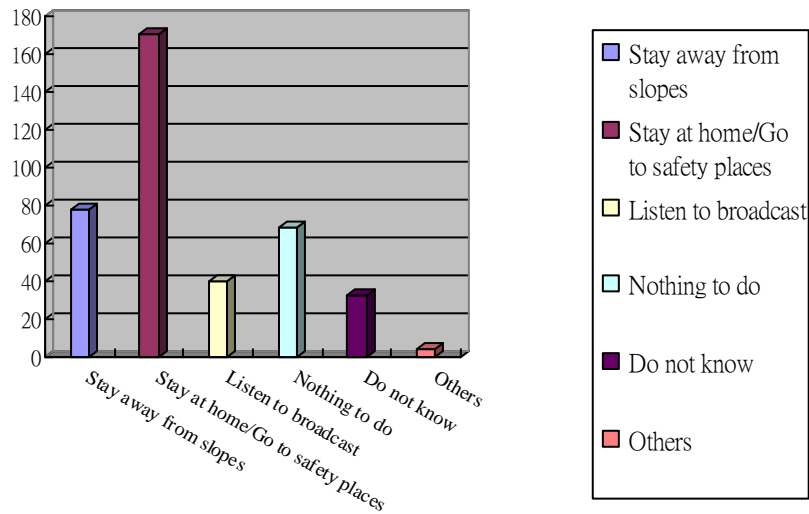


Fig. 5.12 Actions of respondents when Landslip Warning in force (Base: 393)

Most of the respondents prefer staying at home or going to safety places in which the phenomenon is very normal because it can keep them away from any dangerous situation. Moreover, usually when the Landslip Warning is issued, it should be heavily raining. Thus, people have an ordinary behaviour to go back homes or safety places for security which can be interpreted as an instinctive act. For the percentages for “Stay away from slopes” and “Nothing to do/no special actions/no solutions” categories, both take up similar weightings. It is surprisingly that “Nothing to do/no special actions/no solutions” category dwells in a considerable percentage which shows that there are some respondents not sure or do not have any concept of what they should do if there is a Landslip Warning. It may be because they have not come across with any landslide situation before, they cannot imagine what they should do or what should be the proper action. Their knowledge in this situation is

relatively weak.

Besides, there is a comparatively small percentage of respondents who will listen to the broadcasting of television or/and radio which is quite conjunction with the prior result. It can reinforce an occurrence that even though the respondents may know or aware the provision of Landslip Warning, they do have adequate knowledge in the nature and effect of Landslip Warning and they cannot make up their mind on or have never thought of what they should do. It can also be seen that they do not have a sense of crisis and so, they do not have such concept in mind and they will not be well prepared for crisis. As a result, they may not be able to give immediate response whenever landslide may happen.

Next, the respondents were asked whether they would leave homes for safety reasons if Landslip Warning would have been hoisted. For those who are not living next to slopes now, they were asked to give response by assuming that they would be living in next to slopes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	52	35.9	35.9	35.9
	No	93	64.1	64.1	100.0
	Total	145	100.0	100.0	

Table 5.21 Table showing whether respondents will leave homes when Landslip Warning will be in force

Here, it can be observed that although Landslip Warning is in force, only around 36% respondents will choose to leave homes for safety reasons. It

may be because they may not aware the effectiveness of Landslip Warning to their safety and the common perception is staying at home is the securest and safest method to keep away from dangers. In addition, there have been less serious landslides happened in Hong Kong in recent years. They do not remember the property loss and lives loss brought by the landslides, for instance, the landslide in Kwun Lung Lau in Sai Wang. So, they may not have any incentive or perception to move out of homes for safety reasons when Landslip Warning is in force.

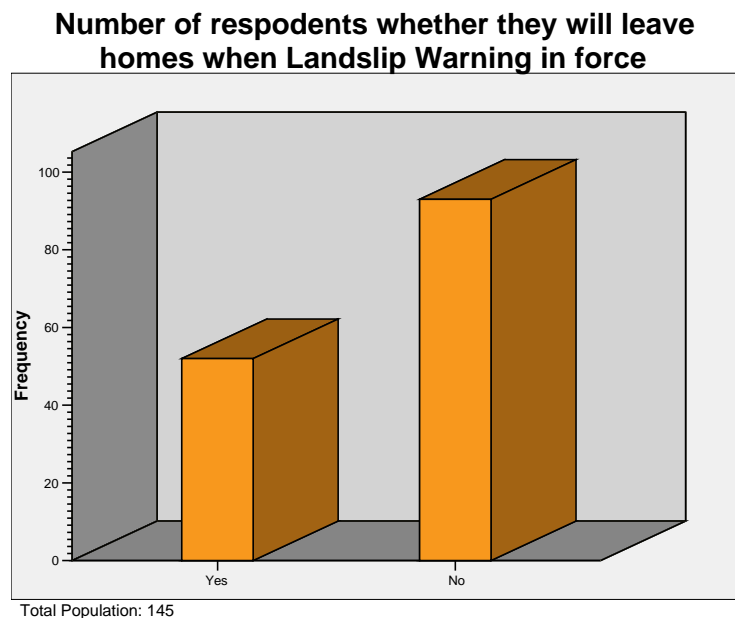


Fig. 5.13 Bar chart showing the number of respondents whether they will leave homes when Landslip Warning will be in force

Then, respondents were questioned of what they would mostly do if they would see signs of landslip danger on slopes near to their homes or along their routes. Multiple answers are allowed.

	Keep away from slopes	Report to the police	Notify the owner/property manager	Ignore it/do nothing	Others	Do not know/hard to say
Frequency	96	87	27	15	11	34
Percentage (Base 270)	35.6%	32.2%	10.0%	5.5%	4.1%	12.6%
Percentage (Base 145)	66.2%	60.0%	18.6%	10.3%	7.6%	23.4%

Table 5.22 Table showing what respondents will do if there are signs of landslip danger on slopes

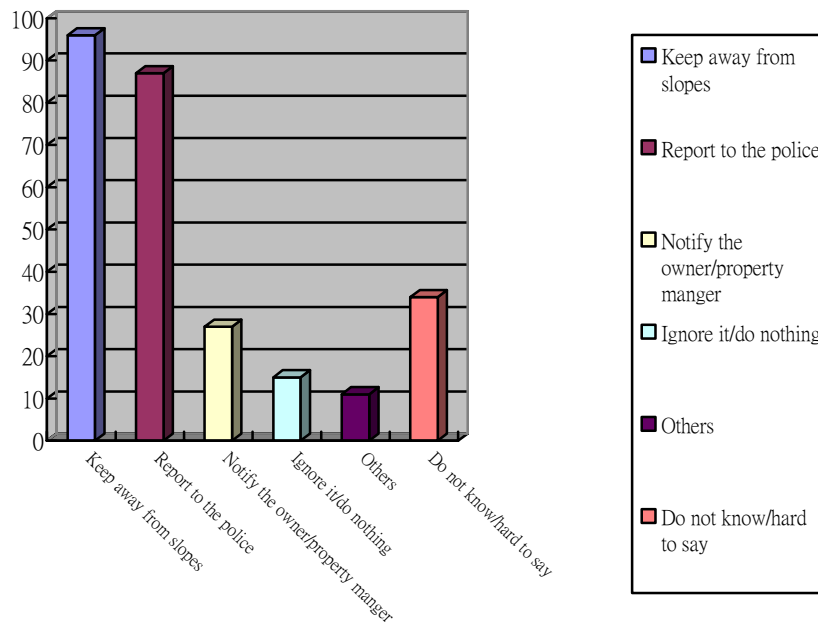


Fig. 5.14 Bar chart showing what respondents mostly do when there is a sign of landslip danger (Base: 270)

According to both table and bar chart shown above, the majority goes to “Keep away from slopes” category, i.e. 35.6%, while “Report to the police” category encounters a similar amount, i.e. 32.2%. It seems less respondents choosing these two categories but as it is a

multiple-answered question, the base is 270 rather than 145. In fact, more than half of respondents agree to keep away from slopes and report to the police about the signs of landslip danger. It can show that most of them know how to react properly when they signify there may have landslip dangers. In addition, there are more respondents reporting to the police than notifying the owners or property managers. It can be interpreted that it is very common for people in Hong Kong to call to the police whenever and whatever has happened due to convenience and reliance. It can express that the “999” hotline is reliable and user friendly and the Hong Kong people trust in police force so much. Conversely, there is a small portion of respondents who will inform either the owners or the property managers since most of the respondents think that the owners do not have the ownership and liability to slopes which has been demonstrated in the previous section. Moreover, they may not aware that they can actually inform the property managers at once for advice and arrangement in the first minute. It may be also because they believe that notifying the owners or property managers cannot minimize or solve the problems in an advanced and speedy approach. As a result, they think that although they inform the owners or property managers, the owners or property managers will just give a call to the police, too. By calling to the police directly, they think that it will be the most effective and fast means to get instructions on what they should do to the landslip dangers. Besides, it is quite unexpectedly that a considerable amount of respondents (12.6%) do not know or hard to say what they mostly do when facing this kind of situation. It means that there is a significant amount of people who do

have basic knowledge in what they should do when they see signs of landslip dangers. Thus, it may endanger their safety if there is really a warning of landslip danger. Apart from that, there is a number of respondents who even will ignore it or do nothing towards the signs of landslip danger. They may think that these signs are just minor things and they think that they do not have responsibility to take any specific action towards that phenomenon. Consequently, these early signals to landslip dangers may accumulate together to trigger off a landslide when there is a heavy rainfall or other accidents.

From the above, more than half of respondents state out their actions when there are signs of landslip danger. So, do they really figure out what the signs of landslip danger are?

According to table and bar chart below, the percentage of “Do not know” category with base 145 engages more than half of the total population, i.e. 57.2%. The respondents do not have any idea of what signs of landslip danger should be and so, they will not alert when there is really a symbol of landslip danger. Fortunately, around a third portion of respondents can realize that whenever there is concentrated water overflowing or falling of objects from the slopes, there may be a danger in landslides since these two signs are easily observed according to common sense. For my opinion, I think the percentage for “New large cracks/ground subsidence” category is too less because new cracks or ground subsidence should be easily identified visually on the surface. However, the respondents may

not be able to aware those cracks or ground subsidence as they have not seen or have not been educated of what the cracks and ground subsidence will lead to landslip dangers.

	Concentrated water overflowing onto slopes	Falling of objects like mud/debris and uprooted vegetation	Signs of cement/concrete surface bulging, soil erosion	Change from clear to muddy water from slopes	Landslip debris on roads and paths	New large cracks/ground subsidence	Others	Do not know
Frequency	54	42	26	8	11	9	4	83
Percentage (Base: 237)	22.8%	17.7%	11.0%	3.4%	4.6%	3.8%	1.7%	35.0%
Percentage (Base: 145)	37.2%	29.0%	17.9%	5.5%	7.6%	6.2%	2.8%	57.2%

Table 5.23 Table showing knowledge of signs of landslip danger of respondents

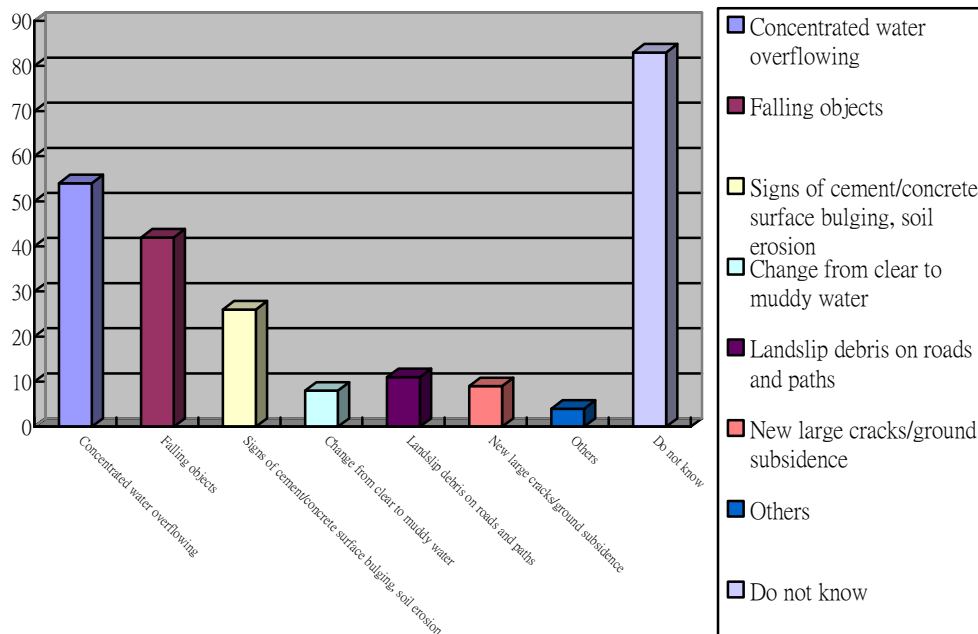


Fig. 5.15 Bar chart showing knowledge to signs of landslip danger of respondents (Base: 237)

5.2.5 Slope Safety Campaign

In the past recent years, the Geotechnical Engineering Office has promoted different kinds of slope safety campaign so as to spread the relevant knowledge to the community and raise up their awareness towards slope safety.

The last part of questionnaire to owners also includes questions relating to slope safety campaign to have an overview of the perception of the same sampling respondents towards this campaign.

They were firstly asked whether they would concern with slope safety problems in Hong Kong and for those who answered “Yes” category, they were further asked the reasons for making them concerned. A cross-tabulation has created to have a better picture of the view which is shown below.

	Landslide incidents	Government propaganda	Personal experience	Others	Hard to say	Not available	Total
Yes	50	12	5	6	7	0	80
No	0	0	0	0	0	65	65
Total	50	12	5	6	7	65	145

Table 5.24 Cross-tabulation between concerning with slope safety problems in Hong Kong and the reasons

Among 145 respondents, there are 80 respondents who answered “Yes” category, occupying 55.2% of the total population while the rest goes to “No” category. It can show that there is a greater majority who concerns

with slope safety problems in Hong Kong but it is not satisfied as it only encounters a little bit above the mid point. It may be because nowadays, there are fewer landslides happened in Hong Kong and so, some of them pay little attention or even ignore the slope safety problems. Apart from that, those who are not living next to slopes may not consider slope safety problems as their major priority.

60% of 80 respondents agree that the landslide incidents made them concerning with slope safety problems. Some of them even added the landslide tragedy of Kwun Lung Lau in 1994 which gave them a deep impression in their mind. However, there is only 15% of respondents choosing “Government propaganda” while there is a minute amount of respondents who have personal experience in landslides. As a result, it can see that the past experience will address people learning from lessons and remind them all the time. By promoting the messages of slope safety, it may not be able to give them a deep impression in mind as they do not have relevant experience and so, they may not remember or aware anything concerning with slope safety.

As mentioned before, there are various kinds of items to promote a message of slope safety or slope maintenance to the general public. To see the effectiveness of these items, respondents were asked to identify which items they have come across before. Multiple answers are allowed.

	“Keep you slope safe”	“Layman’s Guide to Slope Maintenance”	Slope Maintenance Hotline	Promotion of Landslip Warning	Hoisting of Landslip Warning during heavy rainfall	Landslip Warning signs on slopes below safety standard	Having seen road side Landslip Warning signs
Frequency	79	11	7	35	56	23	24
Percentage (Base:235)	33.6%	4.7%	3.0%	14.9%	23.8%	9.8%	10.2%
Percentage (Base: 145)	54.5%	7.6%	4.8%	24.1%	38.6%	15.9%	16.6%

Table 5.25 Table showing level of awareness of messages

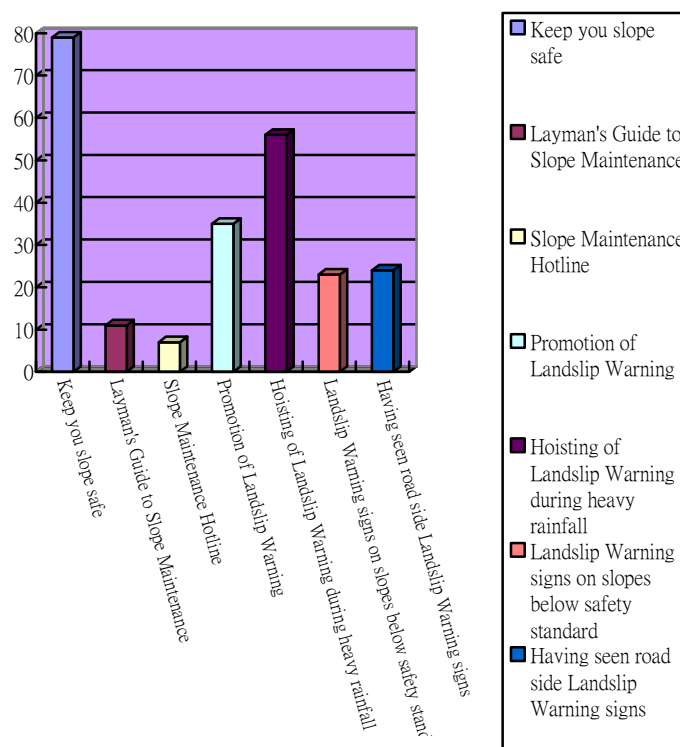


Fig. 5.16 Bar chart showing level of awareness of messages (Base: 235)

“Keep you slope safe” engages the largest portion of percentage (54.5%

with base as 145) followed by “Hoisting of Landslip Warning during heavy rainfall”. But there are fewer respondents knowing the existence of “Slope Maintenance Hotline” and “Layman’s Guide to Slope Maintenance”. It is unexpected that rare respondents know there is a “Slope Maintenance Hotline” offered by the Geotechnical Engineering Office because nowadays, electronic communication is very advanced, especially the telephone service. The less percentages in these two categories may be because respondents not really aware the slope maintenance, so they do not pay much attention to these items.

Subsequently, they were asked to identify where they could get those information mentioned above. A significant amount of respondents also chose “Government TV advertisement” followed by “Newspaper reports” since every day, nearly every one of us will have chance to watch TV and read newspapers. As a result, these two means provide a higher opportunity for respondents to come across with the relevant information. There is also a considerable amount of respondents who got the information from listening to Government radio advertisement, but lesser than those from TV advertisements and newspaper reports. It can be easily distinguished that there may be fewer people listening to radio comparatively with TV and newspapers. Therefore, “Government radio advertisement” encounters a relative small percentage.

	Government TV ad.	Newspaper reports	Government Radio ad.	Poster	Other people told me	Leaflet	TV programme	Others	Never heard about it	Do not know
Frequency	104	94	45	12	10	13	12	9	2	6
Percentage (Base: 307)	33.9%	30.6%	14.7%	3.9%	3.3%	4.2%	3.9%	2.9%	0.6%	2.0%
Percentage (Base: 145)	71.7%	64.8%	31.0%	8.3%	6.9%	9.0%	8.3%	6.2%	1.4%	4.1%

Table 5.26 Table showing where respondents get the information

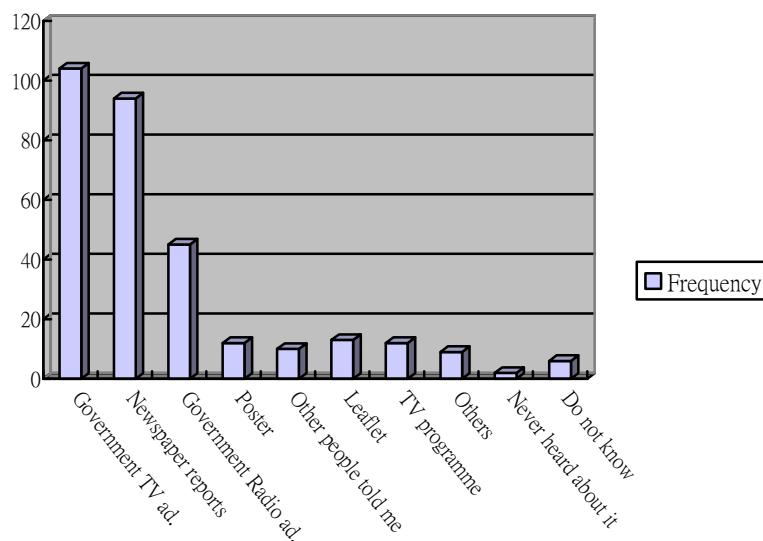


Fig. 5.17 Bar chart showing where respondents get the information (Base: 307)

Finally, they were asked to point out which way they thought was the most effective way in promotion. The result is quite reasonable that mostly respondents chose “Government TV advertisement” category, “TV programme” category and “Newspaper reports”. Similar reasons mentioned as above, the general community has a greater chance to come

across with TV and newspapers. Hence, by promoting the messages through TV and newspapers, it will capture a wider exposure of population.

	Government TV ad.	Newspaper reports	Government Radio ad.	Poster	Other people told me	Leaflet	TV programme	Others
Frequency	45	33	16	3	2	5	40	1
Percentage (Base:145)	31.0%	22.8%	11.0%	2.1%	1.4%	3.4%	27.6%	0.7%

Table 5.27 Table showing the preference of which means is the most effective

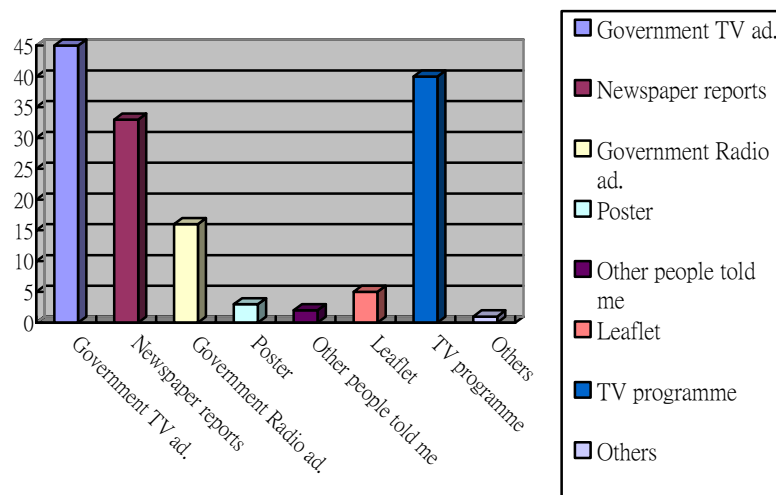


Fig. 5.18 Bar chart demonstrating the preference of which means is the most effective

5.3 Correlations

In this section, relationships between factors will be explored by using correlation programme in SPSS.

5.3.1 Relationships with living conditions

As mentioned before, there are two distinguished samples, i.e. one set is living next to slopes while the other set is not living next slopes. In Chapter 1, it is hypothesized that if people live next to slopes, their level of awareness of slope safety and slope maintenance will be higher than those who are not living next to slopes.

Firstly, correlation between living condition and perception in responsibility for slope maintenance by property owners is done which has been shown as below.

		1=Next to slope 0=Not next to slope	1=Yes 0=No
1=Next to slope 0=Not next to slope	Correlation Coefficient	1.000	.298**
	Sig. (2-tailed)	.	.000
	N	145	145
1=Yes 0=No	Correlation Coefficient	.298**	1.000
	Sig. (2-tailed)	.000	.
	N	145	145

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.28 Correlation between living conditions and perception in responsibility for slope maintenance by property owners

As shown above, the correlation is significant at 99% confident level and it can prove that the perception in responsibility to carry out slope maintenance by property owners will be affected by whether the property owners are living next to slopes. In other words, if they live next to slopes,

their perception in carrying out slope maintenance will be greater.

During heavy raining, Landslip Warning will be hoisted. The table shown below is the correlation between living conditions and knowledge in Landslip Warning.

		1=Next to slope 0=Not next to slope	1=Heard 0=Not heard
1=Next to slope 0=Not next to slope	Correlation Coefficient	1.000	.032
	Sig. (2-tailed)	.	.703
	N	145	145
1=Heard 0=Not heard	Correlation Coefficient	.032	1.000
	Sig. (2-tailed)	.703	.
	N	145	145

Table 5.29 Correlation between living conditions and knowledge in Landslip Warning

From the above, it shows these two factors are not significant with each other. It may be because during heavy rainfall, it is very normal for the public pay much more attention to their surrounding and news broadcasted by the Government. As a result, without reference to living conditions, the public may have heard of Landslip Warning.

		1=Next to slope 0=Not next to slope	1=Special attention 0=No special attention
1=Next to slope 0=Not next to slope	Correlation Coefficient	1.000	.614**
	Sig. (2-tailed)	.	.000
	N	145	145
1=Special attention 0=No special attention	Correlation Coefficient	.614**	1.000
	Sig. (2-tailed)	.000	.
	N	145	145

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.30 Correlation between living conditions and special attention to Landslip Warning

Although there may be many people who have heard of Landslip Warning, it may not represent they will pay special attention to that. Table 5.30 demonstrates the relationship between living conditions and special attention to Landslip Warning. It shows that correlation is significant at 99% confident level which means that if the property owners live next to slopes, they will definitely pay special attention to the media to see whether the Government has issued any Landslip Warning. Hence, it can see that the living locations will affect human behaviour to pay special attention to Landslip Warning.

Once Landslip Warning has been hoisted, there may be a danger happened to have a landslide. Here it demonstrates correlation between living locations and leaving home for safety reasons.

		1=Next to slope 0=Not next to slope	1=Leave home 0=Not leave home
1=Next to slope 0=Not next to slope	Correlation Coefficient	1.000	.310**
	Sig. (2-tailed)	.	.000
	N	145	145
1=Leave home 0=Not leave home	Correlation Coefficient	.310**	1.000
	Sig. (2-tailed)	.000	.
	N	145	145

** Correlation is significant at the 0.01 level (2-tailed).

Table 5.31 Correlation between living conditions and leaving home for safety reasons

According to the table above, it is significant at 99% confident level. This strong correlation can prove that for those who live next to slopes, they will have a stronger desire to leave home for safety reasons when Landslip Warning has been issued. But for those who do not live next to slopes (in this case, they were asked to assume living next to slopes when answering this question), their concept in leaving home for safety reasons is lower because they may think that it is unnecessary to do so, whereas staying at home should be the safest to keep themselves away from accidents.

Lastly, correlation between living conditions and their concerns with slope safety problems in Hong Kong is investigated.

		1=Next to slope 0=Not next to slope	1=Concern 0=Not concern
1=Next to slope 0=Not next to slope	Correlation Coefficient	1.000	.060
	Sig. (2-tailed)	.	.474
	N	145	145
1=Concern 0=Not concern	Correlation Coefficient	.060	1.000
	Sig. (2-tailed)	.474	.
	N	145	145

Table 5.32 Correlation between living conditions and concern with slope safety problems in Hong Kong

It is clearly to show that this correlation is not significant. It implies that the general public concerns with slope safety problems in Hong Kong, regardless of living conditions. The reason for that is largely due to landslide incidents happened in the past which has been displayed noticeably in the previous context.

5.3.2 Relationships with forms of organizations

After exploring relationships with living conditions, the behaviour of respondents may be affected by forms of organizations which are managing their properties.

In the following section, relationships among forms of organizations and variables will be studied. For convenience, abbreviations will be used in expression of data as follows:

Abbreviation	PHM	OC	PM	Non	Others	Unknown
Name	Public housing management	Owners' Corporations	Property management companies	Not managed by organizations	Others	Do not know

Table 5.33 Expression of abbreviations

The relationship between forms of organizations and perception in owners' responsibility to carry out slope maintenance is demonstrated.

		1=PHM 0=No	1=OC 0=No	1=PM 0=No	1=Non 0=No	1=Others 0=No	1=Unknown 0=No	1=Owners' responsibility 0=No
1=PHM 0=No	Correlation Coefficient	1.000	-.332**	-.382**	-.086	-.086	-.153	.156
	Sig. (2-tailed)	.	.000	.000	.302	.302	.066	.062
	N	145	145	145	145	145	145	145
1=OC 0=No	Correlation Coefficient	-.332**	1.000	-.486**	-.109	-.109	-.195*	.002
	Sig. (2-tailed)	.000	.	.000	.189	.189	.019	.981
	N	145	145	145	145	145	145	145
1=PM 0=No	Correlation Coefficient	-.382**	-.486**	1.000	-.126	-.126	-.225**	-.057
	Sig. (2-tailed)	.000	.000	.	.131	.131	.007	.494
	N	145	145	145	145	145	145	145
1=Non 0=No	Correlation Coefficient	-.086	-.109	-.126	1.000	-.028	-.051	-.117
	Sig. (2-tailed)	.302	.189	.131	.	.734	.544	.162
	N	145	145	145	145	145	145	145
1=Others 0=No	Correlation Coefficient	-.086	-.109	-.126	-.028	1.000	-.051	.063
	Sig. (2-tailed)	.302	.189	.131	.734	.	.544	.448
	N	145	145	145	145	145	145	145
1=Unknown 0=No	Correlation Coefficient	-.153	-.195*	-.225**	-.051	-.051	1.000	-.101
	Sig. (2-tailed)	.066	.019	.007	.544	.544	.	.225
	N	145	145	145	145	145	145	145
1=Owners' responsibility 0=No	Correlation Coefficient	.156	.002	-.057	-.117	.063	-.101	1.000
	Sig. (2-tailed)	.062	.981	.494	.162	.448	.225	.
	N	145	145	145	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 5.34 Correlation between forms of organizations and perception in owners' responsibility for slope maintenance

As the table shown here, correlations among them are not significant and hence, it can show that their perception in owners' responsibility for slope maintenance is independent with forms of organizations.

After that, correlations between forms of organizations with knowledge in Landslip Warning are studied.

		1=PHM 0=No	1=OC 0=No	1=PM 0=No	1=Non 0=No	1=Others 0=No	1=Unknown 0=No	1=Heard 0=Not heard
1=PHM 0=No	Correlation Coefficient	1.000	-.332**	-.382**	-.086	-.086	-.153	.460**
	Sig. (2-tailed)	.	.000	.000	.302	.302	.066	.000
	N	145	145	145	145	145	145	145
1=OC 0=No	Correlation Coefficient	-.332**	1.000	-.486**	-.109	-.109	-.195*	-.083
	Sig. (2-tailed)	.000	.	.000	.189	.189	.019	.321
	N	145	145	145	145	145	145	145
1=PM 0=No	Correlation Coefficient	-.382**	-.486**	1.000	-.126	-.126	-.225**	.009
	Sig. (2-tailed)	.000	.000	.	.131	.131	.007	.914
	N	145	145	145	145	145	145	145
1=Non 0=No	Correlation Coefficient	-.086	-.109	-.126	1.000	-.028	-.051	-.187*
	Sig. (2-tailed)	.302	.189	.131	.	.734	.544	.025
	N	145	145	145	145	145	145	145
1=Others 0=No	Correlation Coefficient	-.086	-.109	-.126	-.028	1.000	-.051	-.187*
	Sig. (2-tailed)	.302	.189	.131	.734	.	.544	.025
	N	145	145	145	145	145	145	145
1=Unknown 0=No	Correlation Coefficient	-.153	-.195*	-.225**	-.051	-.051	1.000	-.333**
	Sig. (2-tailed)	.066	.019	.007	.544	.544	.	.000
	N	145	145	145	145	145	145	145
1=Heard 0=Not heard	Correlation Coefficient	.460**	-.083	.009	-.187*	-.187*	-.333**	1.000
	Sig. (2-tailed)	.000	.321	.914	.025	.025	.000	.
	N	145	145	145	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 5.35 Correlation between forms of organizations with knowledge in Landslip Warning

According to table 5.35, correlation between public housing management and knowledge in Landslip Warning is significant with 99% confident interval. It can show that those who live in public housing management, they have a better knowledge in Landslip Warning which may be due to comprehensive promotion in Landslip Warning to public housing. Correlations between knowledge in Landslip Warning and not managed by organizations and other organizations respectively are also significant with negative values falling in 95% confident interval. It shows that their relationships are in reverse directions.

Next, correlations between forms of organizations and special attention paid to Landslip Warning are done.

		1=PHM 0=No	1=OC 0=No	1=PM 0=No	1=Non 0=No	1=Others 0=No	1=Unknown 0=No	1=Special attention 0=No special attention
1=PHM 0=No	Correlation Coefficient	1.000	-.332**	-.382**	-.086	-.086	-.153	.923**
	Sig. (2-tailed)	.	.000	.000	.302	.302	.066	.000
	N	145	145	145	145	145	145	145
1=OC 0=No	Correlation Coefficient	-.332**	1.000	-.486**	-.109	-.109	-.195*	-.217**
	Sig. (2-tailed)	.000	.	.000	.189	.189	.019	.009
	N	145	145	145	145	145	145	145
1=PM 0=No	Correlation Coefficient	-.382**	-.486**	1.000	-.126	-.126	-.225**	-.414**
	Sig. (2-tailed)	.000	.000	.	.131	.131	.007	.000
	N	145	145	145	145	145	145	145
1=Non 0=No	Correlation Coefficient	-.086	-.109	-.126	1.000	-.028	-.051	-.093
	Sig. (2-tailed)	.302	.189	.131	.	.734	.544	.263
	N	145	145	145	145	145	145	145
1=Others 0=No	Correlation Coefficient	-.086	-.109	-.126	-.028	1.000	-.051	-.093
	Sig. (2-tailed)	.302	.189	.131	.734	.	.544	.263
	N	145	145	145	145	145	145	145
1=Unknown 0=No	Correlation Coefficient	-.153	-.195*	-.225**	-.051	-.051	1.000	-.166*
	Sig. (2-tailed)	.066	.019	.007	.544	.544	.	.046
	N	145	145	145	145	145	145	145
1=Special attention 0=No special attention	Correlation Coefficient	.923**	-.217**	-.414**	-.093	-.093	-.166*	1.000
	Sig. (2-tailed)	.000	.009	.000	.263	.263	.046	.
	N	145	145	145	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Table 5.36 Correlations between forms of organizations and special attention paid to Landslip Warning

Here, it clearly shows that correlation between public housing management and special attention paid to Landslip Warning is significant

at 99% confident interval. It further enhances the previous phenomenon that for those housings managed by this category, the property owners will pay special attention to Landslip Warning. For correlations between owners' corporations and property management companies, both have negatively significant at 99% confident intervals while it is negatively significant at 95% confident interval for "Unknown" category.

Then, relationship among forms of organizations with leaving home for safety reasons when hoisting up Landslip Warning is investigated which has been displayed in the following table.

		1=PHM 0=No	1=OC 0=No	1=PM 0=No	1=Non 0=No	1=Others 0=No	1=Unknown 0=No	1=Leave home 0=Not leave home
1=PHM 0=No	Correlation Coefficient	1.000	-.332**	-.382**	-.086	-.086	-.153	.438**
	Sig. (2-tailed)	.	.000	.000	.302	.302	.066	.000
	N	145	145	145	145	145	145	145
1=OC 0=No	Correlation Coefficient	-.332**	1.000	-.486**	-.109	-.109	-.195*	.302**
	Sig. (2-tailed)	.000	.	.000	.189	.189	.019	.000
	N	145	145	145	145	145	145	145
1=PM 0=No	Correlation Coefficient	-.382**	-.486**	1.000	-.126	-.126	-.225**	-.382**
	Sig. (2-tailed)	.000	.000	.	.131	.131	.007	.000
	N	145	145	145	145	145	145	145
1=Non 0=No	Correlation Coefficient	-.086	-.109	-.126	1.000	-.028	-.051	-.162*
	Sig. (2-tailed)	.302	.189	.131	.	.734	.544	.041
	N	145	145	145	145	145	145	145
1=Others 0=No	Correlation Coefficient	-.086	-.109	-.126	-.028	1.000	-.051	-.162*
	Sig. (2-tailed)	.302	.189	.131	.734	.	.544	.041
	N	145	145	145	145	145	145	145
1=Unknown 0=No	Correlation Coefficient	-.153	-.195*	-.225**	-.051	-.051	1.000	-.289**
	Sig. (2-tailed)	.066	.019	.007	.544	.544	.	.000
	N	145	145	145	145	145	145	145
1=Leave home 0=Not leave home	Correlation Coefficient	.438**	.302**	-.382**	-.162*	-.162*	-.289**	1.000
	Sig. (2-tailed)	.000	.000	.000	.041	.041	.000	.
	N	145	145	145	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 5.37 Correlations between forms of organizations and leaving homes for safety reasons

Correlations between leaving homes for safety reasons and public housing management and owners' corporations respectively are significant at 99% confident intervals. It shows that those respondents who live in buildings managed by these two organizations will consider leaving homes for safety reasons when Landslip Warning is hoisted. It may be due to better education by these two organizations to property owners. Hence, their perceptions will be deeply affected. In addition, owners' corporations comprise owners living in those buildings. Thus, their interrelationships among owners are enhanced and so, their behaviour will be easily influenced with each other.

Last one will study correlations between forms of organizations with concerning with slope safety problems in Hong Kong.

		1=PHM 0=No	1=OC 0=No	1=PM 0=No	1=Non 0=No	1=Others 0=No	1=Unknown 0=No	1=Concern 0=Not concern 3=NA
1=PHM 0=No	Correlation Coefficient	1.000	-.332**	-.382**	-.086	-.086	-.153	.118
	Sig. (2-tailed)	.	.000	.000	.302	.302	.066	.157
	N	145	145	145	145	145	145	145
1=OC 0=No	Correlation Coefficient	-.332**	1.000	-.486**	-.109	-.109	-.195*	.130
	Sig. (2-tailed)	.000	.	.000	.189	.189	.019	.119
	N	145	145	145	145	145	145	145
1=PM 0=No	Correlation Coefficient	-.382**	-.486**	1.000	-.126	-.126	-.225**	-.136
	Sig. (2-tailed)	.000	.000	.	.131	.131	.007	.104
	N	145	145	145	145	145	145	145
1=Non 0=No	Correlation Coefficient	-.086	-.109	-.126	1.000	-.028	-.051	-.018
	Sig. (2-tailed)	.302	.189	.131	.	.734	.544	.834
	N	145	145	145	145	145	145	145
1=Others 0=No	Correlation Coefficient	-.086	-.109	-.126	-.028	1.000	-.051	-.018
	Sig. (2-tailed)	.302	.189	.131	.734	.	.544	.834
	N	145	145	145	145	145	145	145
1=Unknown 0=No	Correlation Coefficient	-.153	-.195*	-.225**	-.051	-.051	1.000	-.132
	Sig. (2-tailed)	.066	.019	.007	.544	.544	.	.113
	N	145	145	145	145	145	145	145
1=Concern 0=Not concern 3=NA	Correlation Coefficient	.118	.130	-.136	-.018	-.018	-.132	1.000
	Sig. (2-tailed)	.157	.119	.104	.834	.834	.113	.
	N	145	145	145	145	145	145	145

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 5.38 Correlations between forms of organizations and concerning with slope safety problems in Hong Kong

From the result, there are none significant correlations among those factors. Consequently, whether the respondents concern with slope safety

problems in Hong Kong, forms of organizations managing their properties will not have significant influence on their perception.

5.4 Open-ended Questions

At the end of the questionnaires, two open-ended questions are set to ask for opinions towards the Slope Safety Campaign and Slope Safety System.

For those who have answered these two questions, they also have similar opinions. For the prior one, most of them think that the Government should do more promotion, especially through the television and radio. In addition, closer contact with individual can be done by the relevant government departments so as to publicize the slope safety campaign effectively.

For the latter question, some think that there are some slopes within private lots in danger situations and so, any repair work should be carried out in an advance to prevent any future disaster. Besides, a lot of them also mention that the Government should update the data relating to slope safety in a quicker manner and it should be user friendly. It is also suggested that the Government can issue some notices or even warnings to the owners about the landslip dangers before the rain season. It is also revealed that the Government can assign the priority to each slope according to the level of danger to facilitate the slope maintenance.

In general, respondents think that the Government should employ more human resources to assist promoting the slope safety messages and carry our slope maintenance. It should also listen more and openly from the public to understand more what the public needs and what is lack of. At the same time, respondents think that there is not enough promotion in Slope Safety Campaign and some of them even have not heard of this campaign, as well as the Slope Safety System. Besides, as mentioned in the last paragraph, there is a suggestion to allocate priority to each slope for slope maintenance. In fact, this system has been created and carried out by the Geotechnical Engineering Office for years. It can further enhance a phenomenon that the respondents do not get enough relevant information about the slope safety and slope maintenance.

5.5 Firms' Questionnaire – Findings and Implications

Another set of questionnaire is set and sent to contractors to collect data in this field.

5.5.1 Form of slopes managed

Among 5 contractors, 4 of them manage both private and public slopes while the remaining one manages solely public slopes.

	Private slopes	Public slopes	Both	Total
Frequency	0	1	4	5

Table 5.39 Form of slopes managed by firms

5.5.2 Frequency of slope maintenance carried

Contractors were asked to state how long they would carry out slope maintenance for their clients. There are five choices demonstrated as below:

Frequency/Firm	A	B	C	D	E	Total
Half a year	-	-	-	-	-	0
Once a year	-	√	√	√	-	3
Once every 3 years	-	-	√	-	-	1
Once every 5 years	√	-	√	√	-	3
Others	-	-	-	-	√	1
Total	1	1	3	2	1	8

Table 5.40 Frequency to carry out slope maintenance

From the table, none of firms will carry out slope maintenance half a year. Usually the contractors will carry out slope maintenance once a year or once every 5 years. For firm C, he gave some detailed information. He mentioned for Routine Maintenance Inspection, it would be carried out once a year which was mainly for government slopes. For Engineer Inspection for Maintenance, slope maintenance will be carried out once every 3 years or once every 5 years. It is mainly for government slopes and some private slopes maintained by management companies. For firm E, he mentioned that it would depend on situation, usually from 3 months to 2 years.

5.5.3 Cost

Further, they were asked to state the highest and lowest estimated costs respectively for slope maintenance and slope repair works. Among the data obtained, the highest slope maintenance cost is around \$100,000 while the highest slope repair cost can go to \$400,000,000. The lowest slope maintenance cost is only \$500 while that for slope repair works still requires \$50,000. It can be easily figured out that the cost for slope maintenance is very low comparatively with that for slope repair works.

5.5.4 Slope Maintenance Works

They were asked to state out what slope maintenance works had been usually conducted. The following table will show their respective answers to give a better view. Multiple answers were allowed.

Work/Firm	A	B	C	D	E	Total
Overall upgrade	√	-	-	-	-	1
Repair to surface protection	√	√	√	√	-	4
Clearing of vegetation	√	√	√	√	√	5
Slope inspection	-	√	√	√	-	3
Clearing of surface channels	√	√	√	√	√	5
Others	√	-	-	-	-	1
Total	5	4	4	4	2	19

Table 5.41 Slope maintenance works done by firms

“Clearing of vegetation” category and “Clearing of surface channels” category will be employed for all respondents. It can be seen that these two works are the most basic and easiest methods for slope maintenance. Firm A mentioned that drainage repair, reinstatement and slope access were unexhausted works apart from those choices. “Repair to surface protection” is another common work for slope maintenance.

It is very interesting that although clearing of vegetation and clearing of surface channels are the most common works done by contractors, the owners seem not knowing about these works (Table 5.15), i.e. 20.00% for clearing of vegetation and 1.54% for clearing of surface channels with 65 respondents as base. The owners pay much more attention to repair to

surface protection (24.62%). It may be because the time for clearing of vegetation is too short for owners notify it while clearing of surface channel is not as easy as observable than repairing surface protection.

5.5.5 Difficulty

In the previous section, owners were asked to identify the difficulties that might come across when carrying out slope maintenance. The same question with same choices was given to firms for ranking to see whether there is any difference. The scoring system will be the same as table 5.10.

Difficulty/Ranking	1	2	3	4	5	Total
P	1	0	0	2	2	5
Q	1	1	2	0	1	5
R	2	3	0	0	0	5
S	0	1	2	2	0	5
T	1	0	1	1	2	5
Total	5	5	5	5	5	-

Legend:

P: No difficulty

Q: Difficulty in raising money

R: Poor building management

S: Lack of administrative and technical supports

T: Others

Table 5.42 Quantity of ranking for assigned each difficulty

Difficulty	Total scores	Mean scores	Proportional ratio
P	15	3.0	0.190
Q	16	3.2	0.203
R	22	4.4	0.278
S	14	2.8	0.177
T	12	2.4	0.152

Legend:

Total scores: 79

Proportional ratio: 1.000

Table 5.43 Total scores, mean scores and proportional ratio for difficulties

Ranking	Difficulty	Proportional ratio (= 1.000)
1	Poor building management	0.278
2	Difficulty in raising money	0.203
3	No difficulty	0.190
4	Lack of administrative and technical supports	0.177
5	Others	0.152

Table 5.44 Ranking of difficulties

From the above, it can be seen that the first major difficulty that the firms may face is “Poor building management” with 0.278 of proportional ratio followed by “Difficulty in raising money” with 0.203 of proportional ratio when carrying out slope maintenance. Comparing this table with table 5.18, the rankings for these two reasons are reversed. It can be revealed that different parties will have different perspectives. As a firm, its financial situation is usually sound, or, it will go bankrupt. If it does not have enough money, it will ask for loan from the banks. So, this problem is usually solved. However, if they carry out slope maintenance

for a building without a good management, there will be many uncertainties come across with. For instance, they may not be able to take possession of the site to carry out the work according to the programme and delay in completion will be resulted. There may be a lot of complaints from the owners which may in turn affect the reputation of the firms. Therefore, poor building management will cause many unnecessary situations to firms and they may need to use much more human and time resources to handle extra workloads.

As a professional stream, they must have adequate administrative and technical supports. Hence, this difficulty is not significant to them comparing with the owners. Additional difficulties mentioned by the firms are inadequate access to slopes and site constraints. It is because sometimes, the slopes are located near to some dangerous areas where are difficult to get there with inadequate access. The contractors who were once responsible to these slopes might only provide the minimum standard of access to slopes. Thus, a new contractor who is going to carry out slope maintenance in later times may not be able to get there. For the site, there may be many constraints that out of control of contractors. Accordingly, it will raise the difficulty to them to carry out slope maintenance.

The major ways they think to solve these problems are better planning and resource management. For inadequate access to slopes, erecting scaffolding and temporary platforms are the most common and effective

ways to ease or mitigate the problems.

5.5.6 Factors of refusal to slope maintenance by owners

In this section, the firms were asked to figure out the reasons for owners refusing to carry out slope maintenance according to their knowledge. These reasons were the same as those which were asked to owners and so, ranking system and scoring system will follow the ones in table 5.10.

Reason/Ranking	1	2	3	4	5	6	7	Total
P	0	1	1	1	0	2	0	5
Q	1	1	1	0	1	0	1	5
R	2	1	0	0	1	0	1	5
S	0	1	1	0	0	1	2	5
T	1	0	0	3	1	0	0	5
U	0	1	1	1	1	1	0	5
V	1	0	1	0	1	1	1	5
Total	5	5	5	5	5	5	5	-

Legend:

P: It is too expensive

Q: It is difficult to collect enough money from property owners

R: The property owners do not have a perception to do so

S: The slope is safe

T: It is meaningless and useless to do so

U: They think it is none of their business

V: Others

Table 5.45 Quantity of ranking assigned for each factor

Factor	Total scores	Mean scores	Proportional ratio
P	19	3.8	0.136
Q	22	4.4	0.157
R	24	4.8	0.171
S	15	3.0	0.107
T	22	4.4	0.157
U	20	4.0	0.143
V	18	3.6	0.129

Legend: Total scores: 140

Total proportional ratio: 1.000

Table 5.46 Total scores, mean scores and proportional ratio for factors

Ranking	Factor	Proportional Ratio
1	The property owners do not have a perception to do so	0.171
2	It is difficult to collect enough money from property owners	0.157
2	It is meaningless and useless to do so	0.157
4	They think it is none of their business	0.143
5	It is too expensive	0.136
6	Others	0.129
7	The slope is safe	0.107

Table 5.47 Ranking of factors

After the ranking, they think that the property owners do not have a perception to carry out slope maintenance followed by “It is difficult to collect enough money from property owners” category and “It is meaningless and useless to do so” category. For the owners, they think

that it is none of their business and they think that it is too expensive for slope maintenance. As the firms have a clear concept on the cost between the slope maintenance and slope repair, they may think that cost for slope maintenance will be not the major concern for the owners. They may not understand the financial situations of the general public. Hence, they will think that the owners may not have a perception to carry out slope maintenance rather than it is too expensive. As mentioned before, the firms think that poor building management is the major difficulty and hence, they may believe that it is difficult to collect enough money from various property owners.

A contractor thinks another reason for owners leading not to carry out slope maintenance is that the owners believe that the responsibility for slope maintenance should be rested on the Government.

5.5.7 Level of Awareness of public towards slope maintenance

Among 5 respondents, 3 of them agree that the level of awareness of public towards slope maintenance is satisfactory while the rest thinks that it can be up to good level. One explains that the number of landslides and slope failures have been greatly reduced in recent years. This phenomenon is undoubtedly true but it may not be adequate to prove that the level of awareness of public towards slope maintenance is good. The reduced number of landslides and slope failures can be because the advancement in technology, skills and techniques. Moreover, a large

portion of slopes are really belonged to various government departments who have much more consciousness to carry out slope maintenance because if they fail to do so, the media will report the news widely and it will affect their images negatively. The government departments should be information transparent and so, the public monitors their work closely and critically. Moreover, even though there are fewer landslides and slope failures happened in Hong Kong in recent years, the concept of slope safety in the mind of public may not be deeply rooted. Instead, they may forget those past landslides and slope failures and ignore the importance of various means to protect themselves from tragedies and overlook the significance of carrying out regular slope maintenance.

5.5.8 Open-ended Questions

At the end of questionnaire, two open-ended questions are set which are the exactly the same as the ones in the questionnaire to owners.

Concerning the Slope Safety Campaign, they still think that there should have more public education because many people do not know the crisis if there is not enough or not satisfactory slope maintenance carried out. Hence, the Government should produce more TV programmes and booklets, for example, to introduce the importance of slope safety to the public. At the same time, a financial assistance to slope safety may be provided for the private property owners by the Government, just like the scheme promoted by the Buildings Department and the Urban Renewal

Authority on demolition of unauthorized buildings works and rehabilitation programmes to the old aged buildings.

For the Slope Safety System, they also agree that the information database of existing slopes is missing and it should be updated regularly, as well as user friendly for public to get access. Apart from that, one mentions that the Buildings Department and Geotechnical Engineering Office should simplify and accelerate the approval procedures on those repair works on slopes which have been served a Dangerous Hillside Order.

5.6 Conclusion

Base on findings obtained from above, it can be proved that there is a relationship between level of awareness to slope safety and slope maintenance by property owners with their living conditions. These two factors are affected with each other and correlation tables done as above can demonstrate that.

Besides, another finding is regardless of their living conditions, they have heard of Landslip Warning. However, in case of paying special attention to media to see whether the Government has issued Landslip Warning, this perception will be significantly affected by their living locations. In other words, they will pay much more attention if they live next to slopes. Another behaviour affected by living conditions is whether they will

leave homes for safety reasons during hoisting up Landslip Warning. However, there is no significant observed between living conditions and concerning with slope safety problems in Hong Kong.

Similar results can be obtained when dealing with correlations between forms of organizations and mentioned variables.

Moreover, more than half of respondents also think that it should be government departments who should have responsibility to carry out slope maintenance. For those who live next to slopes, they think that they do not have responsibility or it is too expensive to carry out slope maintenance.

Apart from those said above, it is surprisingly to know that there is a significant amount of respondents who do not know what they should do when Landslip Warning is hoisted. There is even more than half of respondents not knowing the signs of landslip dangers. Their knowledge in these two concepts is very weak and inadequate.

From the results obtained from firms, their views are different from those of property owners. They will think that property owners do not have perception or difficult to collect enough money, so owners refuse to conduct slope maintenance. This finding is totally different from that got from owners. Their respective rankings of factors go into different directions. It can be seen that if people have different roles in society,

their behaviour and concept will be changed accordingly.

CHAPTER 6 INTERVIEWS

Chapter Introduction

In this chapter, interview data will be presented.

There are two main sections. The first section will be the findings got from telephone interview with firms responsible for slope works. The second section will be the information obtained from face-to-face interview with relevant government departments.

The last section will be the summary to give an overview of findings and implications.

6.1 Introduction

Interviews have been conducted with two streams of parties and they are firms responsible for slope maintenance and repair works in Hong Kong and the relevant government departments.

For the previous one, phone interviews have been adopted because the content of the interviews will be based on their completed questionnaires. Hence, a short interview on the phone will be adequate which can save time of the contact persons of the firms.

For the latter one, face-to-face interviews will be employed with representatives of relevant government departments.

6.2 Interviews with firms

Follow up interviews are asked for after collecting the finished questionnaires to firms. There are five completed questionnaires received after sending 26 postal mails as mentioned in the previous chapter. As one of them has not written down the contact, the other four contact persons are called up. Among these four contact persons, three persons have been successfully contacted while the other one has been unable to call up for several times.

The interview questions will be based on the following areas:

- i. Complaints received from clients and ways to solve
- ii. Difference between slope maintenance and slope repair works
- iii. Opinion on a saying: “Slope maintenance is a waste of money”
- iv. Best maintained slope

6.2.1 Shun Yuen Construction Co. Ltd.

Mr. Jasper Chiu is a graduate from Department of Surveying (Department of Real Estate and Construction, currently) at The University of Hong Kong in 1997.

Shun Yuen Construction Co. Ltd. mainly carries out slope maintenance for various government departments, such as Highways Department, Lands Department, Civil Engineering and Development Department, etc.. Sometimes, they will also receive some complaints from their clients which can be classified into three categories. The first one is late programme. The government departments usually allow 30 days for them to carry out slope maintenance. However, sometimes, the construction may be delayed due to various reasons. Hence, there may be a problem in claiming liquidated damages. The second one is their clients may complain their works not well enough. For example, some slopes are located quite near to the public use and public housing. Thus, the construction works may affect the residents and pedestrians and cause

nuisances to them. Besides, machines and plants used in slope maintenance and repair works may cause damages to nearby residential housing premises. As a result, they may need to bear an extra cost in compensation to the sufferings. The last one is about the safety. It is very common to have some accumulation of water on the site areas which may lead to mosquito problems, especially in summer seasons because it is the high risk to have Dengue Fever and Japanese Encephalitis. Therefore, the Food and Environmental Hygiene Department always comes to the sites for inspection and issue warnings, whenever there is a necessary. He thinks that the solutions that they can do are to increase the number of staff and co-ordinate human resources and material resources in a better management and planning.

For his firm, the works for regular slope maintenance are cleaning drainages, clearing of vegetation, grass cutting, etc.. The slope repair works are usually carried out before the slope really goes into failures. It means that whenever there is a sign going to have slope failures, accordingly works will be done to reinstate the slopes in a good condition. In this case, soil nails will be firstly chosen as the repair works. If soil nails cannot be used due to some practical constraints, rock anchors will be employed instead while constructing the retaining walls will be the last resort. If the surface of the slope is concrete, upgrading work will be used and then, either turfing or hydroseeding will be engaged to provide a better appearance. Sometimes, painting may be an alternative. In addition, a safe access will be constructed at the same time next to the slope so as

to provide future maintenance purposes.

In the cost concept, it is undoubtedly that the repair cost must be larger than that of maintenance cost. It is because in repair work, its nature is a permanent work and it usually involves construction of retaining walls which is much more complicated. But in maintenance work, it is usually minor and simple work that is carried out regularly. It will mainly involve labour cost and so, the cost must be relatively lower than that for the repair cost. Moreover, apart from in terms of real money, there may be an economic cost involved in repair works in some circumstances. It is because some repair works may be carried out after slope failures or landslides, so there may be a loss in property or even human lives. As a result, cost for repair works in general must be higher than that for maintenance works.

If there is no regular slope maintenance carried out, he agrees that the consequence must be very great. However, they have not done any research on relationship between repair and maintenance cost and which one the clients or owners should employ because they only do what they are required to do.

He was asked to comment a saying “Slope maintenance is a waste of money”. He totally disagrees with this statement because carrying out regular slope maintenance can prevent landslides which may induce an even greater cost. Moreover, slope maintenance is usually minor works,

such as cleaning of drainage, and so, the cost associated must be low. He carries on that for slope maintenance, it costs around \$3,000 each time which will be conducted around two to three times each year. But for repair work, it at least involves several millions each time. Hence, the aggregate maintenance cost is far less than that of one repair work done. Therefore, he thinks that it is worthwhile to carry out regular slope maintenance.

He thinks that the slopes along Tuen Mun High Speed Road are best maintained in his own opinion. It is because those slopes are employed a lot of panels and have attractive appearance walls. They have contained many special features that cannot be found in other slopes. Besides, these slopes are always maintained which are owned by the Highways Department. He mentions that the Highways Department employs a term contractor to conduct the slope maintenance works. The term contractor is awarded a three-year contract in which the term contractor is required to carry out slope maintenance regularly according to the conditions stated in the contracts. Upon slopes along Tuen Mun High Speed Road, he suggests slopes along Tsing Shan High Speed Road are another best maintained which are also owned by the Highways Department.

At the end of the phone interview, he thinks that there are generally three aspects for a slope to acquire as a benchmarking for others to follow. They are safety, stability and appearance, i.e. providing green feature to slope surface promoted by the Geotechnical Engineering Office.

6.2.2 Wong & Cheng Consulting Engineers Ltd.

Mr. Horace Chu is a graduate from The University of Hong Kong and now working in Wong & Cheng Consulting Engineers Ltd.

Their clients are mainly from private sectors. Surprisingly, they have not received any complaints from their clients.

For slope maintenance, sprayed concrete, hydroseeding and planting are the mostly methods to employ. Whenever there is any damage, they will maintain and restore the conditions in a satisfied state. He mentions that each slope will have its own factor of safety. Hence, they will carry out assessment when it is necessary. If the factor of safety is below accepted standard, upgrading works will be triggered off to increase the factor of safety back to standard. It is the repair work in which they will usually use soil nails. According to Mr. Chu, the practice of rock anchor has been banned to use. He explains that the slope at Haking Wong Building of The University of Hong Kong is an example of using rock anchor. In the past, the inspection was assigned for every three to five months. However, it is found out that if the grouting loses its strength, the prestressed steel bar will eject out suddenly like an arrow. As a result, the inspection has been shortened to every three months and it is banned to use for any new repair work.

In their practice, the maintenance and repair works are carried out

together. So, the cost will include both of them but it is admittedly that the maintenance cost should be lower than that for repair works.

Generally, those slopes registered will be required by the Government to the slope owners to perform two things. The first one is engaged once per five years in which a registered geotechnical engineer is employed to carry out Engineer Inspection Maintenance. This engineer will do inspection thoroughly to explore any defect and if so, he will suggest what kinds of maintenance should be made to a particular slope, for example, repairing cracks and drainage. After that, he will produce Maintenance Manual which is updated from time to time. The second one is done once per year which is called Working Maintenance Inspection. Any person can be entitled to carry out this inspection. This person can be anyone from an engineering department of the property management or managing officer for private slopes. If the slope is government owned, the inspection will be conducted by in-house technical officers or the government department will simply employ a consultant to do so. This person will carry out inspection according to Maintenance Manual produced by the registered geotechnical engineer. If any defect has been found, an engineer should be employed to carry out further inspection to the slope condition and provide any possible relevant maintenance means.

He does not agree that slope maintenance is a waste of money. He elaborates that recently, there have been less landslides happened in Hong Kong because the Government has done a lot of promotion in Slope

Safety Campaign and it also requires the slopes to be registered. Besides, it also publishes a lot of relevant information for the public get access so as to promote the slope safety and importance of slope maintenance. However, in the past, there were many landslides happened in Hong Kong which had caused a lot of loss in properties and lives together with money. As a result, slope maintenance can prevent any future loss in money and economic loss.

In his opinion, he thinks that slope feature 11SW-B/F85 located in Hong Kong Park which is owned by Architectural Services Department. It is mainly because it will carry out regular inspection and maintenance to ensure its stability and safety in good conditions.

In order to act as a benchmarking, he thinks that there should have two criteria to fulfill. The first one is inspection should be performed every year. Another one is to have a better filing system for records and reports produced after each inspection for easier future access and referral. It is because it is very common that at the beginning, a slope will be monitored and maintained by one party but after a certain period of time, this party may not be still employed as consultant or contractor to carry out any necessary maintenance or repair works. Hence, a new party will require examining the previous records and reports to understand the history of a particular slope. Better filing system can assist easier inspection and save much human resources and time. Concerning with appearance, he states that appearance basically does not affect the

stability of slopes. Yet, the Government has received a lot of complaints from the public saying that during carrying out slope works, many trees are being cut down and a dull environment is created. In viewing of that, the Geotechnical Engineering Office has produced a report on green slope in which various means to improve green features on slope surfaces are introduced, for instance, spraying green pigments and applying shortcrete. At the same time, the Government prefers hydroseeding, spraying green pigments, turfing to shortcrete because the prior ones can generate green environment and atmosphere to the society while the latter is dull in colour which is not welcomed by the public. Frankly speaking, he thinks that appearance is just an extra work which is not a major issue for a benchmarking.

6.2.3 BCL Geotechnics Limited

Mr. Andy Tsui is a graduate holding high diploma in Department of Civil and Structural Engineering of Hong Kong Polytechnic University of. He is now studying a degree in civil engineering in Cardiff in United Kingdom. He was once a practionner in BCL Geotechnics Limited.

In his previous company, their clients are mainly the government departments. There are some cases that there is a unclear responsibility between departments. For instance, once they carried out slope work for Highways Department, Agriculture, Fisheries and Conservation Department tried to stop the work because that piece of area should be

managed by them. Unfortunately, the responsibility of slope maintenance work had been assigned to Highways Department. Later, it was found out that Highways Department forgot to apply for permission for work in the country park areas which should be applied first at the very beginning. As a result, it may bring about any unnecessary workload, waste of money and time or even conflict to clients and the company.

Besides, slope maintenance and slope repairs are two different stages in terms of slope safety. If a slope has a sign in failure, they will suggest clients for repair works while the maintenance work will be carried out regularly to ensure the slopes in good conditions. Therefore, he thinks that choices between employing either slope maintenance or repair work will be depended on actual conditions of slopes.

In addition, they will carry out regular maintenance and regular inspection at the same time. Hence, if people ignore regular maintenance, they will definitely ignore regular inspection. Unfortunately, lack of maintenance for slopes and retaining walls is a major contributory factor to many landslides happened in Hong Kong. If the landslides affect to the buildings, the property loss is easy to estimate. But if the landslides cause any harm or damages to human lives, the loss is no longer able to be estimated.

He believes that it is normal for the general public to think that slope maintenance is a waste of money because the public does not understand

the crisis behind if there is a lack of slope maintenance. He thinks that providing enough education to public is the only measure to ease the problem.

In his view, he thinks that every engineer has his own ideas for maintenance but each of them must follow the guide provided by the relevant government departments. Following these guidelines, he thinks that the slope can be attained as a benchmarking.

6.3 Interviews with government departments

Face-to-face interviews have been conducted with two government departments and they are Buildings Department and Civil Engineering and Development Department. The interview contents will be about level of awareness of slope maintenance by property owners and slope safety provisions.

6.3.1 Civil Engineering and Development Department

Geotechnical Engineering Office is under Civil Engineering and Development Department. In Geotechnical Engineering Office, there is a division called Slope Safety Division. The interview was conducted with Mr. David W. Kwok, a senior geotechnical engineer and Mr. Ho Man Yiu, geotechnical engineer. The interview was mainly talked about level of awareness of property owners to slope maintenance and concept in slope

safety.

Every year, their division will carry out surveys about slope maintenance. In the past, there were two set of surveys asked to the public. One set was about slope maintenance while the other set was about satisfaction to works done by Geotechnical Engineering Office by public. However, starting from two years ago, these two sets of surveys have been combined and amended. Although there are surveys conducted each year, they admitted that they have not explored whether there is relationship between living conditions, i.e. whether the respondents living next to slopes, and their level of awareness towards slope maintenance and its responsibility. They also have not done any cross-tabulation between variables.

Concerning with awareness, they thought that generally, everybody must have a certain level of awareness because there are too many slopes surrounding in Hong Kong. However, due to a great reduction in landslides and rare heavy rainfalls in recent years, the level of awareness towards slope safety and slope maintenance has dropped dramatically in past two three years. Their concern with slope safety has also dropped over the years. According to their latest statistics which have been just published in a recent conference, there is a large decrease regarding to concern with slope safety from 2002 to 2004, i.e. decreasing from 73% to 59%.

In addition, there is a wrong concept among the public that once there is a heavy rainfall, there will have a landslide. In fact, there are several conditions to contribute a landslide. The heavy raining should be continuous for a certain period of time which makes the level of water table in soil rises as rainwater goes into soil. As a result, a great water pressure inside the soil will be developed and cause a landslide. Hence, it is actually a delay progress rather than an immediate progress. However, the general public does not have this basic concept in their mind and so, the Slope Safety Division wants to correct this wrong concept upon promoting slope safety and slope maintenance to general public.

The general public has satisfied with existing slope safety, especially conditions in recent years, as there have been fewer landslides happened and even though there have been landslides, each of the extent is not very serious. It is undoubtedly that the degree of slope safety really increases a lot over years. Yet, a better slope safety does not mean that the public do not have awareness towards slope safety. As there is a decreasing trend in self alertness, the public will not aware to think, prepare and take any self precautionary measures in case of landslides. They will also not be willingly to contribute money for carry out slope maintenance but they do not carry out regular slope maintenance, the materials used in slope protection will deteriorate and landslide will be resulted.

As mentioned before, there is no serious landslide happened and there is a reduction in reporting landslides in recent years (201 cases reported in

2003 while 69 cases reported in 2004) together with having inadequate funding from Environmental, Transport and Works Bureau. Accordingly, it is much more difficult to arouse public awareness and concern with slope safety problem. As a result, they have tried to promote this message in another way. They will use history of past landslides to remind the public the crisis brought by landslides. They once set up an exhibition in the Central Library in Causeway Bay to bring back the public to those tragedies so as to improve their concern and awareness to slope safety and promote the importance to carry out slope maintenance.

Mr. Kwok mentioned there was once a very famous engineer named Peter Lumb who once said there was a closure period of landslides in 1973 because at that time, there was a sharp increase in awareness towards slope safety and slope maintenance. Unfortunately, in 1975, Peter Lumb carried on to say that the return period was long enough for memories of disasters lost. Then, there was a serious landslide happened in Sau Mau Ping in the following year. Data had shown that there were various peaks of level of awareness to slope safety and slope maintenance when there were a number of serious landslides happened. For example, there were many squatters, which were very vulnerable, in 1983 and so at the time, many landslides had been resulted and the level of awareness towards slope safety and slope maintenance had a dramatic increase. Mr. Kwok explained that there were actually three cycles repeating from time to time. The first one was concerning with human which was psychological cycle. It meant that people only remembered those serious events and

their alertness would be increased accordingly. The second one was relating to ground or materials. It represented that there was also a cycle for every material to get deterioration. The last one was weather or rainfall because evidence has showed that the amount of rainfall was a cycle. In fact, these three cycles were interrelated with each other. It was because when there was a continuous heavily rainfall for a period of time, materials might get deterioration. Landslide might be caused and then it would arouse the public with a great awareness and concern to slope safety and slope maintenance. When there was a period without any serious landslide, the public would gradually forget the importance of slope maintenance and they would be satisfied with existing slope safety. Level of awareness dropped again and the whole cycle would repeat itself. Therefore, Mr. Kwok highlighted a saying by Peter Lumb that having a constant vigilance was a key to safety.

Due to result obtained from questionnaires to owners which has been presented in the previous chapter, there is a great amount of owners think that it should be the Government who has responsibility for slope maintenance. Mr. Kwok said this phenomenon was very common and the only thing they could do was still by public education to transmit correct messages to the public. At the same time, there have been more people to ask them who carry the ownership of slopes within the lot areas, especially when they want to buy a property. Mr. Kwok went on to say that some people might think that it must be bad to have slopes next to buildings. He totally disagreed with this saying because he thought that

having a slope next to building, it could bring some green features to the surrounding and it could also provide some extra space between buildings. A better and comfortable environment could be achieved among forest of concrete.

Regarding to any complaint received from the public, they usually received calls from property owners when there was any Dangerous Hillside Order issued. The most likely asked by property owners was why they owned that particular slopes. This complaint had raised out many conflicts among parties, such as owners and government departments. Another one was the property owners had already lived in that building for a number of years without any landslide happened, they thought that it was completely unnecessary to carry out any slope maintenance or repair work. In order to deal with this complaint, Community Advise and Education Unit, the combination of former Community Advisory Unit and Public Information Unit, would act as a communication channel between government departments and the public and try to explain the situations and convince the property owners to follow to do what they were required for according to Dangerous Hillside Order. Usually residential buildings in Hong Kong are multi-ownership in nature, hence there are a lot cases that not all the owners willingly give out money for slope maintenance. For those who are unable to give money, property owners can apply for Building Safety Loan Scheme regulated by Buildings Department to borrow money to carry out slope maintenance. It is because slopes have already been included as one part of buildings.

The maximum amount of loan is \$1 million for each unit of flat, depending on situation. If the property owners do not repay the loans, their leases will be subject to determination. It can ensure that maintenance and repair works can be carried out and safety of slopes can be achieved.

Mr. Kwok and Mr. Ho were further asked whether their office had decided to devise a loan scheme mainly for slope maintenance and repair works. However, they answered that they did not have this idea due to insufficient financial backup.

There was a complicated problem they always came across when dealing with ownership of slopes. This was mixed features of slopes case which meant that the ownership of a particular slope was delineated to various parties, i.e. government departments and a number of different owners, because sometimes, the area of slope might cross over certain numbers of lots as shown below:

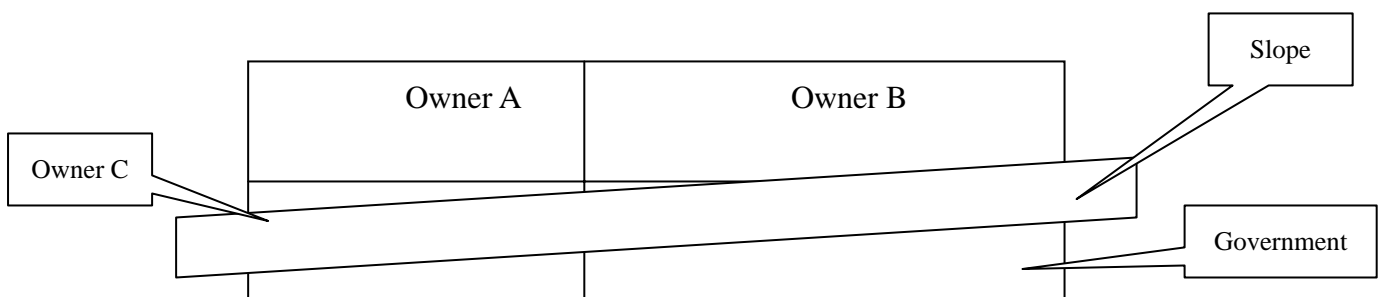


Fig. 6.1 Mixed features of slope ownership

From the figure shown above, it shows the mixed features of slope ownership illustrated by Mr. Kwok. It was very difficult to chase back

and clarify that the slope should be responsible by whom, even though investigating that with site visits and aerial photos. As a result, it would lengthen the process to give comments to the Buildings Department to issue Dangerous Hillside Orders. It might endanger to slopes which were liable to fail due to this administrative problem and this situation was quite annoying to their normal progress.

Geotechnical Engineering Office always works closely with Slope Safety Section of Buildings Department. How do they actually cooperate with each other?

These two offices cooperate with each other basically according to Building Ordinance Section 27A and Section 27C. There are three categories. The first one is dealing with new slopes. When property owners hand in new building plans to Buildings Department, plans of those lots with slopes will be passed to the Geotechnical Engineering Office for conducting investigations and comments which will be bypassed back to Buildings Department for approval of the submission.

The second case is about old slopes. Under Landslip Preventive Measures conducted by Geotechnical Engineering Office, old slopes are prioritized in descending order. Those at top will be proceeded investigation first. There are 300 slopes chosen each year for this campaign. According to information in hand together with observation and experience, they will carry out assessment to those chose slopes. If it is necessary, they will

advise the Buildings Department to issue Dangerous Hillside Orders to owners of slopes to carry out further inspection.

The last one is called default action which is carried out by a team in Buildings Department. This default action will be performed when property owners ignore Dangerous Hillside Orders but the subject slopes are in dangerous situations, this team will ask the Geotechnical Engineering Office to conduct investigation on the slopes and the team will carry out any necessary default works first. After that, the Buildings Department will ask property owners to repay any cost involved. If the property owners refuse to repay, this will bring to legal actions according to Building Ordinance Section 27A. This default action can ensure that slope safety is at the first priority and any risk should be removed immediately to prevent any property and human lives loss.

A saying “Slope maintenance is a waste of money” was presented to Mr. Kwok and Mr. Ho for their opinions. They both disagreed with this saying. They understood that this occurrence was very common in the mind of general public. As they were equipped with professional knowledge, they could easily figure out symptoms leading to landslides. When there was a landslide going to happen, it would be definitely too late for compensation. It would involve even a great amount of money which might be more than a hundred times of the cost for regular slope maintenance. Therefore, they thought that slope maintenance was really valuable to do which could prevent any economic loss except the cost of

repair works.

Mr. Kwok believed that every slope had its own unique feature and so, he thought that it was very difficult to design a benchmarking slope. However, there were some guidelines for slope maintenance provided to follow, i.e. Layman's Guide to Slope Maintenance. Concerning with this guide book, he was questioned that a very small amount of property owners had heard of that. He admitted that it was a true case and they had already tried their best to promote this guide book to the public. For instance, whenever there was a need to carry out slope maintenance, they would offer a complete set of guidelines to property owners. It was pity that it was quite difficult to let everyone have a chance to read it. In addition, they had carried out some seminars with Hong Kong Association of Property Management Companies to arouse the responsibility to carry out regular slope maintenance and promote slope safety to property owners.

At the end of interview, they were asked whether there was any room for further improvement. Mr. Kwok firstly stated that it was impossible not to do any public education and their main aim was to maintain the awareness of owners to slope safety and slope maintenance by sustaining various methods. In this current year to 2006, Mr. Ho mentioned that there would be a lot of activities for public education. Apart from on-going campaigns, such as exhibitions set in schools, seminars, television advertisements, there would be some new activities employed.

A new television programme, namely “Sunny Action” (晴天行動 in Chinese), has been broadcasting in TVB Pearl every Saturday nights. They would be going to publish a book talking about the history of past landslides. There would be issued three new postal frames cooperating with the Post Office. The previous “Best Landscape Slope Awards” would be continued to hold in the following years. Moreover, they have devised a new index called “Landslip Potential Index” and it has been undergoing enquiry and approval process.

Once again, Mr. Kwok emphasized that landslide has been never totally mitigated. Therefore, everybody in this society has a duty to contribute in preventing any serious landslide from happening and maintain awareness to slope safety and slope maintenance.

6.3.2 Buildings Department

As mentioned in the last section, there is a Slope Safety Section under Buildings Department dealing with cases regarding with slope safety together with Geotechnical Engineering Office. The interviewee Zoe Lam, a building surveyor, has been working in this section for four years. This interview will be based on Dangerous Hillside Orders.

Zoe explained that the Buildings Department could issue Dangerous Hillside Order according to Section 27A and Section 27C. For Section 27A, they would ask Geotechnical Engineering Office to carry out

assessment and investigation on factor of safety of slopes. If it was found out the factor of safety was not up to standard, Geotechnical Engineering Office would pass the case back to Slope Safety Section of Buildings Department to issue Dangerous Hillside Orders. This provision was mainly for concerning safety of slopes and retaining walls. For Section 27C, it would be about buried services in the underground next to slopes. Whenever necessary, Geotechnical Engineering Office would carry out site visits and give recommendations to Slope Safety Section to issue Dangerous Hillside Orders. Sometimes, Section 27C would be grouped under Section 27A to issue one Dangerous Hillside Order if both were related to the same slope.

In Slope Safety Section, there were teams respectively responsible for Section 27A and Section 27C. However, it usually issued advisory orders rather than Dangerous Hillside Orders under Section 27C. In recent years, there has been less issued this order relatively to the early development of this system. Unfortunately, there were a significant amount of orders issued to those slopes in New Territories since there were a lot of slopes.

The usual process for triggering Dangerous Hillside Order was explained by Zoe in details. There were two stages. The first stage consisted of two processes. There would be two months allowed for property owners to appoint an authorized person and then, a geotechnical inspection report and proposal for any remedial work should be handed in to Slope Safety Section within the following seven months. In the first stage, a discharge

letter would be also issued in which the property owners were required to stick labels of landslip warning next to the subject slopes and there would be a record recorded in the Land Registry to alert the public that there was a Dangerous Hillside Order proceeding. After approval of inspection reports and remedial work proposal, stage two would be triggered off. Consent would be obtained from Buildings Authority for carrying out approval works. During the progress, there would be random inspections performed by Buildings Authority. Upon completion, property owners or authorized persons would prepare a set of documents, BA form 14 with plans, maintenance manual and any relevant certificates to Slope Safety Section. After that, the property owners needed to complete PNAP 168 with slope registration report and then Geotechnical Engineering Office would employ its internal structural engineers to carry out site inspection and give comments. If everything was satisfied, a letter of compliance would be issue and notify the Land Registry.

The time for complete the above process varied from case to case. The fastest could be around one year while it could not be able to be completed after carrying out more than three years. There would be some cases to allow property owners to apply for extension of time whenever there was such a necessary because they might require a long time for appointment of authorized person, tendering process, etc.. In this case, Slope Safety Section would pass the case to geotechnical engineers to comment whether extension of time should be allowed. If it was allowed, it would be authorized person's responsibility to monitor the condition of

slopes. If he found out any symptom to have landslide, emergency work could be done first followed by reporting to Slope Safety Section. Sometimes, if there was not yet authorized person appointed, Geotechnical Engineering Office would carry out slope inspection first and recommend any urgent remedial work. It would then activate contractors in Buildings Department to carry out the works. Any cost would be repaid by property owners.

Concerning with difficulties Slope Safety Section once came across, there were three problems. The first one was exactly the case mentioned by Mr. David W. Kwok of Geotechnical Engineering Office, i.e. mixed features of slope ownerships. Fortunately, it was relatively easier to deal with in recent years because there were much more data for inspection. If there was really unclear about the ownership of slopes, Geotechnical Engineering Office would carry out site surveys to observe the actual extension of slopes. Another problem was dealing with slopes outside lots. It was because sometimes, there were some slopes outside the lots, i.e. locating on government land, but the ownerships were still rest on private property owners due to written clauses or cutting away clauses stated in the lease contracts. Therefore, they needed to find enough evidence to show that these slopes were belonged to property owners which was very complicated and difficult. In this case, District Land Office and Lands Department would assist Slope Safety Section to find out ownerships of slopes. For those slopes within lots, the slopes may come across with a lot of sub-lots in which the government departments did not have

information and there might have discrepancy between plans contained in the leases and plans from Land Department. The degree of difficulty to clarify slope ownership would hence increase.

Regarding problems faced by property owners, it was particularly serious for old areas because buildings in old districts usually did not have owners' corporations. Thus, it would be very difficult to collect enough money from all owners and to have meetings to discuss how to deal with Dangerous Hillside Orders. In addition, these areas usually had many old people to live in who did not have enough money to carry out slope maintenance. They might also think that slope maintenance was none of their business and there was totally no problem concerning with the slopes. Slope maintenance was meaningless to do. As a result, the order would be ignored and it would lead to legal actions.

The most likely complaint they received was similar to that received by Geotechnical Engineering Office, i.e. property owners complained why they owned the slopes, especially those outside lots. In this situation, Slope Safety Section would try to explain the rationale behind. If it was unsuccessful, a meeting with district council members, property owners, representatives from district office, representatives from Community Advisory and Education Unit and representatives from Slope Safety Section would be held to have a face-to-face understanding. If the property owners wanted to carry out appeal, a legal section in Buildings Department would take up the responsibility to deal with the case. During

the appeal proceeding, property owners sometimes would give up the legal action when they notified that they had a lower bargaining power. They would carry out slope maintenance. But if the court held that it was default made by Slope Safety Section, the Dangerous Hillside Order would be withdrawn.

Nowadays, an Integrated Call Centre has been set up as a complain mechanism. Whenever the public has found any problem with the slopes, they can call into this centre for complaint and the centre will refer the case to Slope Safety Section and Geotechnical Engineering Office will go out for inspection. If the problem is affecting slope safety, an advisory letter will be issued to the owners of the slopes to carry out slope maintenance. When this centre was newly set up, there were many cases passed to Slope Safety Section. However, most of the cases were not relating to slope safety, for instance, rubbish on slopes, broken branches of trees on slopes, etc.. These cases would be passed to District Land Office to settle down. As if the case was described by complainant as very emergent, Slope Safety Section would need to carry out site inspection within three hours. If it was only an enquiry, they would settle down the case within ten days. Hence, if the public wrongly gave out the messages, it would waste a lot of time and human resources among government departments to deal with a minor case.

As mentioned before, Buildings Department has been working closely with Geotechnical Engineering Office. Zoe commented that both had

been well cooperated over years. As Geotechnical Engineering Office had much more professional knowledge in engineering, Buildings Department would rely on it to carry out geotechnical inspection and comments. At the same time, Geotechnical Engineering Office did not have authority to enforce Dangerous Hillside Orders which was under Building Ordinance performed by Buildings Department, it would rely on Buildings Department to carry out any enforcement.

At last, Zoe was asked to comment whether there was room for improvement in Slope Safety Section. She thought that there were already a lot of improvements done over years. At this moment, she believed that everything was quite satisfied.

6.4 Summary

In conclusion, there are five interviews conducted with firms and government departments in total. Although they are different stakeholders, they share similar experiences and thinking in certain areas.

Both firms and government departments also believed that most of property owners did not have a concept in responsibility to carry out slope maintenance, instead they thought that it should be the government departments who had responsibility to do so. Besides, both parties also observed that the level of awareness of owners to slope safety and slope maintenance was related to frequency of serious landslides happened. If

there were a lot of serious landslides happened, property owners would alert so much about the slope safety and they would be much more willingly to carry out slope maintenance. However, there have been few landslides reported in recent years and these landslides were small in scale. Hence, the level of awareness of property owners to slope safety and slope maintenance has been decreased accordingly.

In addition, both parties agreed that slope maintenance cost was much lower than that for repair works. The former one usually involved in money term while the latter one would involve a cost in property loss and human deaths upon money for carrying out repair works. Besides, when comparing the costs solely for maintenance works and repair works, the cost for repair works must be higher than that for maintenance works because repair works usually engaged in a large scale of work, such as constructing a new retaining wall. Yet, it often involved a rather small scale of work in maintenance, like clearing of vegetation and reinstating the surface protection. So, they concluded that regular slope maintenance work was worth to do. Slope safety could be maintained in a pleased degree.

Moreover, with reference to a saying “Slope maintenance is a waste of money”, all had the same opinion that this concept was wrong but the general public had this concept in their mind. It was mainly because the public always had an idea that there was nothing happened with the slopes, it was meaningless to carry out slope maintenance and it was only

a waste of money. The public only did not know the hidden crisis that might bring about if there was a lack of regular slope maintenance. The knowledge of public in the rationales behind the slope maintenance was still inadequate.

In order to spread messages of slope safety and carrying out regular slope maintenance to general public, both parties agreed that public education should be reinforced in various means. Besides, practitioners also raised out that the information relating to slopes should be updated frequently and user friendly for the public.

CHAPTER 7 CONCLUSION

Chapter Introduction

This chapter comprises three sections.

The first one will conclude the findings of this piece of study. The next section will talk about limitations and constraints when carrying out this study.

The last section will explore any possible room for further research.

7.1 Summary of findings

The main focus for this study is to investigate the relationship between the level of awareness of owners towards the slope safety and slope maintenance with their living conditions. As mentioned in the first chapter, it is hypothesized if owners live next to slopes, their awareness towards slope safety and perception in slope maintenance is higher than those who do not live next to slopes.

In this study, literature has been firstly reviewed. Base on those literatures, two set of questionnaires have been devised respective to property owners and firms responsible for slope maintenance and repair works. Then, interviews with firms which have completed the questionnaires and with relevant government developments have been conducted to learn the issue in a greater detail and to generate a deeper understanding.

From the results obtained from questionnaires, the relationship between living conditions and level of awareness of property owners towards slope safety and slope maintenance is significantly sound. The hypothesis is proved correctly. Besides, factors of failure to carry out slope maintenance by owners are also studied and ranked in order. For property owners, the major factor was they thought that it was none of their business followed by the cost for slope maintenance was too high. But for practionners, they believed that the property owners did not have perception to do so followed by difficulty in collecting enough money

from property owners. It can be deduced that being a different role in stakeholders, the perception will change accordingly because they have possessed different degree of knowledge and so, different judgments will be resulted.

Besides, it can be observed that different stakeholders will have different opinions in slope maintenance. As practitioners and representatives from government departments are equipped with relevant professional knowledge, they understand the rationales behind of slope maintenance and they know the crisis brought by failures in slope maintenance and repair works. But for property owners who are mostly general public with a rather low education level, they do not possess relevant professional knowledge. They only concern with the money and they do not understand the importance of slope maintenance and repair works. Consequently, they usually refuse to carry out slope maintenance and repair works.

Moreover, most of property owners thought that the responsibility of slope maintenance should be rest on the government departments. They did not aware that they might also have responsibility to carry out slope maintenance and some of them might even not know that they owned the slopes. Apart from that, their awareness towards slope safety was not well satisfied and there was a significant amount of property owners who did not know or would not take any self precautionary measures to protect themselves from dangers of landslides. Concerning with Landslip

Warning, it is interesting to discover that the respondents have heard of this warning regardless of their living conditions. However, it is significantly correlated with their living conditions and whether they will pay special attention to this warning, i.e. those

In viewing of the situation of property owners towards provisions of slope maintenance and slope safety, practitioners and government departments both believed that public education was a critical and vital means to promote message of slope safety and maintain the level of awareness of property owners to carry out slope maintenance.

7.2 Limitations of study

When conducting this study, there are some limitations and constraints.

1. Although there are 145 respondents towards questionnaires to owners, the sample size is still not adequate to represent the total population of property owners in Hong Kong. It is because this sample size is comparatively small with total population of property owners which may have a figure more than a million.
2. One set of questionnaire is targeted on property owners. However, there may be a situation that the one who answers the questionnaire is not really a property owner. He/she may be only a resident. It may affect the quality of sample size together with the result.

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3. The sample size of respondents towards questionnaires to firms is small. As a result, there may be not enough data to represent the general view of the industry. In addition, there are only three interviews done with respondents which may not be sufficient to support findings.

7.3 Areas for further research

Hong Kong is a hillside land with around 6.8 millions of people living in. It is unavoidable to have buildings either built on slopes or next to slopes. Hence, slope safety is very important to every one in Hong Kong.

Consequently, there still have some rooms for further research in this topic. Further studies can be carried out on exploring whether there is any other factor affecting level of awareness of owners to slope safety and slope maintenance, such as education background, family conditions, etc. Besides, more works can be done on responsibilities to carry out slope maintenance among stakeholders, for instance, government departments, contractors, property management companies, property owners and even simply residents. Interrelationships between those stakeholders are also suggested. In addition, it can investigate setting up a better slope safety system for both contractors and public to facilitate public education.

Last but not least, slope safety is a critical issue in Hong Kong although there are fewer serious landslides happened in recent years. It cannot be

overlooked and ignored, otherwise, economic loss is never able to be estimated.

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APPENDIX I

QUESTIONNAIRE TO PROPERTY OWNERS

The University of Hong Kong 香港大學
Faculty of Architecture 建築學院
Department of Real Estate and Construction 房地產及建設系

1. Which district are you living in? (請問你住在那一地區?) _____
2. What is the form of your housing? (你住的樓宇是屬於哪一種?)
 - Private housing (私人樓宇)
 - Public housing (公共屋村)
 - Squatters (寮屋)
 - Others (Please state) (其他;請說明) _____
3. What is the form of organization that is managing your property? (是甚麼機構管理樓宇的?)
 - Public housing management (公共管理)
 - Owners Corporation (業主立案法團)
 - Property management companies (私人管理公司)
 - Not managed by organization (沒有任何機構管理)
 - Others (Please state) (其他; 請說明) _____
 - Don't know (不知道)
4. Are you living in a building next to the slope? (請問你是否居住於斜坡隔離?)
 - Yes (是) ⇒ Q5 No (否) ⇒ Q6
5. Do you know the ownership of the slope next to your building? If so, who? (請問你是否知道這斜坡的擁有權是誰? 如是, 是誰?)
 - Yes (知道) _____ No (不知道)
6. Who do you think is responsible for slope maintenance? (你認為誰要負責斜坡維修?)
 - Property owners (業主)
 - The Government Department (政府部門) (Name 名稱: _____)
 - Nobody (沒有任何人)
 - Others (Please state) (其他; 請說明) _____
7. Why do you think the answer you gave above is responsible for slope maintenance? (為何你認為以上答案的人是有負責維修斜坡?)
 - They should have this responsibility (他們有這個責任)
 - It's the statutory provision stated in the lease/contract (租約/合約有條例說明)
 - Don't know (不知道)
 - Others (Please state) (其他;請說明) _____
8. Do you think that property owners should be responsible for slope maintenance within private lot? Why or why not? (你是否認為擁有私人土地的業主應該負責斜坡維修? 為何?)
 - Yes (有) _____ No (沒有) _____
9. **(For those who live near to the SLOPE only)** Is the slope once maintained or repaired? (只居住在斜坡附近的人作答: 斜坡是否曾經被維修或修補?)

Yes (是) ⇒ Q10 - Q13 No (否) ⇒ Q14

10. Why do you not carry out slope maintenance? (Please rank with 1 as the most important; 7 as the least important) (為何不進行斜坡維修?請排列 1 為最重要; 7 為最不重要) ⇒ Q11

- It's too expensive (太昂貴)
- It's difficult to collect enough money from property owners (很難從業主集齊足夠的資金)
- The property owners do not have a perception to do so (業主沒有這個意向)
- The slope is safe (斜坡安全)
- It's meaningless and useless to do so (沒有這個的需要)
- It's none of my business (與我沒有任何關係)
- Others (Please state) (其他:請說明) _____

11. Do you know when the last time slope maintenance / repair works was carried out? If so, when? (你是否知道上一次斜坡維修/修補是何時? 若是, 哪時?) ⇒ Q12

- Yes (知道) _____
- No (不知道)

12. (For those who live near to the SLOPE only) What have been done for the slope maintenance? (Multiple answers) (只居住斜坡附近的人作答: 進行過甚麼斜坡維修? 多項選擇) ⇒ Q13

- Overall upgrade to improve slope stability (提昇斜坡整體的穩固性)
- Repair to surface protection (修補表面的防護)
- Clearing of vegetation (清除植物)
- Slope inspection by professional geotechnical engineer (專業人士進行斜坡檢查)
- Clearing of surface channels (清除表面水管)
- Others (Please state) (其他:請說明) _____
- Don't know (不知道)

13. (For those who live near to the SLOPE only) Do you come across any difficulties when carrying out slope maintenance? (Please rank with 1 as the most important; 5 as the least important) (只居住斜坡附近的人作答: 進行斜坡維修時有否遇到以下的困難? 請排列 1 為最重要; 7 為最不重要) ⇒ Q14

- No difficulty (沒有任何困難)
- Difficulty in raising money (很難集齊資金)
- Poor building management (差劣的屋宇管理)
- Lack of administrative and technical support (欠缺行政及技術上的支援)
- Others (Please state) (其他:請說明) _____

14. Have you heard of Landslip Warning? (有否聽過山泥傾瀉警報?)

- Yes (有)
- No (沒有)

15. During heavy rainfall, would you pay special attention to television and radio broadcast to see whether the government has issued any Landslip Warning? (暴雨時, 你有無特別留意政府有否於電視或電台宣佈山泥傾瀉警報生效?)

- Yes (有)
- No (沒有)

16. What will you do when the Landslip Warning is issued? (Multiple answers) (山泥傾瀉警報生效

時, 你會做甚麼? 多項選擇)

- Stay away from slopes (離開斜坡)
- Go to safety places / Stay at home (去一個安全的地方 / 留待家中)
- Listen to the broadcasting of TV or/and radio (留意電視電台的報導)
- Nothing to do/no special actions/no solution (甚麼也沒做/沒有特別的行動/沒辦法)
- Don't know (不知道)
- Others (Please state) (其他:請說明) _____

17. (Assume living next to slopes if not in reality) When Landslip Warning is in force, would you move out of your home for safety reason? (若不是住在斜坡附近, 請假設是: 當山泥傾瀉警報生效時, 你會否因安全問題離開住所?)

- Yes (會)
- No (不會)

18. If you see signs of landslide danger on a slope near your home, or along your route, what would you mostly do? (multiple answers) (若在樓宇附近或於你的路途上見到有山泥傾瀉的徵兆, 你會怎樣處理? 多項選擇)

- Keep away from the slopes (離開斜坡)
- Report to the police (報警)
- Notify the owner or property manager (通知業主或管理公司)
- Ignore it / do nothing (不理會/甚麼都不做)
- Others (Please state) (其他:請說明) _____
- Don't know / Hard to say (不知道/很難說)

19. Do you know the signs of landslide danger? (你是否知道那些是山泥傾瀉前的徵兆?)

- Concentrated water overflowing onto slopes (很多水由斜坡滲出)
- Falling of objects like mud / debris and uprooted vegetation (有物件跌出,如泥,帶根的植物)
- Signs of cement / concrete surface bulging, soil erosion (石灰/石屎曝露, 泥土鬆脫)
- Change from clear to muddy water from slopes (斜坡流出來的清水轉為泥水)
- Landslip debris on roads and paths (道路或小徑上有山泥殘渣)
- New large cracks/ground subsidence (新形成的裂縫/土地移位)
- Others (Please state) (其他:請說明) _____
- Don't know (不知道)

20. Are you concerned with slope safety problems in Hong Kong? (你是否關注香港斜坡安全問題?)

- Yes (是) ⇒ Q21
- No (否) ⇒ Q22

21. What made you concerned the most? (甚麼事最令你關注?) ⇒ Q22

- Landslide incidents (發生過山泥傾斜)
- Government propaganda (政府的呼籲)
- Personal experience (自己的經歷)
- Others (Please state) (其他:請說明) _____
- Hard to say (很難說)

22. Which of the following have you come across? (multiple answers) (以下那些你曾經聽聞過的?
多項選擇)

- “Keep you slope safe” (定期維修斜坡)
- “Layman’s Guide to Slope Maintenance” (斜坡維修簡易指南)
- Slope Maintenance Hotline (斜坡維修熱線)
- Promotion of landslip warnings (山泥傾瀉警報的宣傳)
- Hoisting of landslip warnings during heavy rainfall (暴雨時發出的山泥傾瀉警報)
- Landslip warning signs on slopes below safety standard (不合規格而發出的山泥傾瀉告示)
- Having seen road side landslip warning signs (路邊山泥傾瀉警告標示)

23. Through which channels do you know? (multiple answers) (是從何而得知? 可作多項選擇)

- Government TV advertisement (政府電視廣告)
- Newspaper reports (報紙的報告)
- Government Radio advertisement (政府電台廣告)
- Poster (宣傳海報)
- Other people told me (其他人告知我的)
- Leaflet (宣傳單張)
- TV programme (電視節目)
- Others (Please state) (其他:請說明) _____
- Never heard about it (從沒聽過)
- Don’t know (不知道)

24. Which channel is the most effective way in promotion? (甚麼宣傳渠道是最有效的?)

- Government TV advertisement (政府電視廣告)
- Newspaper reports (報紙的報告)
- Government Radio advertisement (政府電台廣告)
- Poster (宣傳海報)
- Other people told me (其他人告知我的)
- Leaflet (宣傳單張)
- TV programme (電視節目)
- Others (Please state) (其他:請說明) _____

25. What improvement(s) should be taken concerning the Slope Safety Campaign? (斜坡安全計劃有甚麼是需要改進的?)

26. What improvement(s) should be taken concerning the Slope Safety System? (斜坡安全系統有甚麼是需要改進的?)

- Thank you for your co-operation 多謝合作 -

APPENDIX II

QUESTIONNAIRE TO FIRMS

The University of Hong Kong
Faculty of Architecture
Department of Real Estate and Construction

1. Which form of slope do you mostly manage?
 Private Public Both
2. How long does a party usually consult you to carry out slope maintenance?
 Half a year
 Once a year
 Once every 3 years
 Once every 5 years
 Others (Please state) _____
3. What is the estimated cost for slope maintenance?
Highest: _____ Lowest: _____
4. What is the estimated cost for slope repair works?
Highest: _____ Lowest: _____
5. What have been usually done for the slope maintenance? (Multiple answers)
 Overall upgrade to improve slope stability
 Repair to surface protection
 Clearing of vegetation
 Slope inspection by professional geotechnical engineer
 Clearing of surface channels
 Others (Please state) _____
6. Do you come across with any difficulties when carrying out slope maintenance for a building? (Please rank 1 as the most important; 5 as the least important)
 No difficulty
 Difficulty in raising money
 Poor building management
 Lack of administrative and technical support
 Others (Please state) _____
7. How do you solve the problems stated above?

8. What do you think why some owners refuse to carry out slope maintenance? (Please rank 1 as the most important; 7 as the least important)
 It's too expensive
 It's difficult to collect enough money from property owners
 The property owners do not have a perception to do so

- The slope is safe
 - It's meaningless and useless to do so
 - They think it's none of their business
 - Others (Please state) _____
9. Could you name one slope (if possible, please state the one next to the building) that you think it is best maintained? Why?
- _____
- _____
10. What do you think about the level of awareness of public towards slope maintenance and repair works? Why?
- Excellent: _____
 - Good: _____
 - Satisfactory: _____
 - Poor: _____
 - None of this perception: _____
11. What improvement(s) should be taken concerning the Slope Safety Campaign?
- _____
- _____
12. What improvement(s) should be taken concerning the Slope Safety System?
- _____
- _____

Name of firm: _____

Name of contact and telephone number: _____

- Thank you for your kind co-operation -

APPENDIX III

OFFICIAL LEAFLETS ON SLOPES



斜坡安全公眾教育 Public Education on Slope Safety

處理香港的斜坡安全問題是需要政府和市民大眾的通力合作，及社會人士的支持。為了發動群眾力量參與減低山泥傾瀉的危險，推行有關斜坡安全的公眾教育是必須的。公眾教育，是我們預防山泥傾瀉工作不可或缺的一部份，在減低本港的山泥傾瀉風險方面，公眾教育與實際的預防山泥傾瀉工程同屬重要。

To deal with the slope safety problem of Hong Kong, joint action is needed by the government and the general public, with the support of the community. Public education on slope safety is necessary in soliciting community action to reduce the landslide risk. It is an essential part of our landslide prevention function and is as important as the physical landslide preventive works.

公眾教育的目標 Functions of Public Education

- 推廣斜坡維修，以減少山泥傾瀉的機會。
- promote slope maintenance to reduce the occurrence of landslides. ▼



- 提醒市民在豪雨期間所需採取的預防措施，以減低受山泥傾瀉影響的機會。 ▶



Inform the public on precautionary measures in heavy rains to reduce their vulnerability to landslide danger.

宣傳及公眾教育活動 Publicity and Public Education

藉著斜坡安全教育、維修指引、資訊服務及宣傳，我們向市民大眾推廣斜坡安全的訊息。

Through slope safety education, provision of guidance on slope maintenance, information services and publicity, we promote messages on slope safety to the public.

斜坡安全教育 Slope Safety Education

為兒童而設的卡通畫冊 ▶
Cartoon books for children



學校講座
School talk ▼



為中學課程而設的雙語教材套
Bilingual education toolkit for secondary schools



斜坡維修指引 Guidance on Slope Maintenance

維修指南
Maintenance Guides ▼



視像光碟
VCDs ▲

資訊服務及宣傳
Information Services & Publicity



雙語香港斜坡安全網頁
Bilingual Hong Kong Slope Safety (HKSS) Website
<http://hkss.cedd.gov.hk>

上述網頁中「斜坡安全島」內的斜坡維修課程
Slope Maintenance Course in "Slope Safety Island" of the HKSS Website



巡迴展覽
Roving Exhibition

「回溯歷史 記取教訓」
山泥傾瀉話當年展覽
"Let Us Not Forget" The Exhibition on Landslide History in Hong Kong



派發宣傳品、視像光碟、單張及海報
Distributing promotional materials, VCDs, leaflets and posters

電視宣傳片
Television Announcements in the Public Interest



媒體宣傳 — 記者會、簡報會及媒體訪問
Media promotion - press conferences, briefings and media interviews



展望將來
Looking Forward

儘管公眾人士對斜坡安全的認知程度已有所提高，我們仍會不斷進行教育及宣傳運動，令公眾對這方面維持高度警覺，並將知識帶給市民，使他們能進一步減低受山泥傾瀉影響的機會。雖然山泥傾瀉風險永遠無法完全消除，但我們深信憑藉社會整體的共同努力，定可將風險減至可接受的水平，以符合市民對斜坡安全的期望。此外，在確保安全之餘，政府還致力改善斜坡的外觀。希望能通過宣傳及教育，可鼓勵私人斜坡業主和政府齊心努力，美化香港的斜坡。

Although there has been improvement in public awareness on slope safety, it is important to continue our education and publicity campaign to sustain this awareness and provide members of the public with knowledge on how to further reduce exposure to landslide hazards. Landslide risk can never be reduced to zero. We are confident that with concerted effort from the whole community, we can reduce the risk to as low as practically achievable, in accordance with the expectation of the community. Apart from ensuring slope safety, the government is also committed to improving slope appearance. Through publicity and public education, it is hoped that private slope owners can work together with the government to beautify the slopes in Hong Kong.

歡迎瀏覽我們的網頁：
For more information, please visit our website:

土木工程拓展署網頁
CEDD homepage <http://www.cedd.gov.hk>

香港斜坡安全網頁
Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>



社區諮詢服務 Community Advisory Services

透過斜坡安全教育和宣傳，很多私人物業業主已開始明白他們的斜坡維修責任。但對於斜坡改善或維修工程，他們或許完全沒有這方面的資料和專業知識。為提高市民對斜坡安全的認識和加強諮詢服務，土木工程拓展署轄下的土力工程處成立了「社區諮詢服務組」，負責解答市民查詢和就如何進行斜坡維修工程向私人業主提供意見。



Through publicity and education, private owners are becoming more aware of their slope maintenance responsibility, but as laymen they might not possess the required information, knowledge or expertise in slope improvement or maintenance works. To enhance public understanding of slope safety, the Geotechnical Engineering Office of the Civil Engineering and Development Department has established a Community Advisory Unit (CAU) to assist private owners to discharge their slope maintenance responsibility through direct community outreach advisory and information services.

社區諮詢服務組的服務 Functions of Community Advisory Unit

社區諮詢服務組透過社區外展工作，直接協助私人業主履行其斜坡維修責任。社區諮詢服務組的主要職責是：

The CAU adopts a community outreach approach to provide direct assistance to private owners on how to discharge their slope maintenance responsibility. The CAU has the following principal functions:

斜坡安全/維修講座及研討會 Seminars/Talks on Slope Safety and Maintenance



▲ 斜坡安全/維修講座
Slope Safety / maintenance seminars

透過民政事務總署的大廈管理資源中心，政務處等，為私人斜坡業主舉辦關於斜坡安全及維修的研討會及講座。

Through the Home Affairs Department's Building Management Resources Centres, District Offices, etc., organize slope safety and maintenance seminars and talks for private slope owners and bodies involved in slope maintenance.

斜坡維修諮詢服務 Slope Maintenance Advisory Service



▲ 提供維修意見
Advice on Slope Maintenance Works



▲ 會見業主立案法團
Meet the Owners' Corporations

向業主、業主立案法團，互助委員會等提供如何進行維修斜坡工程的意見及資訊服務。

Provide a face-to-face advisory service to private slope owners, Owners' Corporations, Mutual Aid Committees, etc., on how to undertake slope maintenance works.

《危險斜坡修葺令》諮詢服務 DH Order Advisory Service



▲ 向接獲《危險斜坡修葺令》的業主提供意見
Advice to Owners Who Receive a DH Order

主動聯絡已接獲〈危險斜坡修葺令〉的業主，了解他們修葺其斜坡的狀況，務使市民能盡快進行斜坡鞏固工程以符合修葺令的規定。

Take a proactive approach to contact those private slope owners who have received DH Orders. Offer advice on how to proceed with the necessary slope works for prompt and satisfactory compliance with the DH Orders.

▲ 協助業主處理《危險斜坡修葺令》的刊物
Publications to Assist Owners to Deal With Dangerous Hillside (DH) Orders

會見市民活動 Meet-the-Public Service

安排定期會見市民活動，就斜坡安全事宜解答查詢和提供資料。

Provide a regular meet-the-public service to answer queries and provide information on slope safety matters.



▲ 會見市民活動
Meet-the-Public Service

怎樣聯絡社區諮詢服務組：
請致電2760 5800或透過電郵cau@cedd.gov.hk
How to Contact Us:
Please contact us at 2760 5800 or by electronic mail at
cau@cedd.gov.hk

歡迎瀏覽我們的網頁：
For more information, please visit our website:
土木工程拓展署網頁
CEDD homepage <http://www.cedd.gov.hk>
香港斜坡安全網頁
Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>



減低山泥傾瀉對寮屋居民的威脅 Reducing Landslide Hazards to Squatters

政府的政策是為受到山泥傾瀉威脅的寮屋居民提供安置。政府致力透過寮屋區安全清拆計劃，以減低山泥傾瀉對寮屋居民的風險。

It is Government policy to offer rehousing to occupants of squatter structures who are identified as being especially vulnerable to landslide hazard. The Government aims to reduce landslide risk to squatters through the safety clearance of squatter structures.



香港的寮屋分佈圖
Distribution of squatter villages in Hong Kong



脆弱的寮屋結構
Flimsy squatter structure



沙田禾輦寮屋區
Squatter area in Wo Che, Shatin

「寮屋居民」是指房屋署在一九八二年所登記居住在暫准寮屋中的居民。

'Squatters' are those persons who live in tolerated squatter structures surveyed by Housing Department in 1982.



須清拆的寮屋，是由土力工程處經過岩土工程研究及視察後鑒定的。至於安置和清拆的工作，一般是由房屋署及地政總署執行。而位於私人地段的寮屋，則會由屋宇署處理。

The structures needing clearance are identified following geotechnical studies and inspections carried out by the Geotechnical Engineering Office (GEO). Clearance of the structures is generally implemented by Housing Department (HD) and Lands Department (LandsD). Buildings Department (BD) will be involved for cases on private building lots.



受山泥傾瀉毀壞的寮屋
Squatter hut damaged by landslide



當發現寮屋受到即時及明顯的山泥傾瀉威脅，便會立即進行清拆。

In cases where there is an immediate and obvious landslide danger to the squatters, clearance will be carried out immediately.

政府已實踐在一九九二年所作出的承諾，在一九九六年三月底前向所有住在政府土地上的市區寮屋居民提供居所。但上述的服務承諾不包括在私人土地或在政府與私人混合業權地段上的寮屋居民。

As pledged in 1992, the Government has offered rehousing to all urban squatters on Government land by March 1996. However, structures on private land or government land mixed with private lots were not covered by the pledge.



清拆之前
Before clearance



清拆之後
After clearance and restoration

雖自八十年代中期起推行的非發展性清拆、發展性清拆以及山泥傾瀉善後清拆等寮屋清拆計劃，已減輕山泥傾瀉對寮屋居民的威脅，但仍存在相當大的威脅。

Squatter clearance, including Non Development Clearance (NDC), development clearance and clearance following landslides, since the mid-1980's has contributed significantly to reducing landslide risk to squatters, but substantial risk remains.



與房屋署及地政總署人員到場視察
Joint site inspection with HD and LandsD

在雨季期間，土木工程處與香港天文台共同操作山泥傾瀉警報系統。當山泥傾瀉警報發出後，民政事務處便會開放臨時庇護站，收容有需要的寮屋居民或公眾人士。此外，在每年的雨季初，民政事務處會在寮屋區派發土木工程處印製的單張，通知居民採取預防措施。

During the wet season, GEO in conjunction with the Hong Kong Observatory operates the Landslip Warning System. When the Landslip Warning is issued, temporary shelters are provided by District Offices to accommodate squatters or any members of the public in need. Additionally, the District Officers have been distributing warning leaflets, produced by the GEO, in squatter areas at the start of the wet season every year.



分派給寮屋區居民關於山泥傾瀉的小冊子
Leaflet distributed to squatters in respect of landslides

土木工程處會向因斜坡安全理由而建議清拆的寮屋區居民發出危險警告信。自一九九八年起，該處在已建議清拆而未執行清拆的地區豎立警告牌，提醒受影響居民在等候安置期間，需要遵從的各項預防措施。

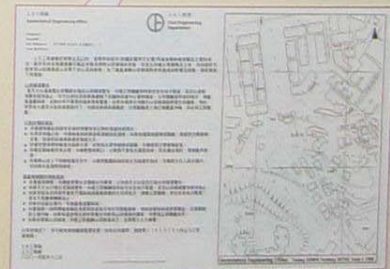
GEO issues warning letters to squatters who have been recommended for clearance on slope safety grounds. Since 1998, the GEO has also been erecting warning signs in areas with outstanding clearance. Squatters are advised to follow the advice given pending action for rehousing.



豎立於寮屋區的山泥傾瀉警告牌
Landslip warning signs erected in squatter areas

雖然已有很多寮屋居民接受了安置，但部分居民屢次拒絕安置。本處強烈呼籲他們為自身安全，儘快接納安置建議。

While many squatters have accepted rehousing, some have repeatedly turned down rehousing offers. We strongly urge them to accept our clearance recommendations for their own safety.



派發警告信
Posting notification letter

歡迎瀏覽我們的網頁：
For more information, please visit our website:

土木工程拓展署網頁
CEDD homepage <http://www.cedd.gov.hk>

香港斜坡安全網頁
Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>

土木工程拓展署出版
政府刊物免費索取
(所用圖像均經編者及取材自可再生林木的高張印刷)



斜坡紀錄冊 Catalogue of Slopes

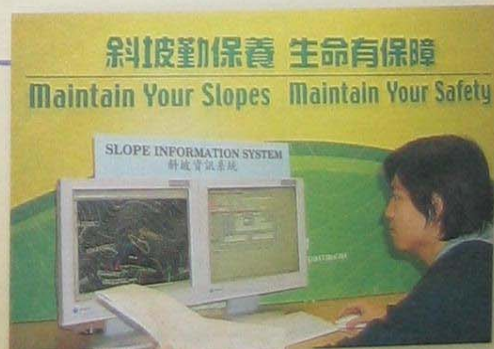
紀錄冊的更新及電腦化工作，不但可以提供香港區內所有已登記斜坡的最新資料，還可以提高儲存及檢索斜坡資料的效率。紀錄冊內的斜坡資料也登載於香港斜坡安全網頁(<http://hkss.cedd.gov.hk>)。市民及工程界人士可從家居或辦公室直接檢索斜坡資料。

The updating and computerization of the Catalogue of Slopes not only provides up-to-date information on all registered man-made slopes in Hong Kong, but has also improved the efficiency of storage and retrieval of slope data. Information on slopes in the Catalogue is also available on the Hong Kong Slope Safety Website (<http://hkss.cedd.gov.hk>); this enables the public and the engineering profession to obtain slope information from their homes and offices.

截至二零零三年十一月，斜坡紀錄冊共收錄了香港區內約 57,000 個人造斜坡資料。為了確保斜坡紀錄冊的資料完整和不斷更新，土力工程處調派了一組專業及技術人員，負責日常的系統管理及資料更新。並建立了一套電腦化“斜坡資訊系統”，以提高檢索及日後更新資料的效率。



As at November 2003, the Catalogue of Slopes contained information on some 57,000 man-made slopes. To ensure that the slope catalogue information is comprehensive and up-to-date, a dedicated team of professional and technical staff has been deployed to administer, maintain and update the catalogue. A computerized Slope Information System (SIS) has also been developed to contain the slope information, thereby improving the efficiency of retrieval and future updating.



斜坡資訊系統

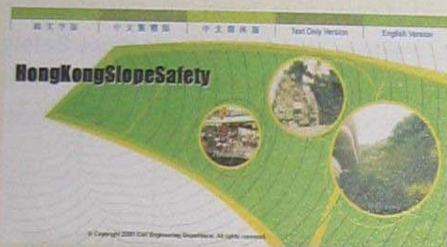
查閱斜坡資料

公眾可利用設於九龍何文田公主道101號土木工程拓展署大樓七樓的電腦或透過其家中電腦連上互聯網的“香港斜坡安全網頁” (<http://hkss.cedd.gov.hk>) 查閱斜坡資料。又或利用表格，以郵寄或傳真方式向土木工程拓展署索取所需的斜坡資料。

Slope Information System

Access to Slope Information

Public access to the SIS can be gained from a computer terminal in the 7/F of the Civil Engineering and Development Building at 101 Princess Margaret Road, Homantin, Kowloon, or at the Hong Kong Slope Safety Website (<http://hkss.cedd.gov.hk>) on any personal computer with Internet access. Slope information can also be obtained by submitting an Application Form by mail / fax to the Civil Engineering and Development Department.



斜坡資訊系統 Slope Information System



位於九龍何文田公主道101號土木工程拓展署大樓七樓、公眾開放使用的電腦工作站。
Computer terminal for public access on 7/F, Civil Engineering and Development Building, 101 Princess Margaret Road, Homantin, Kowloon.

有連上互聯網功能的電腦
Client computers with Internet access

斜坡的維修責任

為了清楚釐訂斜坡的維修責任，地政總署已完成一項“有系統鑑別全港斜坡維修責任”計劃。設立有關斜坡紀錄冊內所有人造斜坡維修責任的紀錄冊。斜坡維修責任的資料可向地政總署斜坡維修責任信息中心查詢或可利用互聯網在地政總署的“斜坡維修責任信息系統”網頁 (<http://www.slope.landsd.gov.hk/smr/s/>) 中瀏覽。

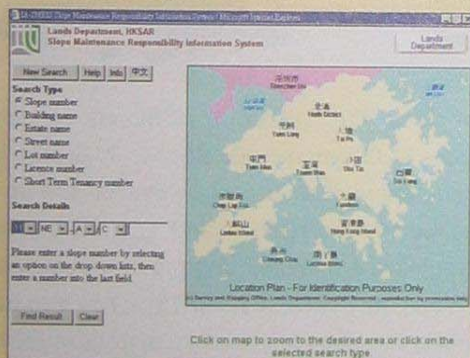


Maintenance Responsibility of Slopes

To make clear the responsibility for maintenance of slopes, the Lands Department has completed the project Systematic Identification of Maintenance Responsibility of Slopes in the Territory (SIMAR) to set up a register of slope maintenance responsibility for all man-made slopes in the Catalogue of Slopes. The information on maintenance responsibility can be obtained from the Slope Maintenance Responsibility Information Centre of the Lands Department or from Lands Department's Website on Slope Maintenance Responsibility Information System (<http://www.slope.landsd.gov.hk/smr/s/>) through the Internet.

歡迎瀏覽我們的網頁：
For more information, please visit our website:

- 土木工程拓展署網頁 <http://www.cedd.gov.hk>
- CEDD homepage
- 香港斜坡安全網頁
- Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>





斜坡維修 Slope Maintenance

要確保斜坡穩固，定期維修不可缺少。政府一直積極維修其負責的斜坡。至於私人斜坡，則需由業主負責。為協助他們履行斜坡維修責任，政府致力提供斜坡資訊服務、宣傳和公眾教育及社區諮詢服務。

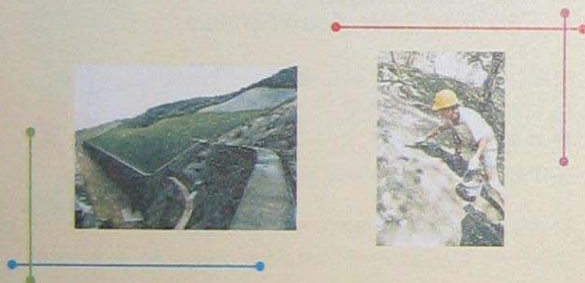
Regular maintenance is essential to the continued stability of slopes. The government actively maintains all government slopes. Maintenance of private slopes is the responsibility of the owners. To assist private owners in slope maintenance, the government is committed to provide public information, public education and community advisory services.

斜坡維修的公眾資訊 Public Information on Slope Maintenance

斜坡維修責任 Slope Maintenance Responsibility

為使業主清楚了解他們的斜坡維修責任，政府已有系統地確定所有政府或私人斜坡的負責人。市民可在下列地點查閱斜坡維修的責任：

- 北角渣華道333號政府合署一樓地政總署的斜坡維修責任信息中心(電話: 2231 3333);
- 地政總署網頁 (<http://www.slope.landsd.gov.hk/smris/>)



The government has systematically identified the responsible party for maintaining each government or private slope to ensure that the owners are aware of their responsibility for slope maintenance. The public can check the maintenance responsibility of a slope:

- at the Slope Maintenance Responsibility Information Centre in Lands Department, 1/F., North Point Government Office, 333 Java Road. (Tel: 2231 3333);
- from the Lands Department Website (<http://www.slope.landsd.gov.hk/smris/>)

斜坡維修標準及指引 Slope Maintenance Standards and Guidebooks

為方便私人業主策劃及進行斜坡維修及鞏固工程，土木工程拓展署轄下的土力工程處為公眾提供多項有關斜坡維修的標準及指引。

In order to assist private owners to plan and implement slope maintenance and upgrading works, the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD) has produced a variety of standards and information guidebooks on slope maintenance for the public.



可於政府刊物銷售處購買
Available at the Government Publication Sales Centre

* 可於民政事務處免費索取
Available free-of-charge at the District Offices

@ 可於大廈管理資源中心免費索取
Available free-of-charge at Building Management Resource Centre

香港斜坡安全網頁 (<http://hkss.cedd.gov.hk>)
Hong Kong Slope Safety Website

除了發放斜坡資訊系統 (SIS) 的斜坡資料及斜坡安全資訊外，此網頁亦有登載斜坡維修的指引。



Apart from disseminating slope information from the Slope Information System (SIS) and other slope safety related information, it also contains guidance on slope maintenance.

宣傳和公眾教育 Publicity and Public Education

斜坡維修視像光碟 Slope Maintenance Training VCD

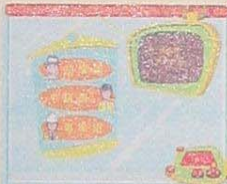


光碟內容是以簡易方式介紹斜坡安全問題及一般維修斜坡的方法。

The content of the VCD introduces the common methods of slope maintenance in a simplified matter.

網上斜坡維修課程 Internet Training Course on Slope Maintenance

在香港斜坡安全網頁上的斜坡安全島內，設有斜坡維修課程。課程分為初學組、中級組及專業組，以迎合大眾不同的需要。



An internet training course on slope maintenance has been set up in the Slope Safety Island of the Hong Kong Slope Safety Website. The course is divided into Beginner, Intermediate and Advanced Levels to cater for the various needs of the public.

「斜坡叔叔」卡通畫冊 "Happy Mr. Slope" Cartoon Book

「斜坡叔叔」是土力工程處製作的第一本卡通畫冊，主題是斜坡維修。目的是用輕鬆有趣的方法將斜坡維修的訊息帶給小朋友們，更希望他們能轉達斜坡安全訊息給家人。



"Happy Mr. Slope" is the first cartoon book produced by the GEO. The purpose is to transmit slope maintenance messages to children in an interesting manner. It is also hoped that they would in turn bring the messages home and share them with their families.

電視宣傳片、小冊子及海報 TV-API, Leaflets and Posters



社區諮詢服務 Community Advisory Services

土力工程處的社區諮詢服務組主動協助私人業主了解及處理斜坡維修及鞏固工程上的技術問題。

The Community Advisory Unit of the GEO provides proactive service to assist private slope owners to understand the technical issues and to provide advice on how to proceed with slope maintenance and upgrading works.

社區諮詢服務組電郵 CAU e-mail gecau1_ssd@cedd.gov.hk
社區諮詢服務組電話 CAU phone number 2760 5800



會見業主立案法團及互助委員會
Meet with Owners' Corporations and Mutual Aid Committees

樓宇安全貸款計劃 Building Safety Loan Scheme

由屋宇署執行的貸款計劃為有需要的個別私人業主提供貸款，以便進行改善其斜坡及／或樓宇安全的工程。查詢可電2626 1579與屋宇署聯絡。



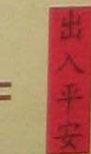
The Loan Scheme administered by the Buildings Department provides loans to individual private owners for carrying out improvement or maintenance works on slopes, among other building maintenance works. Enquiries can be made to Buildings Department at 2626 1579.



認識
Awareness



行動
Action



保障生命
Save lives

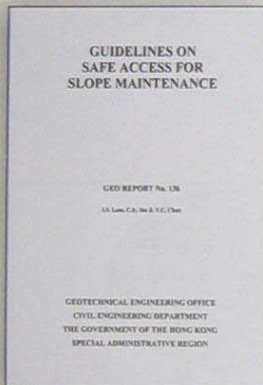
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香港斜坡安全網頁 Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>

斜坡維修安全通道和編號牌 Slope Maintenance Safe Access and Sign Plate

所有斜坡均需定期維修，以確保斜坡長遠保持穩固。為確保斜坡維修人員能安全工作，斜坡上需設立安全通道。此外，為了幫助有關部門能迅速處理山泥傾瀉事故及斜坡安全的投訴和採取相應的維修和修復行動，我們在斜坡和擋土牆上安裝斜坡編號牌，顯示斜坡的登記編號和維修部門。政府致力確保這些設施能夠和四周的環境融合及減低視覺上的不良效果，同時亦避免行人誤闖斜坡維修通道。

Regular maintenance is essential for the continued stability of slopes, and means of safe access is needed for use by maintenance personnel when inspecting and working on slopes. Moreover, to facilitate timely response to deal with landslide incidents and complaints, and implementation of the necessary maintenance/repair actions, slope sign plates are installed to show the slope registration number and maintenance department. Efforts have been made to ensure that these installations blend in with the surroundings and to minimize their visual impact, and that the slope access is secure against trespassers.



- 已印制斜坡維修安全通道的指引，在設計上考慮安全、視覺效果和保安等因素：

"Guidelines on Safe Access for Slope Maintenance" has been issued for designing safe access for slope maintenance taking into consideration safety, visual quality and security:

1. 在設立維修通道時，安全是優先考慮因素
Safety takes precedence in provision of access for slope maintenance



2. 盡量使通道不顯眼
Minimise visual impact of slope maintenance access

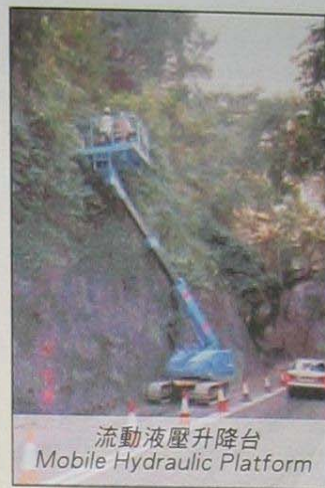


3. 豎立警告牌防止行人誤闖
Erect warning signs against unauthorized entry





永久維修通道 - Permanent Access -
與周圍環境融合。 Blend in with the surroundings.



流動液壓升降台
Mobile Hydraulic Platform

▲
當現場環境不宜設置永久通道時 -
可以應用臨時維修通道/工作台

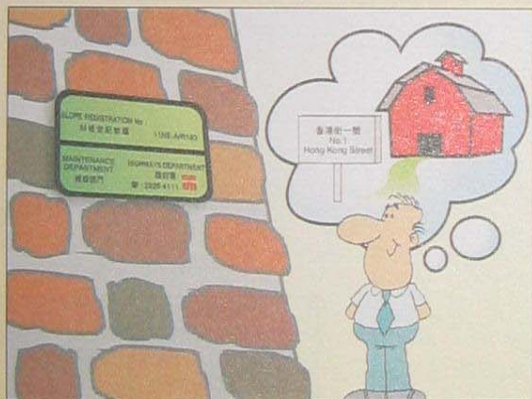
If permanent access is impractical -
temporary access and mobile working platforms
can be used

- 斜坡編號牌的用處與樓宇門牌相似，能夠幫助快捷及容易地確定斜坡的位置。

Similar to street number plates of building lots,
slope sign plates enable quick and easy
identification of slope location on site.

- 當山泥傾瀉事故發生而須要採取緊急修復行動以保障公眾安全時，斜坡編號的功能尤其重要。

Slope sign plates are particularly important after a
landslide to facilitate prompt actions to deal with
the slope to protect public safety.



- 政府致力確保斜坡編號牌能夠和四周的環境融合和減低所引起的不良視覺效果。

Efforts are devoted to ensure that the sign plates blend in with the
surroundings to minimize their visual impact.



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斜坡護面與外觀 Surface Protection and Appearance of Slopes

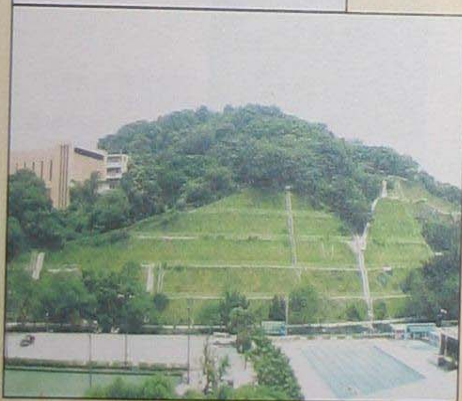
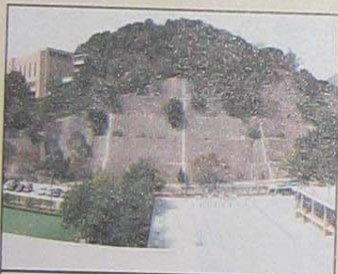
我們的政策是要令政府斜坡盡量看來自然，以減低其視覺影響及改善環境。只有在其他方法不可行或安全度不足時，我們才會在斜坡使用噴漿混凝土護面。

It is our policy to make Government slopes look as natural as possible to reduce their visual impact and improve the environment. Shotcrete cover is used on slopes only after other techniques have been explored and found not practical or inadequate on slope stability grounds.

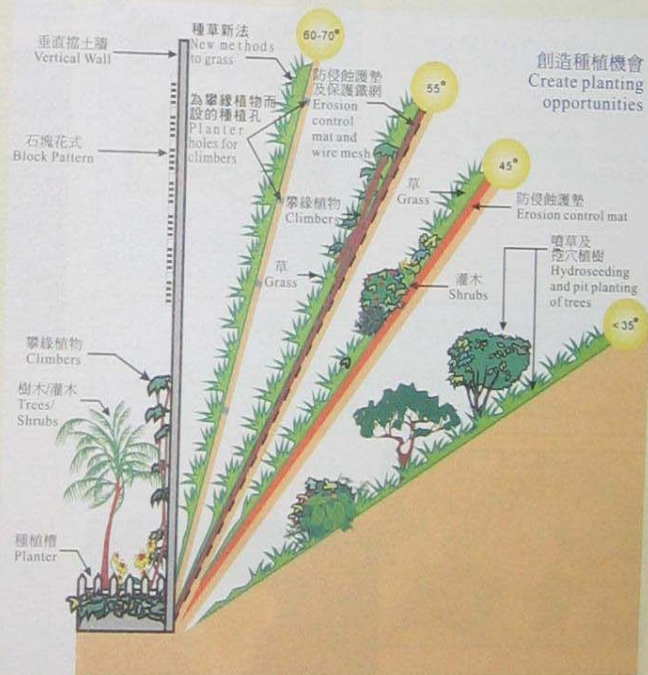
植被護面的使用 Use of Vegetation Cover

為了令人造斜坡看來更自然，我們在斜坡鞏固工程中盡量創造種植機會及保存現有植物。一般而言，斜坡愈陡峭，提供植被護面就愈困難及昂貴。我們現已定下目標，要為70%在「防止山泥傾瀉計劃」下鞏固的斜坡提供植被護面。

To make man-made slopes look more natural, we strive to create planting opportunities and retain existing vegetation in our slope upgrading works. It is generally more difficult and expensive to provide stable vegetation cover on steeper slopes. At present, we have the target of providing vegetation cover to 70% of the slopes upgraded under the Landslip Preventive Measures Programme.



青蔥的斜坡為周圍環境帶來生氣。
The green slope enlivens the surrounding environment.



保存石牆上的樹木
Preserve trees on masonry wall



在工程中保護斜坡上的樹木
Protect trees on slopes during construction

噴漿混凝土護面的使用 Use of Shotcrete Cover

噴漿混凝土能為斜坡提供即時、安全及可靠的保護面。但它不美觀及會反射熱力。我們不會在為達致斜坡安全而別無他選的情況下及在緊急維修山泥傾瀉殘痕之時，才採用這種護面。

Shotcrete (sprayed concrete) cover provides an immediate, safe and reliable surface protection to many slopes. However, it is visually unattractive and heat reflective. We use shotcrete cover only as a last resort on slope stability grounds and as emergency repairs to landslip scars.

加上顏色的噴漿
混凝土護面
Coloured shotcrete



坡腳種植大樹遮擋噴漿混凝土護面
Large trees at slope toe to screen the
shotcreted surface



我們透過部門的「斜坡外觀審核委員會」防止濫用噴漿混凝土護面。如需採用這種護面，我們會提供景觀緩解措施，以改善斜坡的外觀。

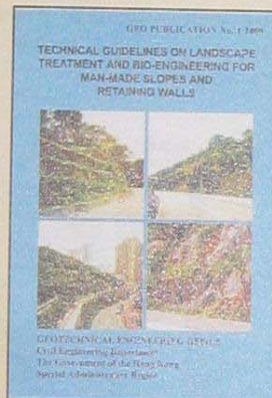
We control the use of shotcrete cover on slopes through the Departmental Vetting Committee on Slope Appearance. Where shotcrete cover is used, landscape measures will be taken to improve the slope appearance.

斜坡綠化技術 Slope Greening

制訂作業技術指引 Set up technical guidelines

土力工程處刊物第1/2000號為專業人士提供詳細的斜坡綠化技術指引。

GEO Publication No. 1/2000 provides detailed slope greening technical guidelines for use of the professionals.



在陡峭斜坡上試驗各種不同的綠化技術 Conduct trials of different greening techniques on steep slopes



纖維強化土種植工程
Planting on fiber-reinforced soil

植生吹附工法
Hydro-mulching

找出在陡峭斜坡上適用的植物物種及作出 試驗種植 Identify suitable vegetation species for use on steep slopes and conduct trial planting



毛椴
Melastoma sanguineum

大頭茶
Gordonia axillaris



噴漿混凝土護面上
種植香根草
Vetiver grass planted
on shotcreted slope
surface

公眾的意見 Public Opinion

二零零二年的公眾意見調查顯示大約有65%的受訪者大致上滿意斜坡的外觀。

Results of 2002 public opinion survey indicate that about 65% of the respondents were generally satisfied with slope appearance.

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斜坡工程的改善生態工作 Ecological Enhancement in Slope Works

在斜坡工程中，我們致力改善斜坡的生態環境。

As part of our slope works, we are making efforts to achieve ecological enhancement of the slopes.



1992



2002

在斜坡上廣植樹木能改善環境。

Extensive planting of vegetation on slopes can improve the environment.



大葉合歡 (*Albizia lebbek*) 木麻黃 (*Casuarina equisetifolia*) 紅膠木 (*Tristania conferta*) 台灣相思 (*Acacia confusa*)

除了常見的台灣相思，在人造斜坡上可以找到很多其他外地樹木。雖然它們生長迅速，但生態價值不高。

In addition to *Acacia confusa*, many other exotic species are found on existing man-made slopes. They grow fast but have little inherent ecological value.

本土植物也能開花結果自然繁殖。更重要的是它們能為野生動物提供適合的食物和棲息地。對改善生態環境有很大的幫助。我們致力採用更多本土植物去綠化斜坡。

Native species flower, fruit, and reproduce naturally. Moreover, they provide food and habitat for wild life, hence they are beneficial to the ecological environment. We are making efforts to adopt more native species for planting on slopes.



崗欖 (*Rhodomyrtus tomentosa*)



梔子 (*Gardenia jasminoides*)



白楸 (*Mallotus paniculatus*)



藍蕚 (*Castanopsis fissa*)



山指甲 (*Ligustrum sinense*)



假黃婆 (*Sterculia lanceolata*)



種植前 (before)



種植後 (after)

在大欖郊野公園，我們聯同嘉道理農場試驗在陡峭土坡上種植八種本地灌木。從2001年7月至今，坡面的植被生長良好，灌木的存活率及生長速度都令人滿意。

In Tai Lam Country Park, in collaboration with Kadoorie Farm, we are carrying out a planting trial of 8 species of native shrubs. Since July 2001, the vegetation cover has become well established. The survival and growth rates are satisfactory.



三椏苦 (*Melicope pteleifolia*)



大頭茶 (*Gordonia axillaris*)



車輪梅 (*Rhapsiolepis indica*)



豺皮樟 (*Litsea rotundifolia*)



大羅傘 (*Ardisia crenata*)



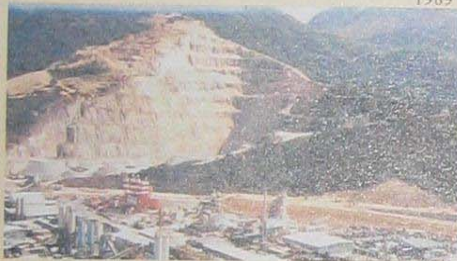
山大刀 (*Psychotria asiatica*)



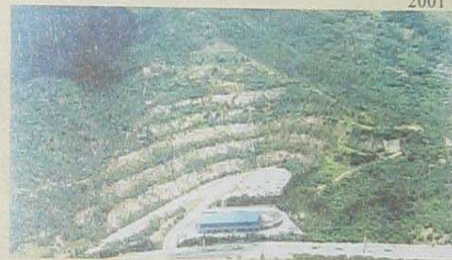
鴨腳木 (*Schefflera octophylla*)



荊櫛 (*Zanthoxylum avicennae*)



1989



2001

石礦場修復過程中，我們加入適當措施，改善生態環境，例如建造人工湖和人工雀鳥巢穴。為野生動植物提供適合生長環境。

In the course of quarry rehabilitation, we include appropriate measures to enhance the ecology, such as creating lakes, ponds and nesting sites. They provide suitable habitats for native plants and animals to recolonize the area.



鷹巢 (Nesting site)



麻鷹 (Black eared kite)



人工湖 (Man-made lake)

我們十分關注斜坡工程對生態環境的影響。我們進行適當的環境影響評估，並採取合適措施以保留受保護的動植物。

We are very mindful of the ecological impact of slope works. We conduct Environmental Impact Assessments as appropriate and provide suitable measures to preserve protected plants and animals during construction.



保護野生蘭花 (Wild Orchid protection)

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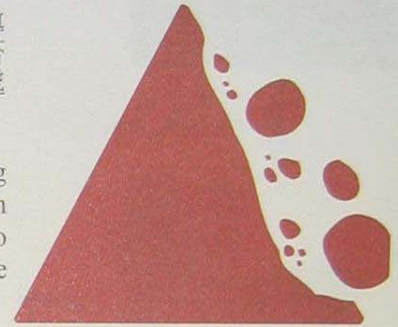
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山泥傾瀉警報系統 Landslip Warning System

本港的山泥傾瀉大多由豪雨引起。一旦預測豪雨將可能導致多宗山泥傾瀉時，天文台便會發出山泥傾瀉警報。是否發出或取消山泥傾瀉警報，是由天文台台長及土力工程處總監共同決定的。

Most landslides in Hong Kong are caused by heavy rainfall. The Hong Kong Observatory (HKO) issues the Landslip Warning when the rainfall is such that numerous landslides are predicted to occur. Decisions as to whether to issue or cancel the Landslip Warning are made jointly by the Director of the HKO and the Head of the Geotechnical Engineering Office (GEO).



土力工程處及香港天文台共設有超過一百台覆蓋全港的自動雨量計，提供雨量資料，以決定是否發出山泥傾瀉警報。

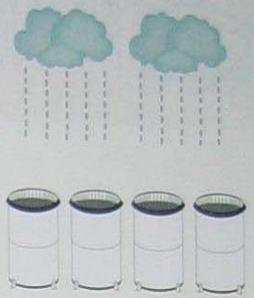
The GEO and the HKO jointly maintain a network of more than 100 automatic raingauges for the operation of the Landslip Warning System.



自動雨量計的分佈圖
Locations of Automatic Rain gauge Stations



土力工程處雨量計
GEO Raingauge



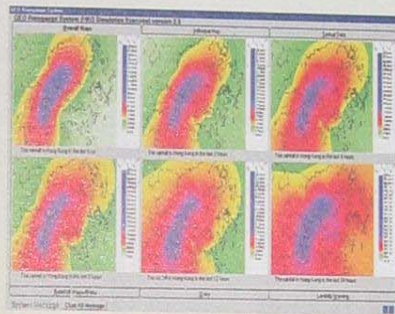
天文台雨量計
HKO Raingauges

電話線
Telephone lines

電話線
Telephone lines



土力工程處系統控制台
GEO CONTROL UNIT



即時雨量分佈圖
Real-time rainfall distribution maps



香港天文台系統控制台
HKO CONTROL UNIT

天文台台長會在諮詢土力工程處總監後發出山泥傾瀉警報。
The Landslip Warning is issued by the HKO after consultation with the GEO.



電台及電視台定時向市民廣播有關山泥傾瀉警報的消息，並建議市民應採取適當的預防措施。
Radio and television stations broadcast the Landslip Warning to the public at regular intervals, together with advice on the precautions that should be taken to protect their safety.

政府部門啟動緊急應變中心。
Government departments mobilize emergency systems.



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Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>

減低人造斜坡山泥傾瀉的風險 Reduction of Landslide Risk in Man-made Slopes

根據我們的十年工作計劃，我們會鞏固高優先次序的斜坡、強化維修政府斜坡、把部份現存斜坡的鞏固工程納入工務工程計劃內及加強宣傳和教育活動以進一步減低山泥傾瀉風險。整個延續十年的防止山泥傾瀉計劃造價約為九十億元。

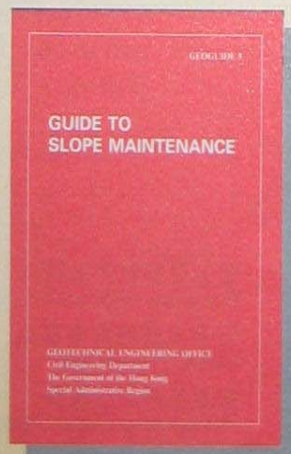
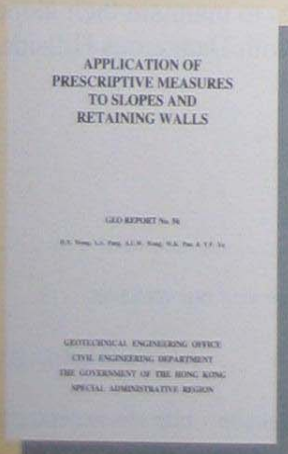
We have a 10-year programme to upgrade high priority slopes, enhance maintenance of government slopes, upgrade some old slopes as part of public works projects and enhance publicity and education campaigns. The estimated cost of the 10-year Extended Landslip Preventive Measures (LPM) Project is about HK\$ 9 billion.

☺ 在延續十年的防止山泥傾瀉計劃下鞏固高優先次序的斜坡 Upgrade High Priority Slopes under the 10-year Extended LPM Project

- 鞏固 2,500 幅不合標準的政府斜坡
To upgrade 2,500 substandard government slopes
- 完成為 3,000 幅私人斜坡所進行的安全篩選研究以便有需要時根據〈建築物條例〉發出危險斜坡修葺令
To complete safety-screening studies for 3,000 private slopes for issue of Dangerous Hillside Orders under the Buildings Ordinance where required.



☺ 強化維修政府斜坡 Enhance Maintenance of Government Slopes



- 定期維修以防止斜坡變壞
To carry out regular slope maintenance to prevent deterioration of slopes
- 透過應用習用措施〈〈土力工程處報告第 56 號〉〉作強化維修，在短時間內提高現存政府斜坡的穩定性
To achieve quick improvement to the stability of existing government slopes using prescriptive measures for enhanced maintenance (GEO Report No. 56)

☺ 把部份現存斜坡的鞏固工程納入新的工務工程計劃內
Upgrade Existing Slopes as Part of New Public Works Projects



- 各政府部門會採用綜合處理方法把影響工務工程計劃或受工務工程計劃影響的不合標準的現存斜坡鞏固工程納入工程計劃內
Government departments to adopt an integrated approach to upgrade existing substandard slopes affecting or affected by their public works projects as part of the projects

☺ 加強宣傳及教育活動
Enhance Publicity and Education Campaigns

- 提高市民對斜坡安全問題的認識
To promote better understanding of the slope safety problems
- 鼓勵及協助市民在山泥傾瀉警報生效時採取個人預防措施
To encourage and assist the general public to take personal precautionary measures during periods of Landslip Warning
- 敦促私人物業業主根據《岩土指南第五冊》所公佈的標準維修斜坡
To urge private property owners to maintain their slopes to the standards promulgated in Geoguide 5



- 土力工程處的社區諮詢服務組會向私人物業業主提供諮詢服務以協助他們履行維修斜坡的責任及遵守危險斜坡修葺令的規定
The Community Advisory Unit to provide advice to assist private property owners to fulfil their duties to maintain their slopes and to comply with Dangerous Hillside Orders

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政府物流服務署印

(採用環保油墨及取材自可再生林木的紙張印刷)



山泥傾瀉風險管理 Landslide Risk Management

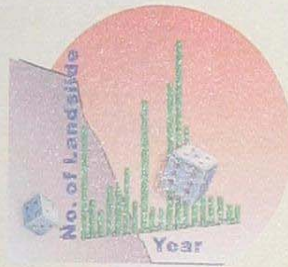
土木工程拓展署之土力工程處，是世界上率先利用量化風險評估技術管理山泥傾瀉風險及評估其斜坡安全系統表現的機構之一。

The Geotechnical Engineering Office of the Civil Engineering and Development Department is among the first in the world to apply Quantitative Risk Assessment (QRA) techniques to manage landslide risk as well as to measure the performance of its Slope Safety System.

山泥傾瀉風險 Landslide Risk

山泥傾瀉風險是指在一段時間內某斜坡發生山泥傾瀉引致某程度損害的機會。

Landslide risk is a measure of the chance of a landslide at a slope causing a certain amount of harm within a given time period.



山泥傾瀉風險
Landslide Risk

=

發生山泥傾瀉的或然率
Probability of landsliding

×

山泥傾瀉的後果
Consequence of landslide

應用量化風險評估技術的例子 Example of Application of QRA



優先處理
Top Priority

1



2



3



4



5



6



7



利用量化風險評估技術，按風險排列處理斜坡次序。



Use QRA to devise risk-based ranking system for action on slopes

控制及減低山泥傾瀉風險的方法
Ways to Control and Reduce Landslide Risk

鞏固不合標準的斜坡
Upgrade Substandard Slopes



確保新造斜坡的安全
Ensure Safety of New Slopes



維修所有屬於政府的斜坡
Maintain All Government Slopes



搬遷承受高山泥傾瀉風險的寮屋居民
Clear Squatters Threatened by Landslide Hazard



透過教育提高市民的合作性及意識，
以保障個人安全
Promote Public Awareness and Obtain Public
Co-operation to Protect Their Own Safety
through Education



透過山泥傾瀉警報系統及緊急控制中心，提供專業
意見以保障公眾安全
Provide Expert Advice to Protect Public Safety
through the Landslip Warning System and
Emergency Control Centre



山泥傾瀉風險
Landslide Risk

根據量化風險評估的結果顯示，香港的整體山泥傾瀉風險正逐漸減少。
The results of QRA demonstrate that total landslide risk in Hong Kong is gradually reducing.



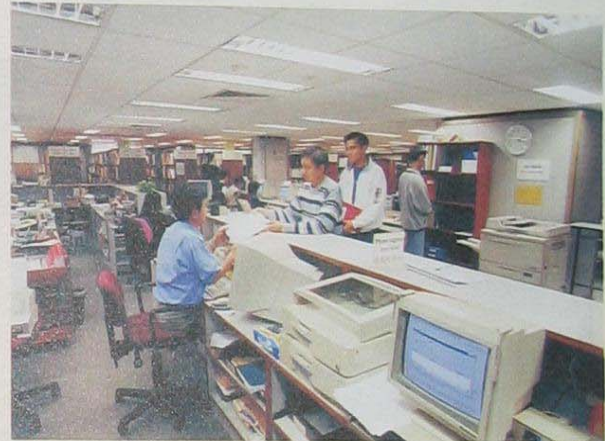
歡迎瀏覽我們的網頁：
For more information, please visit our website:
土木工程拓展署網頁 <http://www.cedd.gov.hk>
CEDD homepage
香港斜坡安全網頁 <http://hkss.cedd.gov.hk>
Hong Kong Slope Safety Website



土木工程圖書館
Civil Engineering Library

土木工程圖書館是土木工程拓展署的參考圖書館，收藏超逾12萬份書籍、期刊、標準章則等土木工程與岩土工程類別的刊物。除開放予政府人員外，亦為市民提供服務。

The Civil Engineering Library (CEL) is the central reference library of the Civil Engineering and Development Department (CEDD). The CEL contains over 120,000 documents on civil and geotechnical engineering. The CEL serves the general public, the engineering profession and government staff.



圖書館附設的岩土工程資料庫，備有以下資料，供市民參閱：

The following materials are available from the Geotechnical Information Unit of the CEL for inspection by the public:



- 岩土勘探報告
Ground investigation reports
- 土壤和岩石測試報告
Reports on laboratory testing of soil and rock
- 已鞏固或已納入現有防止山泥傾瀉計劃合約進行鞏固工程的政府斜坡位置圖
Location plans for government slopes which have been upgraded or which are included in current Landslip Preventive Measures (LPM) contracts for upgrading works.
- 山泥傾瀉資料
Landslip records

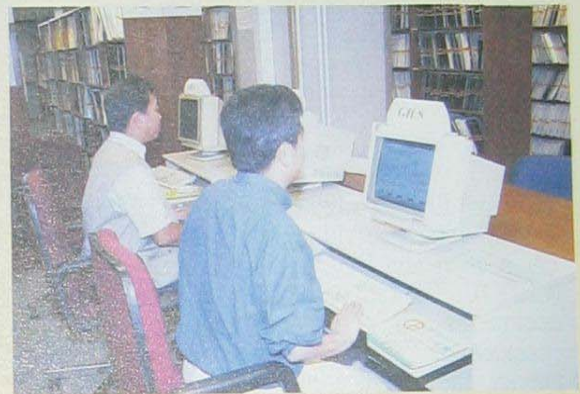


圖書館備有以八達通咭付款的影印機，供市民使用。

Octopus card operated photocopying machine for use by the public.

土木工程圖書館開放時間：
Opening Hours of CEL:

開放時間		
OPENING HOURS		
	公眾人士 PUBLIC USERS	政府職員 GOVERNMENT OFFICERS
星期一至五 MONDAY TO FRIDAY	9:00 - 12:30 14:00 - 16:15	9:00 - 12:30 13:30 - 17:00
星期六 SATURDAY	休息 CLOSED	9:00 - 12:00



電腦化的「岩土資料參考系統」，可供快速搜查岩土工程資料庫內的岩土勘探及土壤和岩石測試報告。
Computerised Geotechnical Information Library System (GILS) for efficient searching of ground investigation and laboratory testing reports in the GIU.

有關圖書館服務的一般查詢和意見，可聯絡圖書館館長。
地址：九龍公主道101號
土木工程拓展署大樓低層地下
電話：2762 5147
傳真：2760 9670
電郵：librarian@cedd.gov.hk

General enquiries and comments on library service should be directed to the Librarian.
Address: LG1 Civil Engineering and Development Building, 101 Princess Margaret Road, Kowloon
Telephone number : 2762 5147
Fax number: 2760 9670
E-mail: librarian@cedd.gov.hk

查詢有關斜坡安全進一步資料，請瀏覽：
For further information about slope safety:

土木工程拓展署網頁
CEDD homepage <http://www.cedd.gov.hk>
香港斜坡安全網頁
Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>



非法耕種 Unauthorized Cultivation

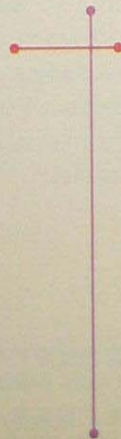
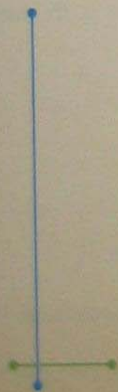
在斜坡上非法耕種，可能會增加山泥傾瀉的風險，對路人及附近居民的生命財產構成威脅。為此，土木工程拓展署轄下的土力工程處已加強公眾教育，以勸阻非法耕種活動。

Unauthorized cultivation on hillsides may increase the risk of landslides and threaten the lives and property of pedestrians and residents living in the vicinity. In view of this, the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department has further stepped up its public education campaign to discourage unauthorized cultivation.

在斜坡非法耕種的影響 Effects of Unauthorized Cultivation on Hillside Slopes

非法耕種活動包括隨意挖掘山邊、破壞林木、挖鬆表土和地表。這些活動會破壞斜坡的護面，對其穩定性構成威脅。非法耕種可能阻塞排水系統，大雨時斜坡無法有效地排水，地面的水會侵蝕泥土，雨水滲入斜坡亦可能引致地下水位上升，最終可能導致山泥傾瀉。

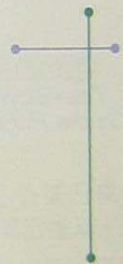
Unauthorized cultivation involves uncontrolled excavation of hillsides, removal of trees and other vegetation, and loosening of topsoil and the ground surface. These activities damage the slope surface cover and adversely affect the stability of the slopes. Unauthorized cultivation may affect the effective discharge of surface water during rainstorms. The surface runoff may erode the topsoil, infiltrate into the ground and raise the ground water table. As a consequence, landslides may occur.



政府對非法耕種所採取的行動 Government Actions on Unauthorized Cultivation

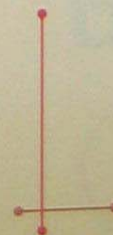
地政總署已於部分地點豎立嚴禁非法耕種的告示牌。各地政處及有關部門亦聯手清除非法耕種活動。

土力工程處已向政府斜坡維修部門發出指引，列明查察及紀錄非法耕種的需要，並要求部門評估其可能對斜坡穩定性的影響。



Lands Department has erected notice boards on some sites advising against unauthorized cultivation. Joint clearance of the unauthorized cultivation is carried out by District Lands Offices and other concerned departments.

GEO has provided guidance to maintenance departments of government slopes outlining the requirements for identifying and recording areas of unauthorized cultivation, and assessing the possible effects on slope stability.



宣傳及公眾教育 Publicity and Public Education

宣傳物品 Promotional Materials



海報
Posters

單張
Leaflets

宣傳手扇
Promotional hand-fans

電視宣傳片 Television Announcements in the Public Interest (TV-API)

政府已製作了一輯電視宣傳片，向市民大眾廣播，以勸阻非法耕種活動。

A TV-API has been produced and broadcast to the public to discourage unauthorized cultivation on slopes.



在非法耕種黑點派發宣傳手扇 Distribution of Promotional Hand-fans at 'Blackspots' of Unauthorized Cultivation

士力工程處定期在非法耕種「黑點」派發單張和宣傳手扇，以宣傳「非法耕種，可導致山泥傾瀉」的訊息。

To disseminate the message that "unauthorized cultivation may cause landslides", GEO has regularly distributed promotional hand-fans and pamphlets to morning walkers at unauthorized cultivation 'blackspots'.



中學教材套 Secondary School Teaching Toolkits

士力工程處已將非法耕種的斜坡安全問題納入了中學教材套內，以加強學生對這問題的認識及關注，從而傳達這訊息給其家人。

In order to increase the awareness of students on this issue, GEO has included unauthorized cultivation and the associated slope problems in secondary school teaching toolkits on Slope Safety. It is also hoped that students will take the messages home and share them with their families.

歡迎瀏覽我們的網頁：
For more information, please visit our website:

土木工程拓展署網頁
CEDD homepage <http://www.cedd.gov.hk>
香港斜坡安全網頁
Hong Kong Slope Safety Website <http://hkss.cedd.gov.hk>