Towards safer hillside developments

Property

Written by Haziq Hamid of The Edge Malaysia

Thursday, 08 August 2013 00:00

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ALL was quiet in the early hours of Dec 6, 2008, when tragedy struck. At 4am, the soil behind 14 bungalows in Taman Bukit Mewah and Taman Bukit Utama in Bukit Antarabangsa gave way, burying the homes and taking four lives.

The landslide, said to be the worst in Kuala Lumpur since the Highland Towers collapse in 1993, happened just five days after the 15th anniversary of that disaster.

Residents quickly put the blame on the local authorities, which in turn blamed the developers.

However, it's hard to identify the responsible party, according to Gue See Sew, CEO of G&P Professionals Sdn Bhd. "There are many possible causes of a landslide, so it is very difficult to assess who the responsible party is."

G&P Professionals is a specialist one-stop engineering consultancy service centre in such areas as geotechnical, civil and structural, infrastructure, flood mitigation and maritime.

Gue says in the case of the Highland Towers, it was the slope behind the condominium that caused the landslide.

"The empty slope behind the condominium was never designed," he explains. "Some engineer simply helped sign the papers for the development to obtain a certificate of completion and compliance."

Designing a slope requires a geotechnical engineer to assess the gradient, soil properties and other technical aspects, and analyse the stability, geometry and soil and water properties. The engineer may then decide to advise the developer to reduce the elevation from, for example, 45° to 25°, or install a retaining wall to act as a buffer.

But while fingers were pointed at the Ampang Jaya Municipal Council (MPAJ or Majlis Perbandaran Ampang Jaya in Malay), MPAJ's Zafrul Fazry Mohd Fauzi says it is the responsibility of the landowner. "The Highland Towers incident was the result of improper maintenance of the empty land behind the tower by the owner," says Zafrul, who is head of the infrastructure maintenance division. "All these issues are closely-linked."

Maintaining a slope requires the owner to assess its condition and strengthen it, should it show signs of degradation.

"First, we have to see who the landowner is," Zafrul says. "Landowners are responsible for maintaining their property and shall be held responsible for any incidences occurring on their property."

Landslides have occurred throughout the country over the years, including at Cameron Highlands, Gua Tempurung, Balik Pulau in Penang, and Ulu Klang.

In January this year, a landslide in Putra Heights, Subang Jaya, caused five cars and a van to be submerged by a wave of mud, while in May, landslides occurred in Jalan Mahameru and Bukit Nanas in Kuala Lumpur.

The slope unit within MPAJ's engineering department was established in 2009, in the wake of the Bukit Antarabangsa landslide.

Following that, the local authority released several guidelines for developers and the public, including the "2010 Guideline for Development in the Hills and Highlands of Selangor".

Zafrul says the landslides on slopes that come under MPAJ's purview were approved before the 2010 guidelines were issued.

"These developments do not comply with what we have introduced in 2010," he says. "That year, the Selangor Town and Country Planning Department (JPPD) introduced a new set of guidelines, more stringent than those before, aimed specifically at developers looking to develop on slopes."

The normal process for a development on a slope is long and tedious and it is not easy to get approvals, says Zafrul.

"After the developers submit their plans, they have to wait for approvals or comments from various departments in Selangor, specifically MPAJ, the Minerals and Geoscience Department Malaysia, JPPD, Ikram Geotechnical Services Sdn Bhd, Public Works Department (JKR), the Selangor Land Office, the Department of Irrigation and Drainage and many more."

When all these departments have given their approval, developers will then submit another proposal to the technical committee of environmentally-sensitive areas, chaired by the director of the Town and Village Planning Department of Selangor. The committee will look at whether the development is safe in terms of the geological and technical aspects as well as public safety, he says.

After this committee gives the nod, the developer has to resubmit the proposal to MPAJ, which will present it to the one-stop centre (OSC) committee to be forwarded to the relevant technical departments for planning permission, building, earthworks and road and drainage plans.

"In the past, MPAJ only looked at the proposals from a technical aspect but now, it will consider all aspects of the development, including any objections from residents.

Classifying hillslopes

According to the MPAJ's new guidelines, a Class 1 hillslope is categorised as an area with low geotechnical risk, and a gradient of 15° and below. Class 2 has moderate geotechnical risk and a gradient of between 15° and 25° with no signs of erosion or instability. Class 3 has a high geotechnical risk and a gradient of 25° to 35° with no signs of erosion or instability, while Class 4 has an extreme geotechnical risk with a gradient of 35° and above with no signs of erosion or instability.

The 2010 guidelines stipulate that only classes 1, 2 and 3 are allowed for residential development and even then, no buildings above three storeys are permitted, Zafrul says. Class 4 is only for infrastructure such as electrical lines and water pipes.

He says, "The structure of the soil and its properties vary widely in different areas. In the case of Bukit Antarabangsa, the soil is easily eroded compared with other hills like Bukit Indah or Ampang. This makes Bukit Antarabangsa more susceptible to landslides."

MPAJ monitors 182 government-owned and 167 privately-owned slopes and will issue notices should it come across slopes with a risk of collapsing or those that show signs of low maintenance and degradation.

In 2013, a total of 31 notices were issued, with 18 of those requiring the owners of the slopes to take action. "If they are slow to take action and we see continuous erosion, legal action will be carried out, that may result in fines and imprisonment," Zafrul says.

He points out that the recent landslides are under the overview of other local authorities.

The landslides in the Ampang Jaya municipality include that at the Highland Towers in 1993, which killed 48 people; at the home of General Tan Sri Ismail Omar in 2002 that took the lives of four people; Taman Zoo View, Kampung Pasir, which killed five people; and at Taman Bukit Mewah, Bukit Antarabangsa in 2008.

According to Gue, Malaysia could model its slope management strategy after Hong Kong's. "We should take advantage of Hong Kong's wealth of experience and adapt its strategies here."

He adds that the Hong Kong government believes prevention is better than cure, imposing stringent requirements and heavy penalties.

"Personally, I have not come across a country with such an elaborate system … it has a very dedicated agency that focuses on slope development and nothing else."

Like Hong Kong, MPAJ is looking at preventing landslides before they happen. For instance, a development cannot be erected next to a hill that does not have a proper buffer and is not maintained properly.

MPAJ's slope department carried out checks on all 349 monitored slopes twice in 2012.

The ROM Scale

Professor Roslan Zainal Abidin, president and vice-chancellor of Infrastructure University Kuala Lumpur, believes prevention and preparedness is better than cure, which is why he created the ROM (Roslan and Mazidah Mukri) Scale.

The ROM Scale is a study to classify and predict potential erosion-induced landslide locations at well-known resort areas in the country, including Fraser's Hill and Genting Highlands.

The classification is done by determining the soil's susceptibility for failure in terms of its soil erodibility index value.

In his research, Roslan found that Km13 to 14 in Genting Highlands was the most susceptible to landslides, while for Fraser's Hill, Km4 to 5 was the riskiest. From the ROM Scale, Roslan came up with the ROSE (Roslan and Shafee) Scale of the rainfall erosivity category. According to the ROSE index, the erosive power of rain is determined by its rainfall intensity (mm of rain per hour) and droplet sizes.

Roslan then combined the soil erodibility and rainfall erosivity and created the RS (ROM and ROSE) chart. The RS chart measures the

Roslan then combined the soil erodibility and rainfall erosivity and created the RS (ROM and ROSE) chart. The RS chart measures the risk level from L (low) to CL 9 (Critical Level 9) of an area.

Using the RS chart, Roslan found that Highland Towers had a rainfall erosivity of 868 and a soil erodibility of 13, putting it in class CL3, or critical level 3; while the area of the Wangsa Maju landslide in October 2006 had a rainfall erosivity of 2,354 and a soil erodibility of 21, putting it at a class CL9, critical level 9 or highly critical.

Areas categorised as CL9 are Wangsa Maju, Kuala Lumpur; Gunung Jerai, Sungai Petani, Kedah; and Setapak, Kuala Lumpur.

Using the ROM Scale, ROSE Scale and RS chart, Roslan can forecast the dangerous months for erosion-induced landslides.

The Federal Territory is most at risk during the months of March, May and November, while for Selangor, it is November, December and April.

According to Gue, after major incidences like Setiawangsa and Bukit Antarabangsa, private and public slope owners have taken steps to improve the stability and safety of their slopes.

"There have been significant improvements but obviously, more needs to be done," he says.

Community-based slope monitoring

Eriko Motoyama remembers well the destruction behind her home in Bukit Antarabangsa. What was once a lush green slope with houses all around was reduced to a heaping mass of earth and debris.

That was five years ago but the 2008 Bukit Antarabangsa landslide still haunts her. It was after this disaster that she and several others from various residents' associations in Bukit Antarabangsa got together and set up a subcommittee called Slope Watch.

"People felt unsafe because you would never know whether where you are staying is safe. The slopes are connected and any one of them could fall next," she says. "There's nothing you can do about it and the only thing you can do is form an early warning system."

Slope Watch is a group of 12 people dedicated to the common cause of monitoring slopes and becoming that warning system.

"We've been working on teaching the residents to watch out for landslides and so far, they've been doing a great job," says Motoyama.

Che Hassandi Abdullah, the head of research and development in the slope engineering branch of the Public Works Department (JKR), acknowledges the contribution of such groups, without specifically naming them.

Slope Watch has been working with the local authorities to educate the public on the risks and to identify early warning signs of landslides.

"The residents act as the eyes and ears of the local authority," Motoyama says. "With the generosity of JKR, which gave us materials like brochures, posters and presentation materials, we can teach them what signs to look out for."

Slope Watch also provides a URL link to the Ampang Jaya Municipal Council's (MPAJ) slope unit so that when a report comes in, the authorities know that it is not just about a pothole in the road.

The group functions according to a standard operating procedure.

"Even though we are a volunteer organisation, we're serving the community so we make sure MPAJ comes back to us within three days and acknowledges our complaints," Motoyama says.

A resident will contact Slope Watch or call Motoyama directly about signs of hillside failure. She or another volunteer then visits the site and takes photographs.

"Nowadays our reports look better," she says. "We generally just observe and report to MPAJ since we're just ordinary people and not geotech engineers. Our reports include the name of the person reporting, the time and place, as well as any sign that can contribute to slope failure and eventually landslides."

Motoyama adds that they will tell the residents to follow up on the case and to continue to keep an eye out.

"If they don't hear from MPAJ within the week, we have them call us. We are not a dumping ground and we want the active participation of the residents in this matter," she explains.

Slope Watch also holds community talks.

"Our presentations are based on four themes. One is to learn about landslides and what causes them. We teach them the basic concepts and tell them it's always triggered by rain. We also teach the residents about the importance of a drainage system. After we've taught them the basic concepts, we tell the attendees to go out and look for the signs," she says.

Slope Watch also asks geotechnical companies for advice, while Gue See Sew of G&P Professionals Sdn Bhd and Che Hassandi of JKR also help out.

Motoyama says Slope Watch gets its funding from various sources.

"MPAJ gives us an annual donation as long as it operates in the Ampang Jaya area. We also received a small grant from the Global Environment Facility (GEF)."

The GEF is a small grants programme (SGP) launched in 1992, in conjunction with the Rio Earth Summit. It is implemented by the United Nations Development Programme and carried out by the United Nations Office for Project Services. GEF SGP works with communities and civil societies around the world and has provided more than 14,500 grants worldwide as at 2012.

Motoyama says Slope Watch is planning a fundraiser soon. She adds that despite the group's focus on Bukit Antarabangsa, it has been getting calls from the greater Kuala Lumpur area.

"We've got people from Kuala Lumpur, Subang Jaya and Petaling Jaya calling us up. We've even gotten a phone call from Kota Kinabalu, Sabah."

Slope Watch has been trying to widen its networking circle and would like to expand its geographical reach because, according to Motoyama, wherever there are slopes, there's a risk of landslides.

Today, the site of the Bukit Antarabangsa landslide is a lush green slope once more.

And Motoyama and the other volunteers of Slope Watch are making sure history does not repeat itself.

This story first appeared in *The Edge weekly* edition of July 22-28, 2013.

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