Stabilizing the Slippery Slope

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Sometimes the ground beneath your feet isn't as solid as it might seem. For many people living on hillsides and in flood plains or seismically active regions, this can be a deadly fact of life. Hoe Ling literally wants to reengineer the ground to make disasters like the one he surveyed in Taiwan recently a thing of the past.

In 2009 during Typhoon Morakot, more than 450 people died when Hsia-Lin Village in southern Taiwan was wiped off the map by a massive landslide that occurred when rain-weakened hillsides above the village let go.

"When you go to the site of a landslide, you really feel you should do something to help people," said Ling. "There are just too many slope failures."

Every year, nearly 100,000 people around the world die because the ground they are living on or the ground somewhere above them fails. The most common causes are earthquakes and heavy rainfall. In the United States, landslides account for as much as $2 billion in damages annually.

Ling is pursuing two lines of inquiry in order to address the problem. First, he is simulating the effect of heavy rain on soils using the department's geotechnical centrifuge to help model and predict soil and slope failure. Ling has used the instrument, which is one of the largest in the country and can generate a force 200 times that of gravity, to study such things as the failure of New Orleans' levees after Hurricane Katrina.

The other approach Ling takes is to develop geosynthetic materials that help reinforce areas potentially prone to fail. The polymer sheets he has developed are installed between layers of compacted soil to create walls and slopes that stand up to heavy loads and severe shocks such as earthquakes better than soil alone. Because geosynthetic materials don't rot or corrode like wood and metal, they are also more suitable as permanent reinforcing materials.

By combining his work to understand how and under what conditions a particular slope might slip with the application of new materials and techniques, Ling hopes engineers will eventually be able to quickly identify and reinforce high-risk areas. Then perhaps he and millions of others around the world will be able to sleep better knowing that the ground is safe.

Ling received the Career Award from the National Science Foundation in 2001. He has published more than 170 journal and conference papers in the fields of geomechanics and geotechnical engineering.

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