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The village of Langtang was buried by a landslide last month after a major earthquake struck Nepal.

EARTH SCIENCE

Mappers rush to pinpoint landslide risk in Nepal

Geologists say hazard posed by earthquake-loosened earth could linger for years.

BY ALEXANDRA WITZE

As Nepal digs out from the devastating magnitude-7.8 earthquake of 25 April, researchers are braced for the next geological hazard. In June, monsoon rains will begin to drench the hillsides destabilized by the quake, raising the risk of disastrous landslides.

Geologists are racing to identify areas that could collapse and bury villages or block important roads. They say that the hazard is likely to linger for years.

So far, the situation has been grim but better than expected. Scientists have identified thousands of landslides in satellite imagery, rather than the tens or hundreds of thousands they

anticipated from the aftermaths of other large earthquakes in mountainous areas. "Something slightly mysterious has happened," says David Petley, a geoscientist at the University of East Anglia in Norwich, UK. "The landslide problem is far from trivial, but it's not as desperately serious as we might have feared."

The most violent event occurred in the Langtang valley, a popular trekking area in the mountains north of Kathmandu. Part of a glacier above Langtang village broke off and plummeted into the valley below. Witnesses report a powerful wind blasting snow, dust and building fragments over the village, suggesting that the avalanche was so powerful that it sent a pressure wave racing outwards, says Dorothea Stumm, a

glaciologist at the International Centre for Integrated Mountain Development in Kathmandu. Satellite images reveal that a giant swathe of mountainside has been obliterated, right down to the river on the valley floor.

Elsewhere, Nepalese authorities worry that landslides might block rivers. This can form lakes that obstruct major roads, force people to evacuate their homes or even burst in a single catastrophic event. Last August, a landslide triggered by heavy rains dammed the Sun Kosi River in northern Nepal, killing roughly 150 people and causing widespread flooding.

At least four groups are using government and commercial satellite imagery to map such hazards. The recent quake caused landslides ▶

▶ that blocked valleys, including several along the Trisuli River, which runs between Nepal and Tibet. “It looks to be quite risky there at the moment,” says Nick Rosser, a landslide expert at Durham University, UK. “This will be the area of biggest impact when the monsoon starts, as rainfall totals there are among some of the highest in the country.” In preparation, a team from the Chinese Academy of Sciences has been surveying landslide sites along roads that lead to Tibet. Another area of concern is a landslide-created lake on the Marshyangdi River, which runs above the Annapurna trekking circuit.

The monsoon in Nepal typically lasts from June to September, and fatal landslides happen mostly during that period. The amount of monsoon rainfall varies dramatically from year to year (D. N. Petley *et al. Nat. Hazards* **43**, 23–44; 2007). The fact that the earthquake struck in April may have been something of a saving grace, because dry soils are harder to dislodge than is wet ground. Many more landslides would have happened had the quake struck just a few months later, says Binod Tiwari, a geotechnical engineer at California State University in Fullerton.

The country was at high risk of landslides even before the tremor. Nepal rides atop the ongoing collision between India and Asia, a geological bust-up that pushes the Himalayas to ever-greater heights. The rugged terrain, unstable soils, heavy rains and mountain communities combine to make it one of the world’s landslide hotspots.

The earthquake, now named the Gorkha quake, has worsened the situation. It ruptured the main Himalayan geological fault to the northwest of Kathmandu. By 11 May, more than 8,000 people had been confirmed dead — although that is many thousands fewer than experts had projected. Buildings in Kathmandu may have been sturdier than thought, or the ground may not have shaken quite as strongly as would be expected from the quake’s magnitude.

Gentler shaking would also help to explain the relative paucity of landslides, says Marin Clark, a geomorphologist at the University of Michigan in Ann Arbor. “Either that, or the rocks are stronger than we estimated,” she says.

But the risk of landslides remains high. After the magnitude-7.6 Chi-chi earthquake in Taiwan in 1999 and the magnitude-7.9 Sichuan earthquake in mainland China in 2008, the number of landslides soared for years as sediment continued to shift in fresh debris flows (B. Yu *et al. Eng. Geol.* **182**, 130–135; 2014). Authorities in Nepal need to prepare for the monsoon season by inspecting and monitoring the places most at risk, Rosser says. “That’s where we need to be focusing,” he says. “Places where we have landslides and there’s a population.” ■

POLITICS

What the UK election means for science

A Conservative majority, Scottish National Party rise and Liberal Democrat losses all have implications for research.

BY ELIZABETH GIBNEY

From an outright majority in Parliament for the Conservatives, to the decimation of the Liberal Democrats and the rise of the Scottish National Party, the UK general election on 7 May was full of surprises — many of which will have implications for science.

Scientists should expect an emphasis on austerity allied to economic growth — a pillar of the Conservative-led government of the past five years, which ruled in coalition with the Liberal Democrats. During that time, the science budget was frozen, and dropped in real terms. But there is support for science in Parliament, and an understanding of its relation to the economy, says Paul Nightingale, deputy director of the Science Policy Research Unit at the University of Sussex, UK. So cutting the research budget would be a “hard sell”, he says. Instead, he expects “more explicit attempts to align research with economic growth”.

Before the election, the Conservatives pledged to seek a “strong” deal at the United Nations climate negotiations in December that “keeps the goal of limiting global warming to two-degrees firmly in reach”. The party also promised to end support for onshore wind farms and to encourage expansion of nuclear power and gas, including fracking.



Former Liberal Democrat MP Julian Huppert was a vocal supporter of science.

Nick Hillman, director of the Higher Education Policy Institute in Oxford, UK, says that the reappointment of Theresa May as Home Secretary may trouble scientists. The last government’s tough stance on immigration included cutting the post-study work visa for international students (see *Nature* **506**, 14–15; 2014). But he sees promise in the new science and universities minister, Jo Johnson, younger brother of the Mayor of London and new Member of Parliament (MP), Boris Johnson. Although not a scientist, Jo Johnson is pro-European and close to the Chancellor of the Exchequer, George Osborne.

A certain outcome of the Conservative win is a referendum by 2017 on whether to leave the European Union. Nightingale suspects that people will vote to stay in. If Britain did leave, it would probably not be cut out of European research programmes, says Kieron Flanagan, a science-policy researcher at Manchester Business School. However, it would feel the loss of cash from a different European pot, which Britain uses to fund science-related infrastructure.

Meanwhile, the Scottish National Party’s increased representation from 6 to 56 seats may affect science across the United Kingdom. Growing Scottish nationalism is likely to further a focus on regional development that was part of the Conservative Party’s manifesto, says Nightingale. This could bolster a trend to allocate science funding directly from the Treasury in London to regional projects, such as the UK National Graphene Institute in Manchester, he says, rather than through national funding agencies. However, David Price, vice-provost for research at University College London, warns that without an increase in the science budget, the regional agenda would be pointless.

Another defining moment was the crash in support for the Liberal Democrats, who lost 49 of their previous 57 seats, including some high-profile MPs. Keenly felt by many scientists was the loss of Julian Huppert, the former Liberal Democrat MP for Cambridge. Previously a biochemist at the University of Cambridge, he was vocal on science issues and popular with scientists. On 8 May, Huppert teasingly expressed fears about the future: “Scientists love control experiments — but I certainly didn’t want a Tory government to show how effective the Liberal Democrats actually were in government.” ■

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