

## Warning too late for Japanese mudslide victims 25 Jul 2003



Concrete 'anchors' on a hillside in Japan to help prevent landslides.

©The Japan Landslide Society

**At least 20 people were killed in mudslides in southern Japan this week. Settlements in the hills surrounding city of Minamata (population 31,000), on the most south westerly of Japans four main islands, Kyushu, were worst effected.**

The prime factor in causing the mudslide was the concentration of rainfall. Over 90mm fell in an hour. Water content is important as it can weaken a slope by increasing shear stress and decreasing shear resistance. Additionally, the weight of the potentially mobile mass is increased and water reduces the cohesion of particles by saturation.

However, it was revealed that a contributing factor to the disaster was poor communication between officials, leading to an evacuation order being issued to late. Mudslides destroyed and buried residents in two mountain districts in the early hours of the

morning while officials were deciding what to do. Only after the torrential rains, falling on already saturated soil, had struck the mountains and downstream the rivers in city had swollen did the order to evacuate come.

The soil was already saturated owing to heavy rains associated with the rainy season or tsuyu, which lasts from June and July - effectively the tail end of the monsoon. In early June, the Northern Pacific High Pressure Zones gradually move from south, and the northern air masses move south from the Sea of Okhotsk and collide above Japan, forming a stationary seasonal rain front. Usually, this early summer stationary rain front lasts for a couple of months, intermittently dropping large quantities of rain. These rains often create landslide and mudslide disasters.

The tsuyu is one of two rainfall peaks in southern and central Japan; the second coming in the late summer with the arrival of the typhoons. If the first season is characterised by prolonged periods of rain which saturate the soil over many days then the second brings high winds and torrential rains over a short periods of time. Both lead to mass movements every year and give the Japan the wettest of any temperate climate in the world.

Only 25% of Japans land area is flat and low lying and the Japanese people have suffered numerous mass movement disasters since ancient times. The population density of Japan is 328/km<sup>2</sup>. However, the population density of the flat and low lying areas and plateaus of Japan is 1312/km<sup>2</sup> indicating the severity of land use in Japan. Conversely, recent residential developments have developed with little regard for the geography of the terrain. At Minamata the slope was steep and there had never been any slides before. Slides generally occur along gently to moderately sloping ground which is important as these areas include residential and agricultural use. Because of these conditions, the Japanese government has taken an active effort to protect the slopes from future failures.

One method, which is highly visible to any visitor to Japan, is to construct retaining walls to prevent landslides. Other methods include building barriers, digging drainage tunnels or trenches to remove water from the slope, putting in piling or anchors to stabilise the slope or by removing soil altogether to change the angle of the slope.

However, hard engineering solutions that cover the country in concrete cannot be implemented in every danger area in a country like Japan where mass movements are so widespread. Calls are being made to turn to information technology, especially in developing disaster-prevention measures to deal with the unexpected by measuring rainfall and river levels early so that preventative measures can be made sooner than they were in Minamata.