Chapter 8

Geotechnical Damage

Geotechnical damage caused by the ground shaking and tsunami resulting from this earthquake may be broadly classified as

- Slope failures,
- Embankment failures,
- Liquefaction and liquefaction induced failures.

In coastal areas, it is sometimes difficult to differentiate whether the cause was ground shaking or tsunami. However, the cause of failures, where there was no trace of tsunami, can be assumed to be due to the ground shaking.

8.1 Slope Failures

Slope failures were mainly observed in the areas of stone quarries, along roadways and seashores. The seashore between Banda Aceh and Lamno is particularly mountainous and slopes are steeply inclined. Furthermore, the rock layers are folded and are inclined towards the sea. The failure of rock slopes was mainly due to sliding on bedding planes of hard sedimentary rocks and the slopes facing the causative fault plane (Photo 8.1). It is therefore thought that the ground shaking was the main cause of rock slope failures. The weathered material on the rock slopes along the seashore was stripped away for a height of 10-20m by the tsunami waves as seen in Photo 8.2. Rock falls were observed in stone quarries in Lhonga area nearby the cement factory.

Slopes involving residual soils or highly weathered volcanic rocks were failed in the form of circular sliding. Such failures are observed on slopes on headlands as seen in Photo 8. 2.

8.2 Embankment Failures

Embankment failures were observed along seashores, rivers and canals and roadways. Some of failures were in the form of typical circular sliding, erosion and liquefaction associated lateral spreading. Photo 8.3 shows some examples of embankment failures.

8.3 Liquefaction and Lateral Spreading

Ground along the western coast of Sumatra Island is mostly sandy soil. Liquefaction can be induced by ground shaking as well as by tsunami. The effects of liquefaction would be ground settlement, lateral spreading and erosion by retreating tsunami waves. The coastal area seems to be settled down and or topsoil is eroded. Photo 8.4 shows some examples of failures induced by liquefaction.



Photo 8.1 Rock slope failures and erosion by tsunami



Photo 8.2 Soil slope failures and erosion by tsunami



Photo 8.3 Embankment failures



Photo 8.4 Effects of ground liquefaction and erosion

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