

6. Conclusions

Evidence shows that forests have a significant role in preventing landslides, as well as mitigating off-site damage. The presence of trees and shrubs increases slope stability mainly through mechanical reinforcement of soil by roots, rainfall interception and drying of soils through transpiration. Without these effects, stability thresholds are reduced, making slopes more susceptible to intense or long-duration rainfall, earthquakes or other triggering events.

Both the mechanical and hydrological effects of forests are relevant to shallow landslides, while for deep-seated landslides, where failure occurs below the rooting zone, the effects of forests are primarily hydrological. Forest cover also indirectly reduces landslide incidence by inhibiting surface erosion and the formation of gullies. Forests and trees have an additional role in providing a physical barrier to the movement of landslide material, as well as trapping material and gradually releasing it with reduced impact.

Continued development in upland areas will result in construction of roads and trails, forest clearance and expansion of land uses with shallow rooting depths. Logging roads and forest management in particular constitute a significant cause of landslides and careful road construction following available codes is therefore necessary.⁶³



Figure 6.1. Tree roots stabilizing steeply sloping soil surface
Courtesy: Masakazu Kashio.

Climate change is also likely to increase the incidence of landslides in parts of Asia where increases in storm frequency and intensity are expected. In regions subject to drought and root die-back or wildfire, subsequent loss of root reinforcement and lower stability thresholds are also likely to make slopes susceptible to landslides triggered by minor earthquakes or moderate rainfall.

Appreciation of the economics of natural hazards and disaster risk reduction is growing. While the economic costs of individual landslides are typically much lower than flood or earthquake events, they are likely to rise for the aforesaid reasons. Furthermore, although individual landslides are mostly small, the cumulative impact can be large and impacts often extend offsite and for long periods.

Consequently, mitigation of landslide hazard follows a two-pronged approach. Firstly, lives, property, natural resource assets and investments need to be protected. Secondly, there is often a need to re-establish production and livelihoods following landslides. Although rehabilitation can be expensive and difficult, quick stabilization of failed slopes and re-establishment of productive assets will minimize costs. Funds for prevention and rehabilitation are likely to be most effectively used by targeting the most sensitive or hazardous sites.