



# Forests and landslides

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The role of trees and forests in the prevention of landslides and rehabilitation of landslide-affected areas in Asia



Forests and landslides: The role of  
trees and forests in the prevention  
of landslides and rehabilitation of  
landslide-affected areas in Asia

Second edition

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# Foreword

Understanding the roles that trees and forests can play in preventing landslides is increasingly important as sloping areas in Asia are further developed and the impacts of climate change affect the region. The roles of trees and forests in rehabilitating landslide-affected areas are also important because of the impacts of landslides on water resources and water quality. Against this background, climate change adaptation in the region is receiving considerable attention. Current rural development trends and predictions of more extreme weather events heighten the need for consolidated information in these contexts.

With natural disasters becoming increasingly frequent in Asia, interest in maintaining forests for the environmental services they provide is growing. In several Asian countries, floods, droughts and landslides have led to major policy realignments that have centred on forests and forestry. However, the resulting policies have often been criticized for their poor technical understanding and disregard for socio-economic considerations. This emphasizes the need for policies to be based on sound science and balanced assessments of the distribution of costs and benefits across society.

FAO is pleased to contribute to increased awareness and understanding of the roles of trees and forests in the prevention of landslides and rehabilitation of affected areas through this publication. The contents should be used in conjunction with economic, social and environmental information to improve management of forests on sloping land both in Asia and elsewhere in the world. It is hoped that by bridging the gap between science and policy and providing a sound basis for decisions involving forests and landslides, a safer and greener future will result.



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# Abstract

The potential for loss of life and destruction of assets through landslides is increasing in many mountainous and hilly areas of Asia. Logging, residential and infrastructure development and other activities continue to expand on slopes highly prone to landslides. Excessive soil water content is the primary cause of slope failure while steep slopes, weak soils or topography that concentrates water are the main factors contributing to landslide risk. Poorly constructed roads and the loss of soil reinforcement and water extraction by tree roots increases the probability of landslides during trigger events such as prolonged heavy rainfall or earthquakes. Climate change predictions suggest that landslide frequency will increase in some areas of Asia as the frequency of extreme storms increases. Drought may also affect some areas resulting in root die-back, pest and disease outbreaks and wildfire – all of which are likely to reduce soil reinforcement provided by trees and increase landslide incidence.

Scientific studies confirm the crucial role of trees and forests in preventing shallow landslides, not only by reinforcing and drying soils but also in directly obstructing smaller slides and rock falls. The role of trees and forests in relation to deep-seated landslides is considerably smaller although soil drying by tree roots can still help to avoid excessive soil water pressures. During extreme events, involving heavy rainfall, very weak slopes or seismic activity, forest cover is unlikely to have any effect. Policies encouraging land uses that reduce soil disturbance and retain a high degree of forest cover can, however, reduce landslide risk. Tree planting on susceptible slopes can also reduce risk while natural regeneration and tree planting on failed slopes can help to control the after-effects of landslides such sediment release into rivers. Fast growing trees and shrubs are best suited to this purpose but socio-economic and conservation-related factors should also be considered. Above all, identifying and mapping high landslide risk zones and avoiding activity within these areas is an essential step in reducing the risk to lives and assets posed by landslides.