

Types of Landslide Maps

Four principal types of information describing the various classes of landslides are portrayed by different landslide maps prepared by the California Geological Survey: (1) inventories of existing landslides, (2) landslide hazard—expressed as landslide susceptibility or landslide potential maps, (3) landslide risk maps, and (4) landslide zone maps. The maps can be either qualitative or quantitative in their preparation.

- 1. Landslide-inventory maps**, the most basic landslide maps, portray the location of prior failure. Because one clue to the location of future landsliding is the distribution of past movement, maps that show existing landslides are helpful in predicting the hazard. Inventory maps do not necessarily distinguish fresh movements, but in any one year some of the mapped slides—or more frequently, portions of them—may become active. A landslide inventory reveals the extent of past movement and thus the probable locus of some future activity within those landslides, but it does not indicate the likelihood of failure for the much larger area between mapped landslides. For this, hazard, risk or zone maps are required.
- 2. Landslide-hazard maps** describe an unstable condition arising from the presence or likely future occurrence of slope failure. There are two general types of landslide-hazard maps, each of which provides a different level of information and detail:
 - a. Landslide-susceptibility maps** describe the relative likelihood of future landsliding based solely on the intrinsic properties of a locale or site. Prior failure (from a landslide inventory), rock or soil strength, and steepness of slope are the three site factors that most determine susceptibility.
 - b. Landslide-potential maps** describe the likelihood of landsliding (susceptibility) jointly with the occurrence of a triggering event (opportunity). Potential commonly is based on the three factors determining susceptibility plus an estimate or measure of the probability (likelihood of occurrence) of a triggering event such as earthquake or excessive rainfall.
- 3. Landslide-risk maps** describe landslide potential jointly with the expected losses to life and property if a failure was to occur. The potential for landslide damage to a road system, for example, can be evaluated by considering the exposure of the roads to different levels of landslide hazard and the vulnerability of the roads to consequent damage. Similarly, the risk of excessive sedimentation in streams and other ecological damage can be evaluated by considering the landslide hazard jointly with the properties of streams and their sensitivity.
- 4. Landslide-zone maps** depict areas with a higher probability of landsliding, within which specific actions are mandated by California law prior to any development. These maps typically are binary in nature (a given site is either in or out of the zone) and are designed for use as planning tools by non-geoscientists. Zone maps may be derived from landslide potential or susceptibility, but some have been based simply on slope gradient or landslide-inventory maps.

Landslide hazard, risk and zone maps are prepared in many ways, increasingly involving complex manipulations of multiple criteria by computer. Because the value of landslide maps can be judged only by whether they correctly predict the locations of future failures, effectiveness of the different approaches to constructing them is difficult to evaluate.

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