12. GLOSSARY

There is no need for precision,
if you don't know what you are talking about.

Rocks are lighter than words.

Nomenclature is important. Despite the efforts, in landslide recognition and mapping (Varnes, 1978; Cruden, 1991; Cruden and Varnes, 1996; WP/WLI, 1990, 1993, 1995), susceptibility and hazard assessment (Varnes and IAEG Commission on landslides and other mass movements, 1984; Aleotti and Chowdhury, 1999; Guzzetti *et al.*, 1999; Partnership for Reducing Landslide Risk, 2004) and risk evaluation (Varnes and IAEG Commission on landslides and other mass movements, 1984; Einstein, 1988; 1997; Cruden and Fell, 1997; ISSMGE TC32, 2004; Partnership for Reducing Landslide Risk, 2004; Vandine *et al*., 2004; Wise *et al*., 2004; Glade *et al*., 2005), confusion exists on the use and application of many terms. This often results in difficulty in comparing the results of different investigators. The simplified glossary presented in this chapter does not have the ambition of solving the problem. In the following, some of the most important terms or expressions used in this work are listed. For each term a short explanation is provided and, where appropriate, reference is made to the relevant literature. Meaning of some of the language used in this work may not be the same as that found in the literature.

A

ACCEPTABLE RISK: A risk for which, for the purposes of life or work, stakeholders are prepared to accept "as is," and for which no risk control is needed (*Wise et al., 2004*).

ARCHIVE INVENTORY: A form of landslide database, reports the location of sites or areas were landslides are known to have occurred from bibliographical, literature and archive inquires (*WP/WLI, 1990*).

ARTIFICIAL NEURAL NETWORKS: Computational frameworks capable of simulating in a crude fashion the behaviour of the human brain in solving a complex problem (*Michie et al., 1994*).

ASSESSMENT: a description of what has happened and what is there, how much of it, and possibly why it got there and how (*Fabbri et al., 2003*).

ASSETS: A synonym of Elements at risk.

C

CASUALTIES: Sum of fatalities (deaths and missing persons) and injured people caused by a damaging event.

CATASTROPHISM: In geology, the doctrine that at intervals in the earth's history all living things have been destroyed by cataclysms (e.g., floods or earthquakes) and replaced by an entirely different population.

COMPLETENESS (OF AN INVENTORY): The degree to which the landslide inventory records all the slope failures occurred in an area, during a single event or in a period of time (*Malamud et al., 2004a*).

CONSEQUENCE: The effect on human well-being, property, the environment, or other things of value, or a combination of these (Wise *et al*., 2004).

D

DAMAGE (EXPECTED DAMAGE): Expected loss, monetary or else, to an element at risk given the occurrence of a hazardous landslide.

DANGER: A (natural) phenomenon that can lead to damage, described in terms of its geometry, mechanical and other characteristics. Danger can be existing or potential. Threat is a synonym of danger.

DEATH RATE: A synonym of mortality rate.

DENSITY MAP: A map showing landslide density, measures the spatial distribution of slope failures (*DeGraff, 1985*).

DESTRUCTIVENESS: The power of a landslide to cause damage. A proxy for the magnitude of the landslide.

DISASTER: A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources (*ISSMGE TC32, 2004*).

DISCRIMINANT ANALYSIS: A classical multivariate statistical technique used to classify samples into alternative groups on the basis of a set of measurements.

E

ELEMENTS AT RISK: The population, properties, economic activities, including public services, etc., at risk in a given area (*Varnes and IAEG Commission on Landslides and other Mass-Movements, 1984*).

EVACUEES: People forced to abandon their homes temporarily.

EVENT INVENTORY: A form of landslide inventory shows all the landslides triggered by a single event, such as an earthquake, rainstorm or prolonged rainfall period, or snowmelt event. It is typically prepared thought the systematic interpretation of aerial photographs taken shortly after an event, supplemented by field surveys.

EXCEEDANCE PROBABILITY: For any threshold, x, the probability that during a period t, (e.g., a year) a random variable, X, will exceed some x; or $P[X>x]$.

EXPERT: An individual with specialized knowledge or skill in a field, gained normally through a combination of training and experience.

EXPERT SYSTEMS: Computer programs capable of exploiting complex information to make decisions, usually based on a set of rules.

F

FATAL EVENT: Event that resulted in fatalities.

FATALITIES: Sum of the deaths and missing persons caused by a damaging event.

G

GEO-HYDROLOGICAL UNIT: A type of mapping unit obtained by subdividing slope units based on the main lithological types cropping out in a region (*Cardinali et al., 2002b*).

GEOMORPHOLOGICAL INVENTORY: A form of landslide inventory shows the sum of many landslide events over a period of tens, hundreds or even many thousands of years. It is typically prepared thought the systematic interpretation of aerial photographs.

GRID CELL: Divide the territory into regular squares of pre-defined size. Used in raster-based GIS systems.

H

HAZARD: A source of potential harm. The probability or likelihood that a danger (or threat) will materialize.

HOMELESS: People who lost their homes.

HUMAN CONSEQUENCES: Casualties, homeless people and the evacuees.

I

INDIVIDUAL RISK: Risk imposed by a hazard (e.g., a landslide) to any unidentified individual (*Cruden and Fell, 1997; ISSMGE TC32, 2004*).

INVOLUNTARY RISK: Risk imposed on an individual or society. Examples include building structural failure, dam failure, and lightning strikes (*Wise et al., 2004*).

ISOPLETH LINES: Lines showing equal quantity. Used to show, e.g., landslide density (*Wright et al., 1974*).

J

JUDGMENT: An estimate or conclusion drawn on the basis of all the information available, including data, models, literature, and experience.

L

LANDSLIDE CARTOGRAPHY: The science and art of preparing landslide maps and models. An ensemble of theories, paradigms, models, methods, and techniques to obtain, analyze and generate relevant information on landslides, and to convey it to the end users.

LANDSLIDE DENSITY: The frequency or percentage of landslide area in any given region (*DeGraff, 1985*).

LANDSLIDE HAZARD MODEL: Model (and associated maps) showing landslide hazard.

LANDSLIDE HAZARD ZONE: Area of possible or probable evolution of an existing landslide or a group of landslides of similar characteristics (*Cardinali et al., 2002b*).

LANDSLIDE HAZARD: The probability of occurrence within a specified period and within a given area of a landslide of given magnitude (*Guzzetti et al., 1999*).

LANDSLIDE INTENSITY: A measure of the destructiveness of a landslide (*Hungr* 1997). A synonym of, or a proxy for, landslide magnitude. In geomorphological risk assessment, it is defined as a function of the landslide volume and of the landslide velocity.

LANDSLIDE INVENTORY: The simplest for of landslide map. It shows the location and, where known, the type of landslides that left discernable features in an area (*Hansen, 1984*).

LANDSLIDE MAGNITUDE: A synonym of landslide intensity. Measured by the size (area or volume), speed, momentum or destructiveness of the landslide.

LANDSLIDE PROTOCOL: A set of regulations that links terrain domains on inventory, density, susceptibility and hazard maps, to proper land use or planning rules.

LANDSLIDE SUSCEPTIBILITY/HAZARD ZONATION: Division of the land into homogeneous areas or domains and ranking of the areas according to their degree of actual o potential landslide susceptibility or hazard (*Guzzetti et al., 1999a*).

LANDSLIDE: The movement of a mass of rock, debris, or earth down a slope (*Cruden and Varnes, 1996*).

LIKELIHOOD: In Bayesian statistics, the conditional probability of an outcome given a set of data, assumptions and information. Also used as a qualitative description of probability and frequency.

LOGISTIC REGRESSION ANALYSIS: A classical multivariate statistical technique used to investigate a binary response from a set of independent measurements.

M

MAPPING UNIT: Portion of land containing a set of ground conditions that differ from the adjacent units across definable boundaries (*Hansen, 1984*).

MORTALITY RATE: The number of deaths per 100,000 of any given population over a pre-defined period.

MULTIPLE RISK: Risk to more than one specific element from a single specific hazardous affecting landslide or the risk to one specific element from more than one specific hazardous affecting landslide (*Vandine et al., 2004*).

MULTI-TEMPORAL INVENTORY: The most advanced form of landslide inventory. It shows the location and types of failures in an area, and portrays their evolution in space and in time. Typically prepared thought the systematic interpretation of aerial photographs of different periods available in an area, field surveys, and

information on the occurrence of historical landslide events, obtained by searching archives and bibliographical sources.

N

NATURAL HAZARD: The hazard posed by a potentially damaging natural event or process, such as an earthquake, flood, volcanic eruption, snow avalanche, hurricane, ground subsidence or landslide.

P

PARTIAL RISK: The product of the probability of occurrence of a specific hazardous landslide and the probability of that landslide reaching or otherwise affecting the site occupied by a specific element. Also referred to as the probability of a specific hazardous affecting landslide (*ISSMGE TC32, 2004*).

PERSISTENCE: The degree to which new a slope failure occurs in the same place as an existing landslide.

PREDICTION: A description of what will happen in the future, where it will happen, and when (*Fabbri et al., 2003*).

PROBABILITY DENSITY FUNCTION: The probability distribution of a continuous random variable.

PROBABILITY MASS FUNCTION: The probability distribution of a discrete random variable. Often depicted graphically by a probability histogram.

PROBABILITY OF LANDSLIDE SIZE: The probability that a landslide will have an area greater or equal than an established landslide area, AL. It can be estimated from the analysis of the frequency-area distribution of known landslides, obtained from landslide inventory maps.

R

RESIDUAL RISK: The risk remaining after all risk control strategies have been applied (*Wise et al. 1997*).

RESIDUAL RISK: The risk remaining after all risk control strategies have been applied (*Wise et al. 1997*).

RISK: Mathematically expressed as the product of the probability of the occurrence and the probability of the consequence.

S

SCENARIO: A description of a hypothetical, potentially damaging event and its consequences, including includes a description of the “actors” and the “context”.

SLOPE UNIT: A type of mapping unit that partitions the territory into hydrological regions between drainage and divide lines (*Carrara et al., 1991*).

SOCIETAL RISK: Risk imposed by a hazard (e.g., a landslide) on society as a whole (*Cruden and Fell, 1997; ISSMGE TC32, 2004*).

SPECIFIC RISK: The expected degree of loss due to a particular natural phenomenon. It may be expressed as the product of hazard and vulnerability (*Varnes and IAEG Commission on Landslides and other Mass-Movements, 1984*). The risk of loss or damage to a specific element, resulting from a specific hazardous affecting landslide (*Vandine et al., 2004*).

SPECIFIC VALUE OF RISK: The worth of loss or damage to a specific element, excluding human life, resulting from a specific hazardous affecting landslide (*Vandine et al., 2004*).

STAKEHOLDERS: Any individual, group, or organization able to affect, be affected by, or believe they might be affected by, a decision or activity. Decision-makers are stakeholders (*Wise et al., 2004*).

STRUCTURED EXPERT JUDGMENT: A systematic set of steps and analytic methods for accurately representing the range of expert estimates or conclusions about an uncertain variable or outcome.

SUSCEPTIBILITY MAP: Map showing where landslides may form. Ranks slope stability of an area into categories from stable to unstable.

SUSCEPTIBILITY: The likelihood of a landslide occurring in an area on the basis of local terrain conditions (*Brabb, 1984*).

T

TERRAIN MAPPING UNIT: A type of subdivision of the terrain based on the observation that in natural environments the interrelations between materials, forms and processes result in boundaries which frequently reflect geomorphological and geological differences.

THREAT: A synonym of danger.

TOOLBOX (FOR LANDSLIDE CARTOGRAPHY): An ensemble of scientific knowledge, case studies, reliable statistics, tested models, proven techniques, and verified procedures to prepared landslide cartographic products.

TOPOGRAPHIC UNIT: Vector-based subdivision of the terrain obtained by partitioning a catchment or a single slope into stream tube elements of irregular size and shape (*O'Loughlin, 1986*).

TOLERABLE RISK: Risk that stakeholders are willing to live with so as to secure certain net benefits, knowing that the risk is being properly controlled, kept under review, and further reduced as and when possible (*Wise et al., 2004*).

TOTAL RISK: The expected number of lives lost, persons injured, damage to property, or disruption of economic activity due to a landslide (*Varnes and IAEG Commission on Landslides and other Mass-Movements, 1984*). Risk to all specific elements from all specific hazardous affecting landslides (*Vandine et al., 2004*).

U

UNCERTAINTY: Describes any situation without certainty, whether or not it is describe by a probability distribution. Caused by natural variation and/or incomplete knowledge (ISSMGE TC32)

UNIFORMITARIANISM: A theory that rejects the idea that catastrophic forces were responsible for the current conditions on the Earth. The theory suggests that continuing uniformity of existing processes are responsible for the present and past conditions of this planet. In geology, doctrine holding that changes in the earth's surface that occurred in past geologic time are referable to the same causes as changes now being produced upon the earth's surface.

UNIQUE CONDITION UNIT: A type of mapping unit that implies the classification of each instability factor into a few significant classes which are stored into a single map, or layer (*Chung et al., 1995*).

V

VOLUNTARY RISK: Risk that an individual or society usually takes willingly. Examples include rock climbing, skiing, and motorcycle riding (*Wise et al., 2004*).

VULNERABILITY: The degree of loss to a given element or set of elements at risk resulting from the occurrence of a landslide (*Varnes and IAEG Commission on Landslides and other Mass-Movements, 1984*).

Z

ZONATION (ZONING): Division of the land surface into areas of actual or potential landslide susceptibility, hazard or risk.