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Service for Glacial LAke MOnitoring



Terminology

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TERMINOLOGY

In order to avoid confusion with terminology used in other fields, definitions of the terms that will be used in the project are given below. This terminology refers to Käab (2008) and JCT1 (2004):

Threat: Threat is a ‘natural phenomenon that could lead to damage, described in terms of its geometry, mechanical and other characteristics. The threat can be an existing one (such as a creeping slope) or a potential new one (such as a lake outburst). The characterization of a danger or threat does not include any forecasting’.

Susceptibility: Spatial distribution of threats (sometimes referred to as hazard disposition).

Hazard: ‘Probability that a particular threat occurs within a given period of time.’ It includes the process, magnitude or intensity of the process at a certain location, and the probability of occurrence. Threat describes therefore the process and magnitude of a dangerous event, susceptibility includes its spatial distribution, and hazard its temporal distribution.

Vulnerability: ‘Degree of loss to a given element, or to a set of elements within the area affected by a hazard’, or to a ‘set of conditions and processes resulting from physical, social, economic, and environmental factors’.

Risk: ‘Measure of the probability and severity of an adverse effect to life, health, property, or the environment’. It is thus a combination of hazard and vulnerability (i.e. Risk = Hazard x Vulnerability, see Figure 1).

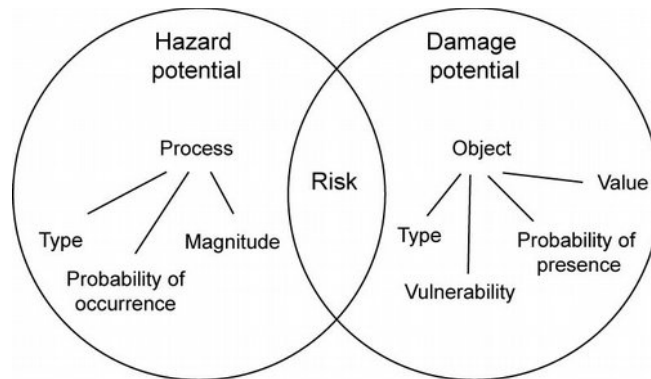


Figure 1: Schematic sketch of the relations between hazard, damage potential, risk and related terms. After Kienholz et al. (2003).

Glacier lakes are classified according to their location related to the glacier (pro-glacial, glacier-marginal, supra-glacial, englacial, glacier-dammed, e.g. Costa and Schuster, 1988) and the dam properties (moraine, rock, or ice dammed). Figure 2 and Figure 3 illustrate the concept. Please notice that ‘glacier’ and ‘glacial’ (hazards, lakes, etc.) are used as synonyms as usually in the literature, even if ‘glacial’ refers sometimes to past and present glaciations, whereas ‘glacier’ sometimes only to present-day glaciations. Although outburst from such sub- and englacial reservoirs can have devastating consequences similar to GLOFs (e.g., Haeberli, 1983; Walder and Driedger, 1995), such water-filled cavities cannot be detected remotely. Even with geophysical measurements it is hard to identify such englacial water bodies, the probably only example of successful detection of such a water-filled cavity before an outburst is reported by Vincent et al. (2012). Thus, Sub- and englacial reservoirs (C in Fig. 2) are not considered by the S:GLA:MO service.

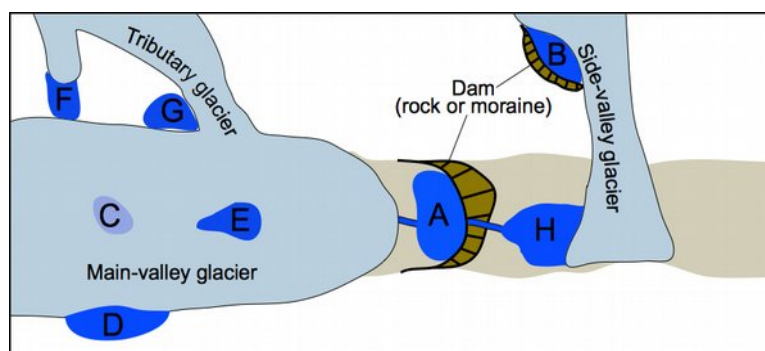


Figure 2: Classification of glacier lakes based on the position relative to the glacier and the dam properties: A: Moraine- or rock-dammed pro-glacial lake; B: Moraine- or

rock-dammed glacier-marginal lake; C: englacial lake (i.e., water reservoir within the glacier, not further treated here); D: ice-dammed glacier-marginal lake; E: supra-glacial lake; F: ice-dammed interglacial lake; G: ice-dammed lake at a glacier confluence; H: lake dammed by side-valley glacier. For examples of real lakes see Figure 3. (Modified after Costa and Schuster, 1988).



Figure 3: Examples of glacier lakes according to the classification shown in Figure 2 (letters are corresponding). A1: Moraine-dammed pro-glacial lake (Laguna Palcacocha, Peru, Photo: C. Simonds), A2: Rock-dammed pro-glacial lake (Laguna 513, Peru, Photo: C. Giráldez); B: moraine-dammed glacier-marginal lake (Lake Miage, Italy, Photo: J. Alean); D: ice-dammed glacier-marginal lake (Grubengletscher, Switzerland, Photo: J. Alean); E: supra-glacial lake (Lago Effimero, Belvedere Glacier, Italy); F: ice-dammed interglacial lake (Lake Nolake, Canada, Photo: Canadian Geological Survey); H: lake dammed by side-valley glacier (Laguna Parón, Peru, Photo: J. Alean). (Modified after Frey, 2007)

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