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Serious game for landslides: a review of the literature reviews to fill an existing gap in serious game research

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Serious games (SGs) are games developed and designed to inculcate skills, knowledge, competence or change the attitude towards a specific topic. Here we (i) review 58 serious games developed to inform actions and inculcate skills or knowledge on natural hazards or disaster risk; and (ii) propose four serious games for landslides. We, first review nine literature reviews on serious games (post-2002) that list and compare SGs based on different characteristics (for example: their (SG) effectiveness, or their roles for improving decision-making capacity, communication and spurring learning, or their alignment with Sustainability Development Goals). From these reviews, we identify 33 serious games developed to inform actions and inculcate skills or knowledge on natural hazards or disaster risk. We, then, carry out a systematic online-database search in Web of Science to identify 25 more natural hazard-based serious games, bringing the total to 58. For the 58 serious games, we compare the following characteristics: (a) year of game development; (b) game format; (c) player number; (d) target audience; (e) hazard studied; (f) vulnerability; (g) exposure; and (h) methodology followed to identify the game's effectiveness. Based on our review, we identify 11 gaps in the serious game research area for natural hazards and DRR, of which the most important ones were: (i) limited literature describing how awareness, skills and knowledge are co-created using a serious game, i.e., the effectiveness of the game, and (ii) limited number of games on landslides, either as a standalone hazard or a part of multi-hazards.

Using the learnings from this review, we devise four ideas to develop a computer or board game for landslides in data-poor regions (we will focus on India): (i) a multiplayer game with an aim to explain different roles of stakeholders in landslide hazard management; (ii) a multiplayer game to explain the data collection process, and data flow needed to forecast landslides; (iii) a single or multiplayer game on identifying the interaction between different landslide-related variables; and (iv) a single player game on identifying the landslide risk and future actions. These four ideas involve different stakeholders as target participants, including local inhabitants, academics, government officials and scientists, private contractors, NGO workers, politicians. We further try to integrate these four ideas into one simple serious game and discover a pathway to quantify the effectiveness of this game. We believe that these four ideas also open an avenue for further

research and work on serious games on landslides in data-poor regions.