



# Review of Serious Gaming Applications in Humanitarian Operations and Disaster Risk Management: State-of-the-Art and Future Directions for Research

Junko Mochizuki

*IRisk and Resilience Program, International Institute for Applied Systems Analysis, Schlossplatz 1 - A-2361 Laxenburg, Austria,  
[mochizuki@iiasa.ac.at](mailto:mochizuki@iiasa.ac.at)*

**ABSTRACT:** Recent years have seen growth of interest in so-called ‘serious game’ applications in a number of fields including humanitarian operations and disaster risk management. By integrating an element of ‘gamification’, i.e. the use of game-based features to encourage engagement and learning on broad range of topics, serious games applied in the area of humanitarian operations have sought to engage various stakeholders to raise awareness and collaboratively work on problem solving. This presentation reviews the various concepts related to gamification and serious games in general, identifying their strengths and limitations as well as what makes them unique as opposed to more conventional instruction and stakeholder engagement tools. The study then reviews the recent applications of serious games in the field of humanitarian operations and disaster risk management and identifies current research trends, major findings, and important knowledge gaps for further research. This presentation will be of interest to wide policy and academic audiences interested in the topic of novel stakeholder engagement methods.

**Keywords:** Humanitarian Assistance, Serious Games, Gamification, Reviews

## 1. INTRODUCTION

A serious game is a stakeholder engagement method that uses “careful and considered applicable of game thinking to solving problems and encouraging learning” (p.15, Kapp, 2012). Recent years have seen a revival of interest in so-called ‘serious game’ applications in a number of fields including humanitarian operations and disaster risk management. While the earlier studies using serious games or policy exercises on this topic focused on expert-led crisis management and contingency planning exercises (Walker, 1995; Mayer, 2009), recent years have seen on-the-ground applications of serious games in a variety of ways, both to raise awareness of salient scientific information, engage stakeholders, and to gain insights into human decision making in uncertainty and complexity (de Surez et al., 2012; ODI, 2014; Mochizuki et al., 2016).

This presentation first reviews key concepts related to serious games such as gamification, games, and serious games to familiarize the audience with often-confused notions related to serious games. It will then identify major strengths and weaknesses of serious games used in the area of humanitarian operations and disaster risk reduction, outlining areas for fruitful further research. The cursory review of existing serious games in humanitarian operations and disaster risk reduction indicates an overwhelming focus on emergency management as opposed to other dimensions of disaster risk management, reflecting common shortcomings observed in the disaster risk management field in general.

## 2. CONCEPTUAL OVERVIEW

There are number of related concepts in serious games that benefit clarification. These are by no means the only definitions available, but highlight some of the salient aspects of games and gamification.

**Game:** “A game is a system in which players engage in an abstract challenge, defined by rules, interactivity and feedback, that results in a quantifiable outcome often eliciting an emotional reaction” (Koster, 2005).

**Gamification:** “Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning and solve problems” (Kapp, 2012).

**Serious Game:** Serious games are “a careful and considered application of game thinking to solving problems and encouraging learning” typically using “a game within well-defined game space like a game board or within a computer browser” (Kapp, 2012).

Other related concepts include policy exercises, role playing and simulation games, which will be reviewed in this presentation.

### 3. STRENGTHS AND LIMITATIONS OF SERIOUS GAMES IN HUMANITARIAN ASSISTANCE AND DISASTER RISK MANAGEMENT

Serious games integrate ‘serious’ elements of contextual environments—e.g. scientific and institutional information surrounding disaster risk management challenges in a particular region—with an element of fun, thereby engaging players to think creatively of the many potential solutions for solving complex issues of humanitarian assistance and disaster risk reduction. Serious games may be used as a medium of instruction, together with integrating social and natural science knowledge (as well as professional and lay persons’ knowledge). Games can also be used to provoke players to think critically about fundamental ‘mental models’, thereby facilitating what is referred to as double- and triple-loop learning. While still under-utilised, game space can be a potential space for experimental observations, where researchers may test the presence of certain decision-making heuristics and/or the effects of social interactions, etc. These are the many potentials offered by serious games as a means of instruction, integration of knowledge, creative thinking and experimentation (Partson, 1996).

While the development and implementation of serious games in humanitarian operations and disaster risk reduction require interdisciplinary synthesis of knowledge and expertise, the review of existing serious games on these topics indicate that these games often demonstrate partial knowledge integration. Some games focus solely on teaching emergency responses (such as first aid knowledge), others focus on demonstrating the interlinkages of hazards and technical disaster risk reduction options (such as building of dikes and hazard-proofing of buildings). Integration of social science aspects such as governance issues is rare, though games – with their unique ability to convey ‘storylines’ – offer much potential to include social science theories and stylised facts together with natural science knowledge. Limited interdisciplinary knowledge integration in many ways reflects existing issues of humanitarian assistance and disaster risk reduction.

### 4. CONCLUSION AND AREAS FOR FURTHER RESEARCH

Recent years have seen a revival of interest in so-called ‘serious game’ applications in a number of fields including humanitarian operations and disaster risk management. This presentation provided a brief overview of key concepts, their comparative strengths and limitations and important areas for further research. The cursory review of existing serious games in humanitarian operations and disaster risk reduction indicates that games offer potential as a means of engagement, integration of knowledge, creative thinking and experimentation. While there are a variety of potentials, there has been limited integration of interdisciplinary knowledge in existing games, with many focuses solely on topics such as emergency management and technical solutions for disaster risk reduction. Given the strengths of serious games in conveying engaging ‘storylines’ to stakeholders, further research to include insights from social science studies may be a fruitful avenue to enhance the effectiveness of serious games as stakeholder education and engagement tools. At the same time, there have been limited studies investigating the effectiveness of these gaming interventions in the field of humanitarian assistance and disaster risk reduction. Scientific evaluation of gaming effectiveness is thus also an important area for future research.

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