



The HuT

Manual for Safe Haven serious games

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1. Technical references

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- * PU = Public
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RE = Restricted to a group specified by the consortium (including the Commission Services)
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1.1. Document history

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3. Introduction

This document brings together various publications and manuals that have been developed in the context of subtask 2 “Serious games” of task 3.2 “Robust decision support tools for multi/systemic risk policy making”, as part of the larger framework of Work Package 3 - Governance and Policy. This document is not a manual in itself, but rather gives the context of the game development as well as a summary of the materials that have been published, including the manual(s) of the game. It follows the chronological order of the development of the game, and is organized as follows:

- single-hazard Safe Haven games;
- online version (app) that has been modeled after the single-hazard Safe Haven game;
- multi-hazard version, with extra rules that combine risk factors for multiple hazards.

The overall purpose of the game is to raise awareness and promote understanding of risk. We have taken into account the following main elements related to the risk concept and its management: (1) risk is a product of its three components: exposure, vulnerability and hazard; (2) risk is probabilistic and the chances of a disaster happening are never zero; (3) risk reduction methods and tools need to be chosen considering the characteristics of the hazards and their potential consequences. The interaction between these elements results in a more nuanced image of risk and lets players discover the complex interplay of factors influencing risk.

The target audience includes high-school students, educators, and different stakeholders offering them a collaborative, interactive environment to discuss and experiment with risk management concepts. We have played the game with 200+ persons in multiple countries (Italy, Germany, Spain) and with participants ranging from high-school students to risk experts.



4. Single-hazard versions

The game employs simple yet dynamic card-based mechanics to simulate real-world challenges associated with hazard and risk. Participants play municipal decision makers that need to manage risk in the municipality. In multiple rounds, they need to keep the risk in the municipality below a certain threshold, starting from a base risk level (resulting from dice rolling) and then adopting and properly maintaining risk reduction measures (risk reduction cards) with the budget available. During each round, individual factors (chance cards) can decrease/increase the risk, and round after round local, national or global phenomena, such as global warming or national funding cuts, also enter into play (game scenarios).

There are four single-hazard versions of the Safe Haven serious game: “Safe Haven - Landslides” (English/Italian), “Safe Haven - Floods” (English), “Safe Haven - Heatwaves” (Spanish), and “Safe Haven - Wildfires” (English/Italian). Each version is identical in its game play: there are three phases (dice roll, risk reduction cards, chance card) per round. The 12-sided dice employed are also the same: one dice for each risk component (hazard, exposure and vulnerability) and three different distributions of hazard, exposure and vulnerability levels (nine dice in total).

Table 1 provides an overview of all the published manuals and do-it-yourself (DIY) instructions. Each version of the game is published as a “physical object” record with a DOI on Zenodo, and comprises eight files. The game has a playing board, cards, scorecards, scenarios and a rule book that need to be printed. Additionally, further explanation of the card values is given in a spreadsheet and the setup of the playing board is provided. A document with DIY instructions on how to create a complete version of the game is also present. As an example, Figure 1 shows images of the game material needed to play “Safe Haven – Landslides”.

Table 1: Published single-hazard manuals and DIY instructions.

Title/Name	Zenodo	Published date
Safe Haven - Landslides	https://zenodo.org/records/17169844	September 21, 2025
Safe Haven - Landslides (Italian version)	https://zenodo.org/records/17516217	November 3, 2025
Safe Haven - Floods	https://zenodo.org/records/18235152	January 13, 2026
Safe Haven - Heatwaves (Spanish version)	https://zenodo.org/records/xxx	March xx, 2026
Safe Haven - Wildfires	https://zenodo.org/records/xxx	March xx, 2026
Safe Haven - Wildfires (Italian version)	https://zenodo.org/records/xxx	March xx, 2026



Figure 1: “Safe Haven – Landslides” game material.

The different versions of the game differ in the risk reduction measures presented. Some of the measures are hazard-agnostic, such as early warning systems and return in each version of the game. Other measures, such as polders to reduce the flood hazard or deflection structures to decrease the vulnerability of landslides, can only be found in a single game. However, the structure of the cards is the same for each game: there are three types of risk reduction per risk component (hazard, exposure and vulnerability). Each risk reduction type has four cards representative of measures that are designed and implemented well (therefore effectively reduce the risk), three that are designed and implemented adequately, and one where there is no risk reduction at all due to mistakes in the design or implementation of the measure.

The games also differ in chance cards, but also in this case the structure of the cards is the same. For example, there is a multi-risk card that increases the hazard in each single-hazard deck. In the case of landslides, this is an earthquake that triggers a landslide, while in the case of floods, it is the flood that triggers a landslide.

Each game has three global scenarios (translating into an easy, medium and hard difficulty). The description of the scenarios reflects global circumstances that are related to the single hazard. However, the gameplay does not differ between the single hazard games. For example, in round five of the medium game, the vulnerability difficulty increases. In the landslides game, the reasons are “aging structures and infrastructures”. The explanation for this increase in the floods game is “aging drainage systems and flood defenses”.

5. Online game

The online app adopts the rules of single-hazard games. The main differences with the physical board game include: (1) a single-player mode, wherein one can try to beat the game by surviving for ten rounds; (2) a multi-player mode that is not limited to a maximum number of players. The physical board game can only have up to 6 teams (4 suggested for better playability), as there is a limited number of cards to play with. In the online game, the number of cards is unbound, and therefore can be played with a larger group (for example a classroom). The multi-player version needs a game master that initializes the game and takes care of the rounds and phases. Figure 2 shows three phases of the game.



Figure 2: Three phases of the online game.

The game is created using the open-source game engine Godot. That gives the opportunity to easily export the game for multiple operating systems (linux, android, windows, web). In our case, we just exported it to the web version, but with little work one could make it into a phone app. For multiplayer communication, the game uses the WebSocket (WS) protocol, which should be set up on a server. One The source code and app are published on Zenodo (See Table 2), including a manual of autonomously deploying the app, and one instance is deployed on the website <https://safehavengame.dynamicexposure.org/>.

Table 2: Published resources of the online game.

Title/Name	Zenodo	Published date
Safe Haven - Landslides	https://zenodo.org/records/17169844	September 21, 2025

6. Multi-hazard version

The multi-hazard mode aims to test a new gameplay experience that accounts for the interactions among different hazards and the associated mitigation strategies under conditions of uncertainty. As expected, the current objective is to move towards a multi-hazard version capable of capturing the complexity faced by researchers, decision-makers, and communities when addressing disaster risk. At the same time, we aim to preserve the integrity of the single-hazard version of the game and, above all, to capitalize on the assets already developed, avoiding the need to restart from scratch.

Phase 1 – Assignment of roles and contexts

In the first phase, each player takes the role of a risk manager tasked with supporting Disaster Risk Reduction (DRR) actions within a given territory. The assignment of the territory is random and is determined by drawing a “use-case” card. Each card reports the conditions of hazard (H), exposure (E), and vulnerability (V) on a scale from 1 to 5, which is the same scale used in the single-hazard version of the game (1 indicates very low conditions of H/E/V, 5 represents the maximum level), for four perils: landslides, floods, wildfires, and droughts (see Table 3).

Risk is calculated as the product of the three components, therefore ranging from a minimum value of 1 ($1 \times 1 \times 1$) to a maximum value of 125. In addition, each city card includes two further context-specific parameters: i) Annual budget available for risk reduction measures; ii) acceptable risk threshold, defined as the value of the $H \times E \times V$ product considered acceptable given the socio-economic conditions of the territory.

Table 3: Example of “use-case” card in Safe Haven Multi-hazard.

Disasters	Hazard	Vulnerability	Exposure	Risk
Floods	4	3	3	36
Landslides	2	4	2	16
Droughts	3	4	2	24
Wildfires	1	1	1	1
Acceptable Risk	30			
Annual Budget	8			

The initial risk conditions for the four perils, together with the acceptable risk level and the available budget, represent an additional element of reflection within the serious gaming framework, as they help players understand how acceptable risk levels are closely linked to both the underlying risk conditions and the financial resources available.

Lessons learned from this phase include:

1. Contexts differ significantly – there is no universal solution.
2. Socio-economic factors can strongly influence the capacity for action.
3. Risk acceptance is closely linked to the socio-economic context.

First round – Mitigation measures

During the first round no additional complications are introduced, and players proceed to purchase mitigation measures.

Mitigation cards are similar to those used in the single-hazard version and therefore have two sides. When purchasing a card, players can see:

- which component it affects (H, E, or V)
- the installation and maintenance cost
- the specific hazard it targets.

On the reverse side of the card (which remains hidden at the time of purchase) the actual capacity of the measure to reduce H, E, or V is specified. Naturally, single-hazard measures are less expensive, while multi-hazard measures require higher investment. After mitigation measures are implemented, risk conditions are recalculated. Each player therefore knows in advance for which hazards the system remains above or below the acceptable risk threshold.

Peril occurrence

At this point, a hazard may occur. The event is determined by drawing a card from a deck structured as shown in Table 4.

Table 4: Structure of the card deck for peril occurrence: “baseline”.

Disasters	Frequency
None	6
Landslides (L)	2
Floods (F)	2
Forest Fires (FF)	2
Droughts (D)	2
L + F	2
FF + D	2
D + F	1
FF + L + F	1

The event may correspond to:

- a single hazard, or
- a compound event involving multiple hazards.

As in the single-hazard version of the game, if the player is above the acceptable risk threshold for the hazard drawn, they lose one of the two available lives.



Additional scenarios from round two onward

Starting from the second round, two additional scenarios are introduced simultaneously: a global scenario and a local scenario.

The first is a global scenario, selected by the game master or applied uniformly to all players. It is linked to the Shared Socioeconomic Pathways (SSPs) used in climate modelling to represent future socio-economic developments and greenhouse-gas forcing conditions.

The following scenarios are considered:

- SSP1 – Sustainability ("Taking the Green Road")
- SSP3 – Regional Rivalry ("A Rocky Road")
- SSP4 – Inequality ("A Road Divided")
- SSP5 – Fossil-fueled Development ("Taking the Highway")

Depending on the scenario selected, the conditions of H, E, V, the acceptable risk threshold, or the available budget may change for each player (Figure 3).

Sustainability (SSP1)

Round	€	H	E	V	R _a
2					
3			down		
4				down	
5	up				
6		down			
7			down	down	
8	up				down
9					
10					

Regional rivalry (SSP3)

Round	€	H	E	V	R _a
2					
3					
4			up	up	
5					
6	down				
7					down
8					
9			up	up	
10					

Inequality (SSP4)

Round	€	H	E	V	R _a
2				up	
3			up		
4		up			
5	down				
6					down
7				up	
8			up		
9	down				
10		up			

Catastrophic (SSP5)

Round	€	H	E	V	R _a
2		up			
3			up	up	
4	down				
5					down
6		up			
7			up	up	
8	down				
9			up	up	
10	= 0				

Figure 3: Game evolution according to different global scenarios.

The second scenario is local and is determined by drawing a card before each round. The meaning and effects of these cards are reported in Figure 4.

What	€	H	E	V	R _a
Nothing happens					
New scientific study: H update in your area		L up OR down			
		F up OR down			
		FF up OR down			
		D up OR down			
		L&F up OR down			
		FF&D up OR down			
Mass immigration in your city			up		
			up	up	
Mass migration from your city			down		
Major national funding for infrastructure maintenance				down	
Updated national guidelines					down
Other Disaster (e.g., war) priorities in your country					up
	down				
	none				up
Major national funding for NH risk reduction	up				
Your city goes bankrupt	zeroing				

Figure 4: Cards representing the evolution of local scenarios.

Evolution of hazard occurrence

As the game progresses, the composition of the hazard event deck may also change, shifting from a “baseline” mode to a “world full of hazards” mode (nickname: “shit happens”), where the probability of compound or extreme events increases (Table 7).

Table 5: Structure of the card deck for peril occurrence: “world full of hazards”.

Disasters	Frequency
None	0
Landslides (L)	3
Floods (F)	3
Forest Fires (FF)	3
Droughts (D)	3
L + F	3
FF + D	3
D + F	1
FF + L + F	1

Educational purpose

The game represents an attempt to build upon existing assets with a clear educational objective. It provides a valuable opportunity to raise awareness of several key concepts:

- Shared Socioeconomic Pathways;
- risk awareness and risk management;
- trade-offs between disaster risk reduction and financial constraints;
- compound events and multi-hazard interactions.

Possible future improvements

Further refinements of the game are possible. For instance, when a combination of hazards is drawn, vulnerability levels could be dynamically increased to reflect the compounding effects between hazards.

Although distinguishing within the game mechanics between compound, cascading, and related hazard events is challenging, this level of nuance can be addressed within the complementary educational module accompanying the gameplay.



7. Conclusions

We aimed to develop a serious game about risk to climate extremes in the context of The HuT project, that could be played physically (board game), as well as virtually (online). This led us to create the game Safe Haven, a game where players are decision makers that want to keep the risk below an acceptability threshold in a locality.

The main purpose of the Safe Haven is to raise awareness and understanding of disaster risk. We have developed different versions with various specific aims: topical board game versions that can be used to educate high-schoolers about risk to a single hazard; an app that can be used to educate an audience from a distance, or can be played by an enthusiast using the solo player variant; and a multi-hazard version that aims to expose players to multi-risk scenarios due to climate extremes in a changing world.

Risk is a complex subject, but it can be deconstructed into easy-to-digest learning items, such as (1) the probabilistic nature of risk, (2) concrete risk reduction methods and (3) dividing risk into its three components: hazard, exposure and vulnerability. On top of that, we tried to link the SPPs in the multi-hazard version, as well as to incorporate the concept of compound- and cascading hazard.

The games have been played with over 200 participants across multiple countries. Although the main audience are high-school pupils, positive feedback was also received from risk experts. This is because the game play is not only easy to understand, engaging, effective in communicating key concepts, but also a conversation starter when played with practitioners.

The project leaves a substantial collection of outputs: game manuals, DIY instructions to create the board games and source code for their online versions. These are all openly published on Zenodo, therefore promoting accessibility of educational material for all and adhering to the open data policies of the EU. We think that the development of the game is a relevant contribution to disaster risk awareness, to communicate complex scientific topics to a wide audience. We are confident that the game may serve as a valuable tool for educators for the years to come and that it may contribute to a better general understanding of the concept of disaster risk.

