



PHUSICOS

According to nature

Deliverable 6.3

The PHUSICOS NBS Simulation – Moderator’s Handbook

Work Package 6 – Learning arena innovation to encourage knowledge exchange

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IIASA

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Summary

Socio-ecological simulations, or serious games, are participatory tools where participants collectively explore complex realities and challenges. They have been shown to be effective learning tools that can support understanding of complex governance issues, including sustainable development, climate change adaptation and disaster risk reduction.

The PHUSICOS simulation is a serious game that was developed under the PHUSICOS' WP6 'Learning arena innovation to encourage knowledge exchange'. The game is set in a fictional setting (PHUSICOS region) at risk from multiple extreme events and in which different stakeholder groups are represented. The game places emphasis on negotiations that occur between stakeholders while they implement NBS or alternative solutions and weigh up their costs and co-benefits. The players learn to appreciate the complexity of the hazard and stakeholder landscape as well as the multiple benefits of NBS, and they gain experience by participating in the process of negotiated policy making.

This document serves as a Handbook for potential moderators to organize and facilitate the PHUSICOS simulation.

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Appendix A	Introduction script (optional)
Appendix B	Detailed Gameflow
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1 How to use this Handbook

The purpose of this Handbook is to provide easy-to-use instructions on how to successfully moderate the PHUSICOS simulation. The Handbook will take you through the preparations to facilitate the simulation, simulation elements, and its interface, and all steps of the workshop facilitation.

The Handbook will first introduce you to the social simulation tool and then guide you through the steps of moderating the game play: logging in and managing the sessions; becoming familiar with the game interfaces; running the workshop from its introduction to the debriefing and survey; and answers to common questions.

If you cannot find the answer to your questions within the following pages, please contact us at michalina.kulakowska@crs.org.pl.

2 Understanding the theoretical background of social simulations

Understanding the conceptual background of *social simulations* enables moderators to effectively provide the purpose and motivation of the policy exercise in opening the workshop. Game-based learning is immersive and experiential, yet participants often begin with skepticism that this method can be effective and useful. Moderators who understand the underpinnings of social simulations can also run debriefings more effectively by facilitating deeper and more reflective conversations.

A social simulation is an experiential process where a group of participants collectively explore a complex reality. It is *social* because it requires the participation of real people who represent different groups and organizations. We call it a *simulation* because it represents carefully selected real-world structures and processes. It is similar to a multi-player game, as it uses many game-like mechanics, but it also resembles interactive theatre by being open-ended and not pressing participants to achieve any specific goals.

Social simulations bring together participants with diverse backgrounds and values to interact in a shared, safe environment. In this simulated reality, participants take on specified roles, e.g., representing different actors in the policy process, including researchers, public administrators, businesses and NGOs or civil society. They have an opportunity to prioritize problems, plan and implement solutions, and solve conflicts via negotiations and dialogue. Together, they creatively experiment, test, and tinker with new ideas, after which they instantly face the outcomes of their collective decisions.



Figure 1 An illustration of social simulations elements and potential interactions between players. Source: [Centre for Systems Solutions, 2020](#).

It is an approach that combines the benefits of experiential learning (learning through direct experience) (Kolb, 2015) and social learning, that is: ‘[...]a process of iterative reflection that occurs when we share our experiences, ideas and environments with others’ (Keen et al., 2005, p. 9). The dialogue and exchange of ideas within social simulations removes barriers to learning (Sterman 2000) and can enable participants to understand and respect different and competing worldviews (Mochizuki et al. 2018). The shared experience often reduces communication barriers among diverse parties, enhancing trust, respect and understanding. As a result, participants may find it easier to find constructive compromises in otherwise polarized policy landscapes, leading to creative, inclusive, and resilient solutions, sometimes known as ‘clumsy’ solutions (Scolobig, et al., 2016) as well as inspiring change and action in the real world (Duke & Geurts, 2004).

The social simulation approach is thus ideal for addressing complex or wicked problems, i.e., ones where the stakeholders can hold strongly conflicting perceptions of what both the problem and the solution are (Linnerooth-Bayer, 2021; Thompson, 2018) ones where the overall system behavior cannot be reduced to a simple sum of its parts. Even a few simple parts with complex interactions can lead to surprising, emergent behavior (Holland 1992). Complex systems have been studied within many disciplines (Berkes et al. 2008). In the context of sustainability and nature-based solutions (NBS), it is

important to consider both the problem-oriented (biophysical, technological, and economic) and people-oriented (psychological, ethical, social, and political) dimensions (de Vries, 2012). Systems that embrace all these dimensions simultaneously, as do the political and technological systems inherent in designing and implementing NBS (Martin et al., 2021) tend to be highly complex. It is this complexity of the system which tends to produce multiple perspectives and uncertain outcomes.

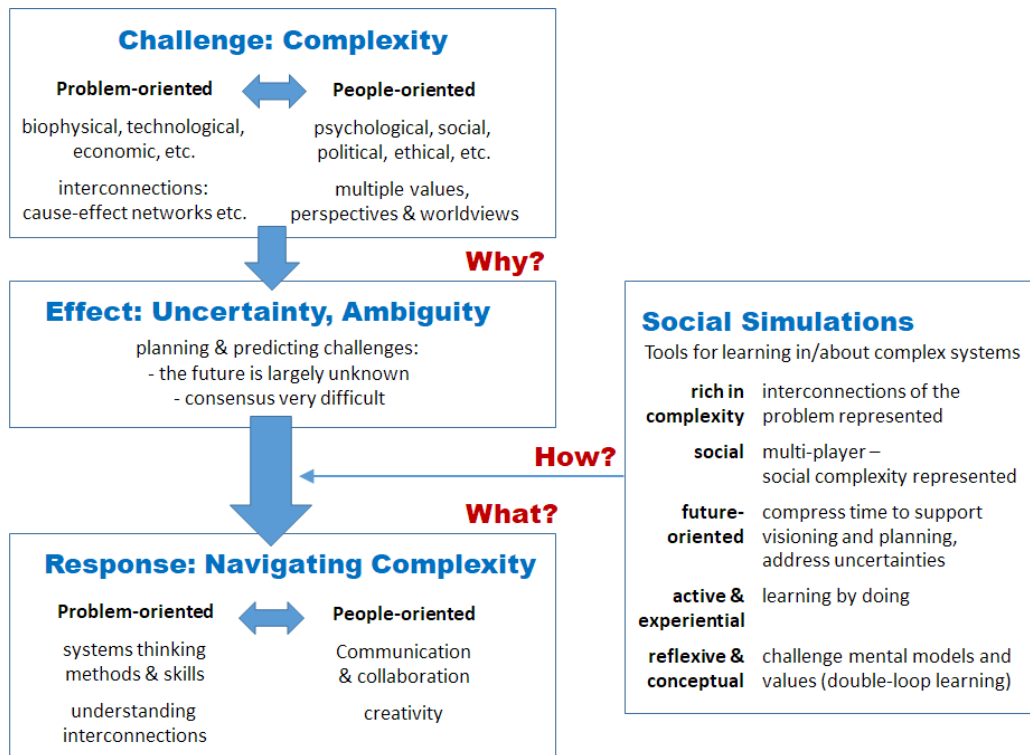


Figure 2 An illustration of social simulations impacts. Source: Centre for Systems Solutions, 2021.

Decision making and policy development in complex systems therefore require participatory systems thinking, where stakeholders openly reveal their assumptions and preferences or worldviews, develop a shared understanding of their challenges, and look for possible compromise ways forward.

Social simulations as a tool can greatly support this journey by providing a rich representation of the real-world problem situation, involving participants with different backgrounds, orienting towards the future, and allowing participants not only to talk but also to interact within the system and therefore to ‘learn by doing’. They provide participants with a way to keep their distance from the well-trodden paths of ideas and to look at the world from a different perspective. Seeing the results of their decisions often challenges implicit assumptions, leading to a deeper understanding, new creative ideas, and a commitment to action.

3 General description of the PHUSICOS simulation

The PHUSICOS simulation is a multiplayer browser-based simulation focusing on the challenges related to the implementation of nature-based solutions (NBS) for disaster risk reduction.

The simulation sets emphasis on the negotiations between stakeholders in their attempts to implement available nature-based solutions. The role-playing aspect of the game will enable stakeholders to experience a situation where various and often opposing worldviews and goals are represented.

3.1.1 Potential learning outcomes

The PHUSICOS project aims to demonstrate the effectiveness of NBS and their ability to reduce the impacts of extreme weather events (extensive risks) in rural mountain landscapes. NBS are cost-effective and sustainable measures inspired by nature that attenuate, and in some cases prevent, the impacts of natural hazard events and thereby the risks that affect the exposed regions.

The social simulation aims to address underlying concepts and challenges related to NBS governance, including understanding or appreciating the:

- heterogeneous stakeholder values, worldviews and interests regarding NBS and other structural (grey) solutions;
- hurdles in communication and cooperation between local and national authorities, civil society, the private sector and non-governmental organisations;
- multiple and wide-ranging co-benefits of NBS;
- differences between grey vs. green solutions in terms of their cost-effectiveness over time;
- governance barriers to implementing solutions.

During the game development process the following requirements were taken into account: 1) the simulation has to be easily accessible to players, especially in ad hoc situations; 2) the moderator has to be able to organize multiple workshop sessions, also simultaneously; 3) moderators should be able to access the outcomes of previous workshops; 4) the outcomes of each workshop session should be treated anonymously, therefore they should be password-protected.

With that in mind, it was decided that the PHUSICOS simulation will be a browser-based application, where data is stored in a password-protected moderator account. When organizing a workshop, the moderator creates a unique link to a game session and shares it with the players directly.

3.1.2 Who can play

The PHUSICOS simulation can be played by anyone, but is best suited to those working directly on NBS or disaster risk reduction, such as practitioners, decision-makers, stakeholders or researchers in the field. The recommended number of participants ranges between 8 and 40 players. Players can be grouped to play as one stakeholder in case of very large group sizes.

We recommend 1-3 moderators per game, or roughly 1 moderator for groups of up to [20] people.

4 Preparation to moderate the simulation

We find it helpful to print out some of the same materials to make it easier to facilitate. To save paper you can also use digital documents. If you have access to another monitor, you might want to use it too. With two or more screens, it will be easier to follow what's going on in the game and game flow at the same time. Make sure that you have tested software and devices you are going to use during the simulation.

Prepare yourself to make the introduction - practice it and, if possible, send the short one-pager instructions to the players before the workshop. Just in case, prepare a draft of an email with email addresses of all participants - in case of an emergency, you will be able to quickly send a message with additional information and/or materials.

During the Registration Period

If you are inviting international guests, make the time zone of the workshop very clear if people will be playing from different locations. Send a link with a time zone converter to help.

2 Days Before the simulation

Check for updated version of a browser you will be using
Send an invitation for a meeting on teleconferencing software - players may not call in!

1 Day Before the simulation

Prepare link to the simulation and other materials you might need
(instructions, presentation)

Day of the simulation

Log in to the teleconferencing software
Use presentation mode to share the intro presentation

Log in to the game on a computer as moderator to use it for displaying the map and results

Running the simulation

Explain the setting and the game's world (with help of presentation)

Use the game flow document to manage the game
Run debriefing

5 How do you start the simulation?

This section guides you through how to be a PHUSICOS simulation moderator. In September 2021, a webinar was held to briefly explain the aims of the game and how to run it. You can watch a recording of the webinar [here](#).

5.1.1 Requirements

The PHUSICOS simulation was developed during the COVID-19 pandemic, which is reflected in its design. The simulation can be used remotely, in tandem with conference software (to sustain audio-visual contact with participants), or in a face-to-face setting when all players and moderators gather in the same room with their devices.

The game doesn't require any installation and can be used in ad hoc situations, just by using devices with one of the browsers listed below.

Requirements (YOU)

1 computer

- **Technical requirements:**
 - An internet connection – broadband wired or wireless (3G or 4G/LTE)
 - Speakers and a microphone – built-in or USB plug-in or wireless Bluetooth
 - Power outlet
- **Supported browsers:**
 - Windows: IE 11+, Edge 12+, Chrome 30+
 - Mac: Chrome 30+
 - Linux: Chrome 30+

For moderator we recommend using 2 screens.

Remote setting

- A teleconference software of your choosing (e.g., Zoom, Teams)
- A webcam or HD webcam - built-in or USB plug-in
- Or, a HD cam or HD camcorder with video capture card
- For moderator we recommend using 2 screens

Recommended software for remote settings

- Conference software:

- Zoom
- Any software that enables moderator to:
 - Share the screen
 - Divide participants into groups
- Virtual whiteboard software (for debriefings):
 - Miro board
 - Mural
 - Jam boards
- Other helpful software (for quick live surveys):
 - Mentimeter

Language requirements

The PHUSICOS simulation is currently available only in English. However, if you are interested in running the game in a different language, we have designed the game such that all in-game text can easily be extracted. This means that if you are able to translate the game text into your native language, we can support you in creating a game version in a different language.

5.1.2 Logging into the game as a moderator

To login as a moderator, you will need to receive the login credentials. These are freely available to anyone interested in playing or moderating the game. As of this moment, the automatic system for account creation is not yet implemented. To receive login credentials, please contact michalina.kulakowska@crs.org.pl.

After receiving your individual login credentials, [follow this link](#). You will be redirected to the login page for the online platform where the simulation is hosted. You can use the provided login credentials to login into platform.

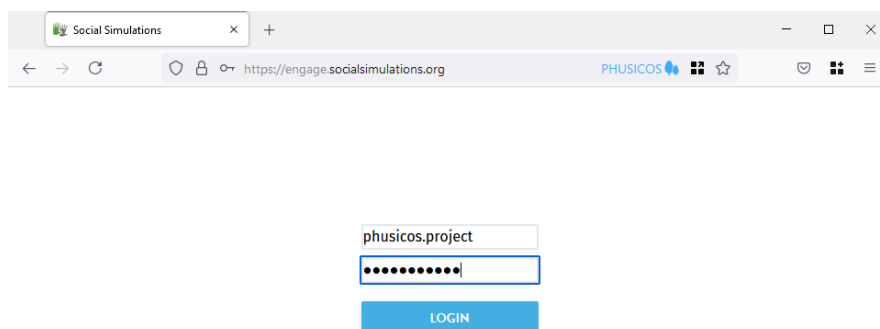


Figure 3 View of the Simulation platform's moderator login page.

5.1.3 Creating and managing game sessions

Creating the game session requires a unique link that you can share with the players. For this, you need to 1) choose 'PHUSICOS' from the expandable template list; 2) click the 'CREATE GAME' button; 3) when the platform prompts you to name the game session, choose a name to identify your session later on; 4) click the "Ok" button. The game session should now be visible in your list of sessions.

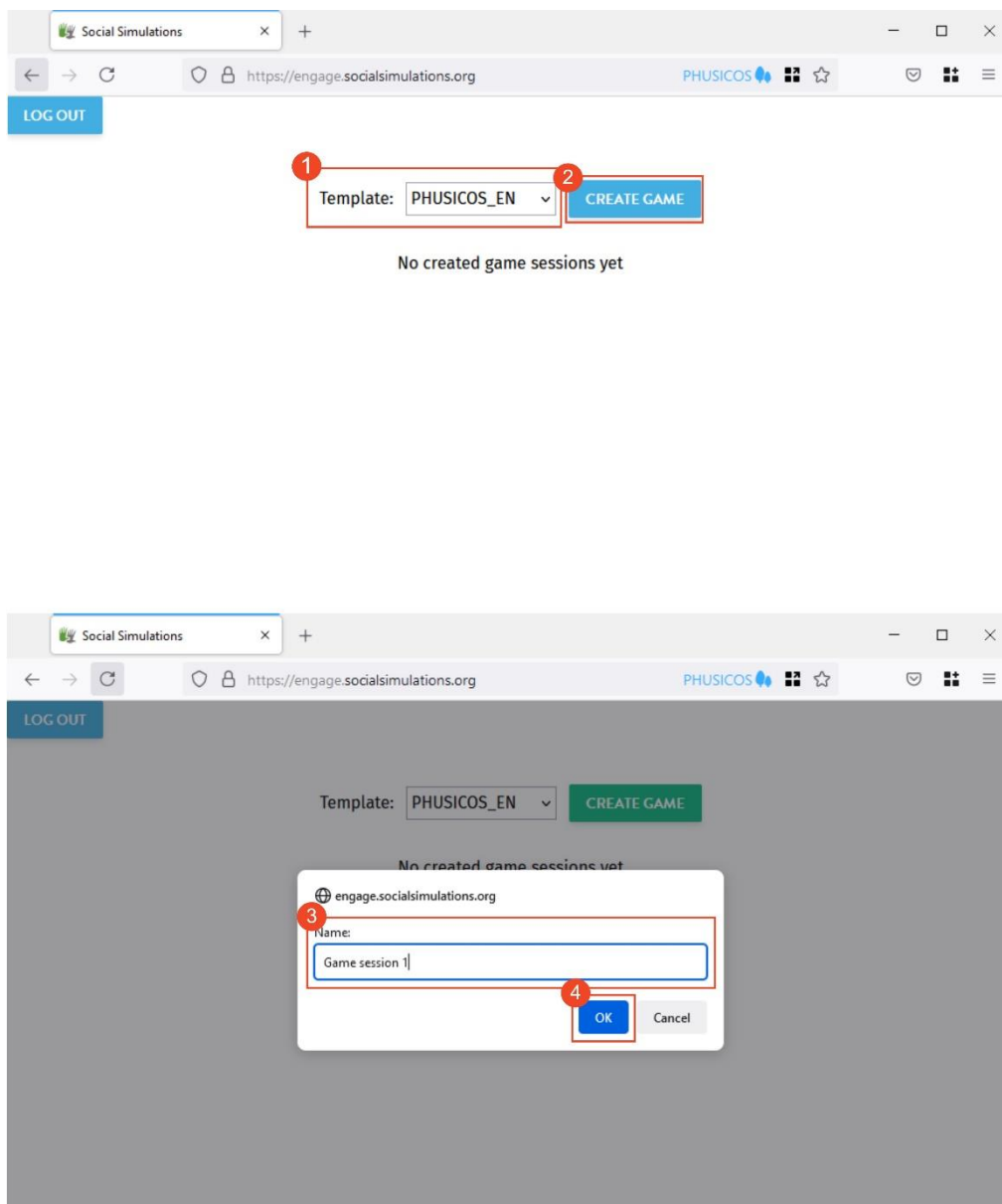


Figure 4 1) Choose from the expandable list template' PHUSICOS template; 2) Click the 'CREATE GAME' button; 3) When the platform prompts you to name the game session, write the name to identify the session later on; 4) Click the 'Ok' button.

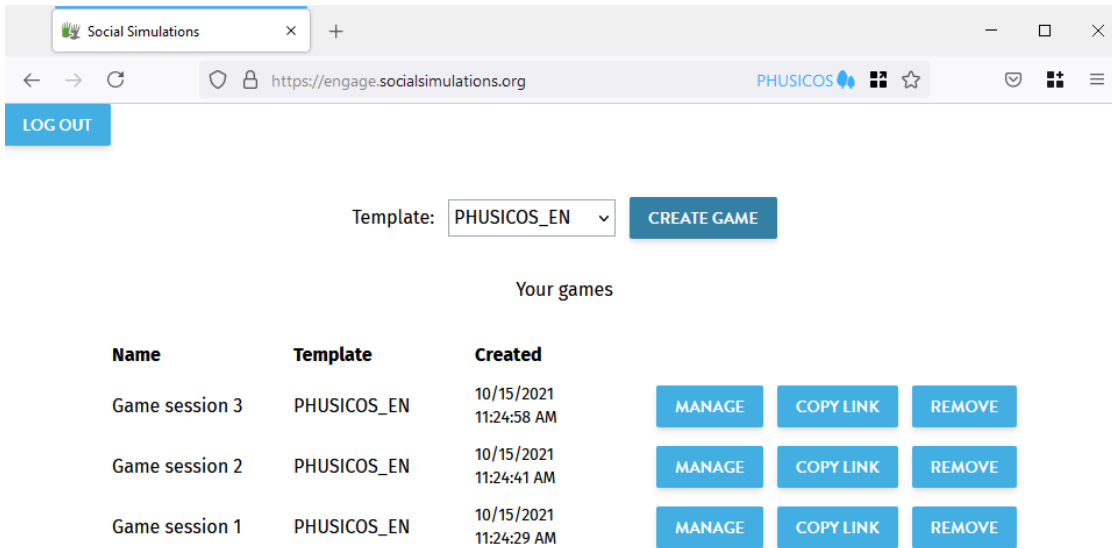


Figure 5 List of the Game sessions created by one moderator. View from the moderator account.

Each game session has 3 available options: 1) ‘Manage’; 2) ‘Copy link’; and 3) ‘Remove’. Use the ‘Copy link’ button to quickly copy and share the link with the participants of your workshop. The ‘Manage’ button will take you directly to the session’s moderator interface (more details in chapter 4.3). By clicking the ‘Remove’ button, you can delete the session. Be careful, as by clicking this button you lose all the data contained in the session, and the unique link for the session will be inoperable.

6 Elements of the PHUSICOS simulation

This section helps you understand what you and players will see during the PHUSICOS simulation and what it means. Players take on roles and make decisions in a world that is still unknown to them. As the moderator, you will have to familiarize yourself with the mechanisms of all these specific elements in order to facilitate the game. In our experience, players’ questions will in a first instance often relate to what they can and cannot do in the game in relation to the different game elements and associated actions..

6.1.1 The Problem

The PHUSICOS simulation takes place in the Phusicos region with players taking on different stakeholder roles with high stakes in the current situation. With Phusicos City at its center, Phusicos region is surrounded by sharp mountain peaks and with a river that flows through the area. Occasional landslides and floods that intensified during the




past two decades wreak havoc among people living in the area, destroying their livelihood. The region also faces other economic and societal challenges, which disturb the efforts to lower the risk of further damages. Players have a year (12 phases representing months) to decide their priorities and decide which of the proposed projects – green solutions or grey solutions, or both - should be implemented in the region. Only the projects that are fully funded at the end of November, will be implemented. The feedback is given in two dimensions – immediately after acceptance of the budget (December) to show the initial reactions to the plans – and in long-term (Future) to show the outcomes of the decisions.

During the simulation, players participate in negotiations on various levels: internal organizational, and bilateral. They are also invited to participate in series of obligatory public consultations that provide another opportunity to collectively decide on the course of action. At the same time, participants need to navigate the inflow of information about the current situation and future prognosis about the benefits and co-benefits of projects in form of newspaper and scientific journal posts and community voices.

6.1.2 Organizations and their members (Players)

In many cases, responsibilities were intentionally split between roles to provide incentives for cooperation. Whether players cooperate or not is up to them, but clear opportunities for working together have been built into the different stakeholder roles.

Table 1 Playable stakeholders in the PHUSICOS simulation

Icon	Full name	Description
	Local Government: infrastructure and development	The Department of Infrastructure and Development is responsible for local infrastructure and the collaboration with country-level administration.
	Local Government: environment and tourism development	The Department of Environment & Tourism Development is responsible for the development of local tourism and recreational areas.
	Local Government: Civil Protection Agency	The Local Civil Protection Agency is responsible for promoting preparedness and the implementation of protective measures on a regional scale.



National Civil Protection Agency

The National Civil Protection Agency is responsible for promoting preparedness and implementation of protective measures on a national scale.



Ministry of Environment and National Parks

The Ministry of Environment and National Parks is responsible for forest and mountain areas in the region, which officially belong to the state.



River Basin Authority

The River Basin Authority is an international organization responsible for the management of the river basin.



Local Entrepreneurs Group

The Local Entrepreneurs Group is a local organization that promotes local business and economic development in the region.



Local Farmers Collective

The Local Farmers Collective is a local organization that protects the interest of the local farmer community.



Environmental NGO

The Environmental NGO is a local non-governmental organization focused on promoting sustainability and the natural environment.

Player's logins and role distribution

To enable players to log into the simulation, send them a link to a session you generated. They will see a list of available roles. On the login screen, players will be able to choose their roles by clicking 'Select'. If more than 9 players are joining your session, after all roles are taken, new roles will automatically pop-up on the screen.

You can divide players on a voluntary basis or ask them to choose a specific role depending on what effect you want to achieve. Players tend to choose the roles they are the most familiar with, so if you want them to look at the system from a different perspective.

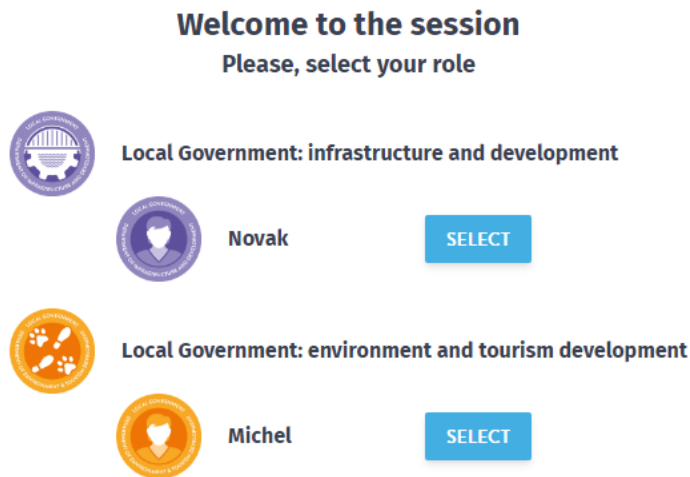


Figure x

6.1.3 Investments decisions

The participants can choose from various potential investments that represent both green and grey infrastructure. Each organization has specific bias towards one or more available projects.

Table 2 Projects available for players

Name	Description	Type of solution
Reconstruction of the river bed	The measure encompasses the widening, deepening, and re-meandering of the river bed. This might regulate the river flow and reduce sediment delivery, thus decreasing the risk of floods. It will also positively affect the local biodiversity and increase soil retention (Environment). The investment requires the use of land next to the river for implementation. The project will also require expert knowledge and specialized force to finish up the job (Technical feasibility). The project might also bring some potential challenges connected to the increased erosion.	Green
	Time necessary for implementation: long-term	

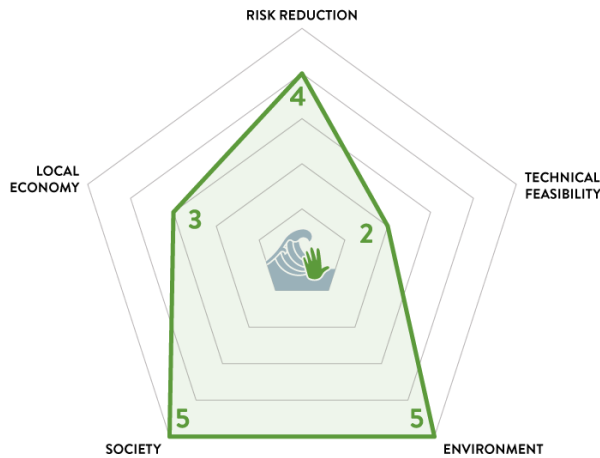


Figure x

Planting of indigenous plants on riverbanks

The measure encompasses planting selected species of indigenous plants on the riverbanks. This might potentially increase the water quality (due to filtration) and reduce riverbank erosion. The project will create new habitats for riverine flora (Environment). The project might also bring some potential challenges connected to the maintenance and the vegetation of the plants and reducing the area available for other activities (Technical feasibility).

Green

Time necessary for implementation: medium-term



Figure x

Reforestation in upstream area of the river (multiple vegetation layers)

The measure encompasses reforestation in the upstream area of the river. This might potentially increase water retention and create shelter and new habitats for local species (Environment). It will also help to decrease soil erosion. The investment requires the use of land next to the river for implementation. It also requires a lot of workforce

Green

and expertise during the planning process (Technical feasibility). In the long run, new forest can, if well maintained increase the aesthetic and touristic potential of the region

Time necessary for implementation: long-term

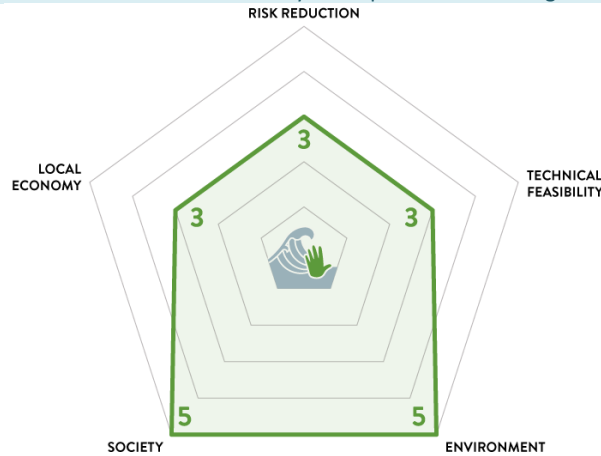


Figure x

Revegetate steep slopes: 'hydro seeding' or 'spray cover' grasses on mountain pastures

The measure encompasses the revegetation of steep slopes in the region. The project might diversify the local species and make them more visually attractive (Environment & Society). It potentially minimizes the dangers of local landslides but requires expert knowledge to implement (Technical feasibility). The investment requires the use of a big acreage of land.

Time necessary for implementation: medium-term

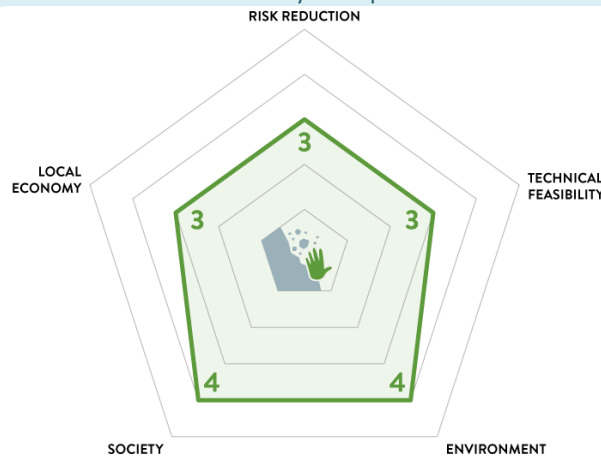


Figure x

Afforestation of mountain slopes

The measure encompasses the afforestation of mountain slopes and temporal retention nets that will protect the slopes during the growth process. This might potentially increase water retention and

Green

create shelter and new habitats for local species (Environment). The investment could potentially slow down erosion. It will also require some acreage of land.

Time necessary for implementation: long-term

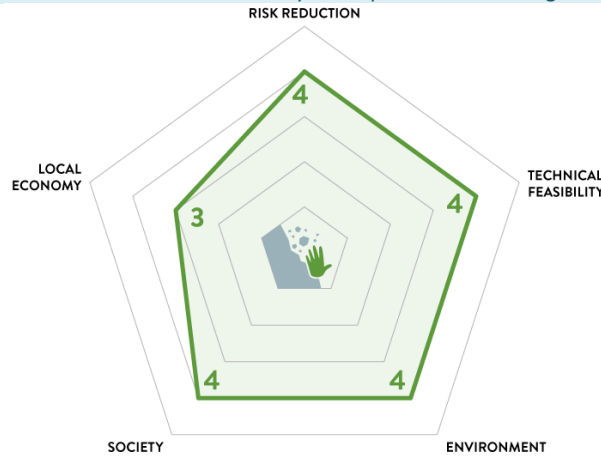


Figure x

<p>Dam</p>	<p>The measure encompasses erecting a dam. The investment will protect the local community from floods. It's a very well-known measure, often connected with safety. There are many people in favor of the dam among the community and decision-makers, but it's aesthetic value is dubious. It may potentially also serve as a risk to the landscape heritage, not only directly in the PHUSICOS, but also downstream from the region. But the investment also has a lot of downsides, e.g., it will be a barrier to the spread of local species and influence river flow (Environment). The act of erecting the dam is costly, as are the future maintenance costs (Technical feasibility).</p> <p>Time necessary for implementation: long-term</p>	<p>Grey</p>
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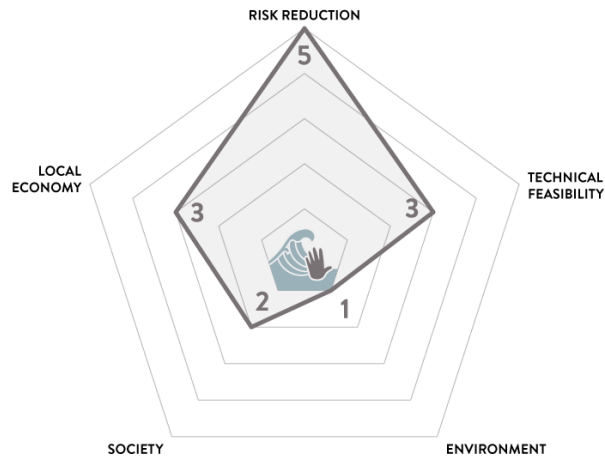


Figure x

Retention nets (for soil and rock falls) The measure encompasses the use of retention nets for preventing / protection against soil and rock falls. It decreases the dangers of local landslides. The process of implementation is short and doesn't require vast acreage of land (Technical feasibility). Depending on the placement, nets might negatively influence the spread and condition of local fauna and flora, as well as decreasing its attractiveness (Environment & Society). The process can lead to high maintenance costs.

Time necessary for implementation: long-term

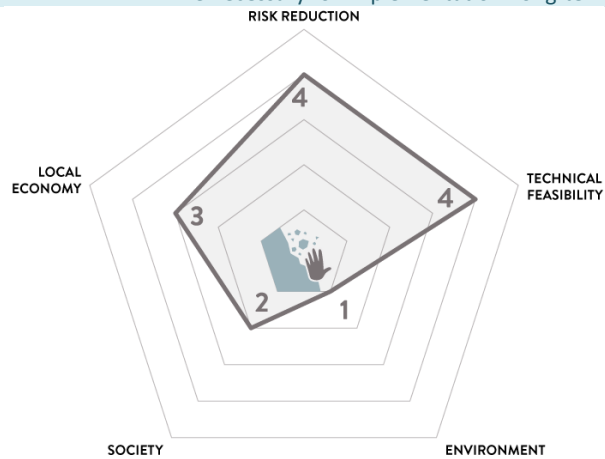


Figure x

6.1.4 Moderator's Interface

The moderator's interface is composed of left and right sidebars. The left sidebar enables a moderator to go back to a list of created games ('Main Menu') and log out of the platform. It also provides basic information on the status of the game ('Phase'). The right sidebar consists of control buttons used during the game. The 'Redirections' buttons allow a moderator to transport players to specific tabs within the game (e.g., chat or investment window). The 'Other' buttons allow a moderator to manage the information flow ('Post groups', 'Assets'), players activities ('Users', 'Block Investments'), and time flow ('Next phase').

Besides the control panel visible only to moderators, a moderator sees all the information available to the players, including discussion in public and internal chats.

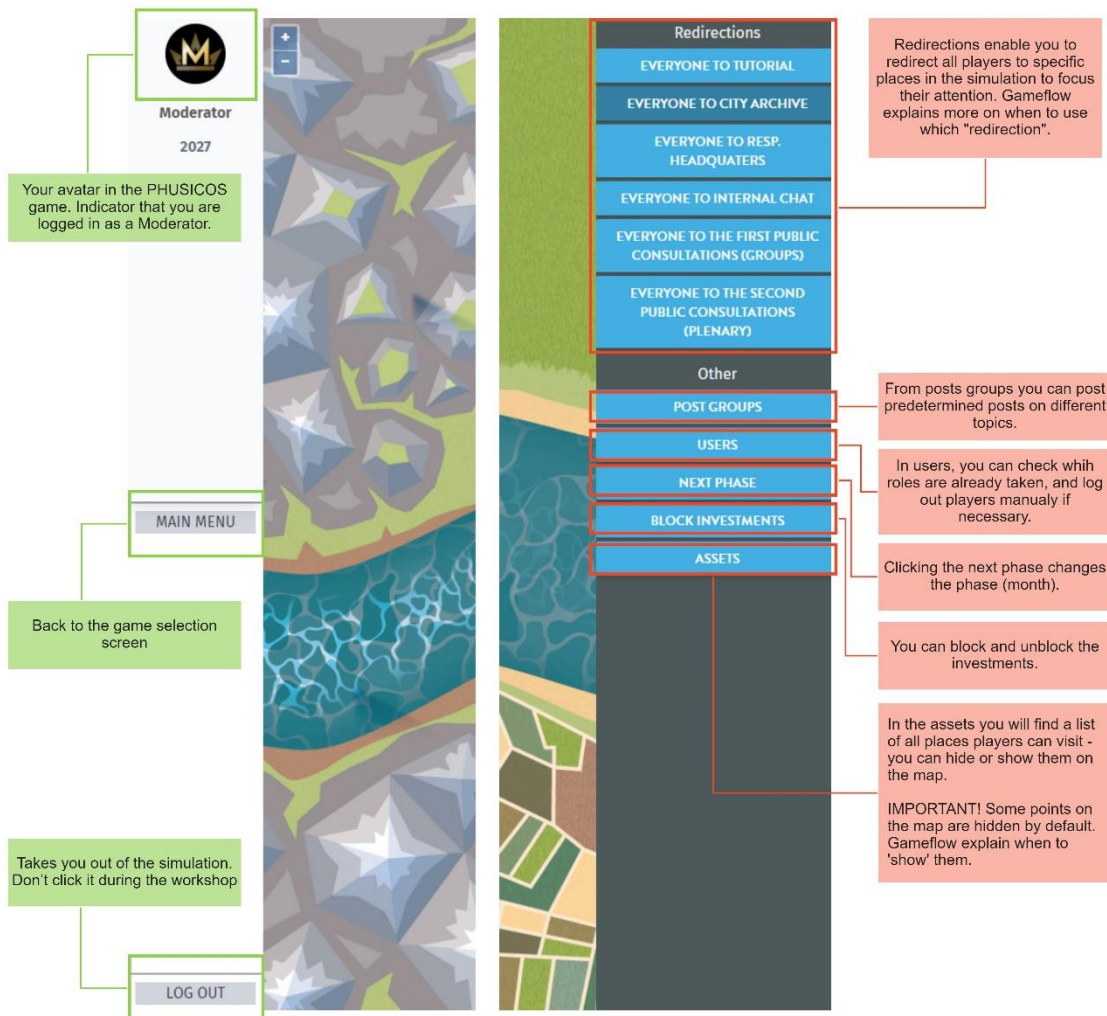


Figure XY Graphic explaining moderator interface. The view on the left and right sidebars.

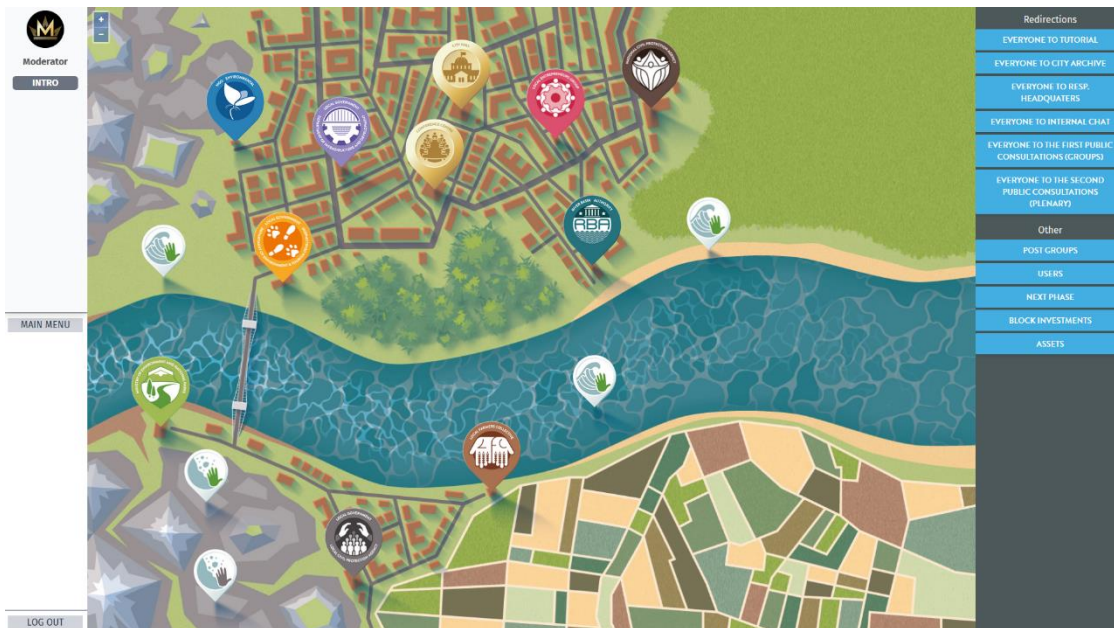


Figure xy The full view on the moderator's interface.

6.1.5 Player's Interface

The player's interface is based on the idea of an interactive map, which players can explore freely or with guidance from the moderator. Players can visit potential investments sites, support investments by dividing their organizational budget, or veto projects that they deem unsuitable for the region. While exploring, they can communicate via chat messages available in public locations or visit different organizations to negotiate in smaller groups.



Figure x General view in the PHUSICOS simulation interface from a player's perspective.

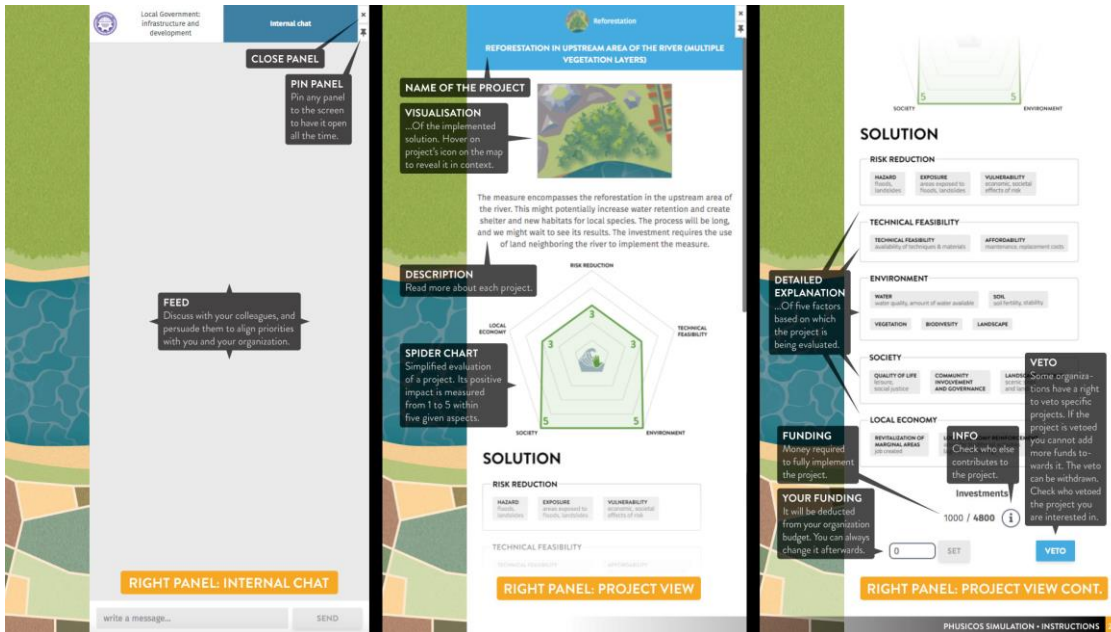


Figure x View on chat and projects in the PHUSICOS simulation interface from a player's perspective.

Instructions for players are also attached as graphic and can be shared with players directly.

7 Flow of the simulation

The moderator plays a critical role in guiding players through social simulations. He or she is a game master, facilitator, and helper. However, moderators also have to be careful not to get too involved in the action. Although they are responsible for outlining in the key aims and steps the game, they should more be seen as detached advisers than engaged wizards. Moderators are responsible for guiding players through a smooth gameplay and for answering technical questions. However, they should try to avoid telling players how to act strategically or what exact steps to take. The reason for this is that players are supposed to test ideas and solutions independently – there is no ‘right’ or ‘wrong’ way to play the game.

Table 3 ‘Dos’ and ‘Don’ts’ of facilitating the simulation

DOs	DON'Ts
Be confident and assertive	Don't set goals
Allow players to ask questions	Don't rely too much on notes
Make it fun and engaging	Don't jump from point to point
Practice your introduction!	Don't emphasize winning/losing

Be reassuring! (“Confusion is normal, you will get it”)	Don’t obsess over keeping an eye on the time during the introduction and debriefing
Organize the introduction in a sensible way - basic information should always be communicated to all	Don’t provide too much information at once
Focus on the game – you can talk about the real world in debriefing	Don’t get carried away in discussing real-life issues rather than the game setting during the gameplay

7.1.1 Introduction

The introduction is the first chance for players to familiarize themselves with the new world they are occupying. It is the space where you define what is important, what they need to know, and how you will proceed. The introduction should be practiced and contain enough information without giving away too much.

It is not essential that you use exactly what we have included here – you know your audience best, and you may find that they need more or less information depending on the context and their background. As you adjust the introduction to your audience, keep in mind that there is a limit to how much new information someone can take up at once. It is fine to move relatively quickly to the gameplay itself. Players will receive additional in-game instructions which will guide them step by step. Be prepared to answer their questions throughout the simulation.

We propose this general structure for the introduction:

- A short overview of the key parts of the workshop (introduction, simulation, debriefing, survey);
- Your aim in playing the simulation - this may differ depending on the group you are playing the simulation with;
- A short introduction to social simulations;
- A short introduction to the rules of the simulation; and
- A short introduction to the game flow.

Before you start the simulation:

1. Ask if there are any questions

It is good practice to check with the participants if they understood everything. You may encourage players to ask/write down questions even before the end of the introduction of the game rules and world? When participants ask for elements that will be explained later - be polite but tell them that it will come up later.

2. Establish communication channels

Players might be confused about how to communicate with other participants. Should they talk through a simulation? Or should they use the teleconference chat (during online workshops?). When doing the introduction in an online workshop, have players join a

teleconference. They can hear your voice and see your screen as you lead the introduction. Encourage participants to turn on their cameras when possible.

3. Create breakout rooms

If you want to give players a chance to discuss their actions per voice chat, create breakout rooms in a number of organizations in the simulation. You can also rename the breakout rooms so it's easier to operate. Before you open the breakout rooms, you need to give participants a clear announcement on what will happen next and how it will affect the communication.

7.1.2 Gameflow

The PHUSICOS simulation was prepared to be played via 13 rounds. However, you can accelerate the game by skipping some of these rounds in order to fit your timeframe. In this particular simulation, moderators can manage and influence what players are seeing and when. Depending on players' decisions, moderators can send players additional information that would directly answer to what has happened in PHUSICOS region.

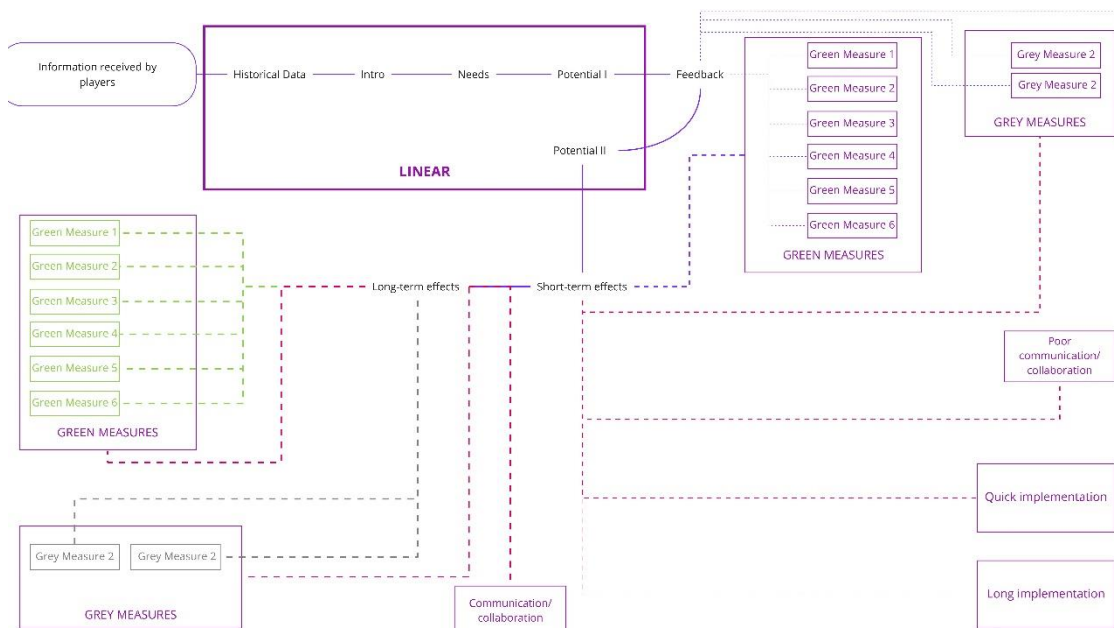


Figure x Information flow in the PHUSICOS simulation. Moderator starts with sharing linear information, and then depending on players' decisions, shares posts tailored to the situation.

To focus players' attention, moderators can also redirect players to specific places in the PHUSICOS region. The moderator interface is explained in section 4.1.3. Any moderator can slightly adjust the game flow to fit within the context of their workshop.

Round 0 (around 10 minutes, shorten/extend time accordingly): JANUARY (around 10 minutes, shorten/extend time accordingly)

FEBRUARY (around 10 minutes, shorten/extend time accordingly)
MARCH (around 10 minutes, shorten/extend time accordingly)
APRIL (around 10 minutes, shorten/extend time accordingly)
MAY (around 10 minutes, shorten/extend time accordingly)
JUNE (around 10 minutes, shorten/extend time accordingly)
JULY (around 10 minutes, shorten/extend time accordingly)
AUGUST (around 5 minutes, shorten/extend time accordingly)
SEPTEMBER (around 5 minutes, shorten/extend time accordingly)
OCTOBER (around 10 minutes, shorten/extend time accordingly)
NOVEMBER (around 10 minutes, shorten/extend time accordingly)
DECEMBER (around 10 minutes, shorten/extend time accordingly)
THE FUTURE (around 10 minutes, shorten/extend time accordingly)
DEBRIEFING

7.1.3 Debriefing

The debriefing provides players the opportunity to reflect on what they did, why they did it and what it meant. It also provides time for bridging the gap between the game's world and reality. We have a tendency in running workshops to let participants play a little longer when they're having fun and cut the debriefing short. This is a mistake. The debriefing is the time when we close the experiential learning cycle. Finding a solution in the simulation is not enough. Without reflection and abstract conceptualization, we are not able to understand why the solution was chosen or how it could be modified to be even more effective.

Debriefing can take place simply through the simulation itself. As a moderator you also have the access to the chat, and you already have players split in the groups. You can use it to ask a few simple questions about the results of the simulation.

To continue with the debriefing, you can simply use conference software, or you can use another method, for example virtual whiteboard. For the face-to-face workshop you can discuss the outcomes of the simulation while being seated in a circle or work in groups with a flipchart. In choosing your method of organizing the debriefing, please take the following things into consideration:

- Number of players: The more participants there are, the more difficult it will be for you to ask questions in plenary; and
- Familiarity of the software: If the participants do not know the software you want to use for the game, bear in mind that you will have to explain and introduce it during the workshop. No matter the technique, there are a few important rules to follow in a debriefing.
- Make sure the participants' attention is on you: Players should be following your announcements throughout the game.

Prepare to ask questions

Did you observe the players? Great, you can now use your observations to engage players in the Debriefing. Try to engage participants by asking questions, e.g., how they feel they are doing, what challenges they encountered and more.

Prepare to answer questions

In the Debriefing, players will often ask: WHY? They might be confused about some of the results. Depending on the question, you might want to answer them yourself or redirect them towards other participants.

Table 4 Debriefing overview

Phase	Topic	Discussion points	Format
What?	Results Overview	⇒Quick overview of what happened ⇒Map ⇒Role-by-role	Moderator > Whole group
So What? Part 1	Reflection on the simulation experience	⇒Goals ⇒Challenges ⇒Relationships with other roles ⇒Interlinkages in the systems	Small-group discussion
So What? Part 2	Plenary	Summary	Participants > Whole group
Now What? Part 1	Bridging with Real World	⇒Connections between game world and real world ⇒Trade-offs and synergies in the real world ⇒Effective and ineffective solutions and approaches to problem-solving	Small-group discussion
Now What? Part 2	Plenary	Summary	Participants > Whole group
Evaluation	Individual reflection	⇒Lessons learned ⇒Game survey	Individual

Examples of debriefing questions

What?

- What DRR solutions did players invest in ?
- Where did they see growth?
- What happened ?

So What?

Goals:

- What was your role in the game?
- What goals were you able to achieve (in whole or in part)?

Challenges:

- What made the pursuit of your goal(s) difficult?
- Were there any particular situations that were challenging or frustrating?

Cooperation:

- What interconnections have you observed between you (your decisions) and other roles (their decisions)?
- How well did you work with other roles?

Now What?

Similarities to the real world

- What similarities have you observed between the game and the situation in your area?
- What lessons learnt can you extract from playing the simulation?

Inspirations

- What inspirations did the game bring you to do differently / to initiate in your job/area?

7.1.4 Survey

At the end of the simulation workshop, we ask you to share the simulation survey with the participants.

We encourage moderators to run this survey, as it will help us gather data on the players' game experience in order to understand what impact (if any) the PHUSICOS simulation had on the players. The simulation survey is in form of an online Google form document, and can be accessed [here](#). To make it easier, for moderators we embed the survey in the game in form of a link a moderator can send to players at the end of the session.

We invite simulation users to contact us in relation to research based on the post-game surveys.

8 References

- Berkes, F., Colding, J., & Folke, C. (Eds.). (2008). Navigating social-ecological systems: building resilience for complexity and change. Cambridge University Press.
- De Vries, B. J. (2012). Sustainability science. Cambridge University Press.
- Duke, R. D., & Geurts, J. L. (2004). Policy Games for Strategic Management: Pathways to the Unknown West Lafayette, IN.
- Holland, J. H. (1992). Complex adaptive systems. *Daedalus*, 121(1), 17-30.
- Kolb, D., 2015. *Experiential Learning. Experience as the Source of Learning and Development*. Second Edition. Upper Saddle River, New Jersey: Pearson Education, Inc.
- Keen, M., Brown, V., Dybal, R., 2005. *Social Learning in Environmental Management*. Earthscan, London, UK.

Linnerooth-Bayer, J (2021) On decision-analytical support for wicked policy problems, *Risk Analysis*, Vol. 41, No. 6.

Martin, J.G.C., Scolobig, A., Linnerooth-Bayer, J., Liu, W. and Balsiger, J. (2021). Catalyzing Innovation: Governance Enablers of Nature-Based Solutions. *Sustainability* 13 (4).

Mochizuki, J., Magnuszewski, P., & Linnerooth-Bayer, J. (2018). Games for aiding stakeholder deliberation on Nexus policy issues. In *Managing Water, Soil and Waste Resources to Achieve Sustainable Development Goals* (pp. 93-124). Springer, Cham.

Scolobig, A., Thompson, M., & Linnerooth-Bayer, J. (2016). Compromise not consensus: Designing a participatory process for landslide risk mitigation. *Natural Hazards*, 81, 45–68

Sterman, J. (2000). *Business Dynamics. Systems Thinking and Modeling for a Complex World*. Boston: Irwin McGraw-Hil

Thompson, M. (2018). Wicked environmental problems. In N. C. M. Hulme & J. D. Proctor (Eds.), *Companion to environmental studies* (pp. 258–262). Abingdon, UK: Routledge.



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