

# A literature review about Social Policy Simulation Games

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## 1 Abstract

The increasingly fast rate of evolution of technology enabled the creation and implementation of new teaching/training tools and techniques. From this, a number of alternative models have been developed, the social policy simulation games. Gaming simulations for policy and decision making have been closely associated with educational and training games. The use of simulation games in the educational process allows the user to gain a first hand understanding of the processes of real life. Public-administration, public-policy and political-science courses increasingly adopt simulation games in universities worldwide for the use of teaching or decision making. Simulation-Serious Games aim to connect or narrow the gap between universities, where all the theoretical studies take place, and the real world, where people need to apply their knowledge. In this paper, we will explore real-world use cases of social policy simulation games, identify applied markets of these games while using the G/P/S model to classify potential games.

## 2 Introduction

### 2.1 An introduction to Serious Games

There are many definitions of what a serious game is, which all go back to the 1970s. The first formal definition was introduced by Abt, who presents simulations and games to improve education, both inside and outside of the classroom [5]. One of the most modern definitions we found was the one Zyda proposed in 2005, which is the following. Serious game is a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives [76]. Although, the general definition of serious games seems to be shared by many people, a slightly different definition might be used in each field of study.

Serious games (SGs) are games primarily intended for education, rather than amusement. In recent years, Serious Games have been used in many different fields including agriculture, risk management, food security, water resource management, climate change, environmental management, health and education [19]. The use of simulation games in the educational process allows the users to gain first hand understanding of the processes of real life. Simulation games allow users to get closer to reality and to practice their knowledge in an interesting way, to learn about interpersonal interaction and collective decision-making and to understand that the individual bears responsibility for decisions made or not made. [39] Scholars from the gaming/simulation discipline have frequently reported on the use of gaming in policy and strategic change projects in a large variety of organizations [60]. However, it's difficult to find successful implementations of them [27].

### 2.2 Social Policy Simulation Games

Social Policy Simulation Games can be considered as a subset of serious games. Simulation games refer to a situation in which human participants play a role and follow certain rules to simulate a complex real-world phenomenon. Such a game can enhance participant's understanding of the complexities involved in the big picture, which might facilitate improvement [37]. The simulated world allows users to gain insights of a problem first-hand, including the social interactions among multiple stakeholders with conflicting agendas, problem frames and worldviews. Moreover, different policy solutions and their tradeoffs are discussed and negotiated amongst stakeholders. [43] Simulation games have been proven most effective for education and decision making and they are able to provide an interactive environment to facilitate these purposes. [38] Game simulations may provide one or more advantages as research tools including:

1. ease of observation and data collection,
2. reproducibility,
3. lower cost

4. ability to study phenomenon where direct research is not ethically, politically, or socially acceptable.[58]

### 2.3 An introduction to the G/P/S model

In recent years, many serious games have become an industry standard. When any topic becomes suddenly available with a wide variety of options, it encourages a natural desire to classify it. Fasli and Michalakopoulos(2006) indicate that nowadays there is no standard classification of games [20], while Kutergina(2017) indicates that simulations should be divided into two groups, the person-to-person simulations and the person-to-computer simulations[39]. However, the most widely known classification method is the G/P/S model which stands for Gameplay, Purpose and Scope. Therefore, we aim to classify any social policy simulation games proposed in this paper using the G/P/S model.

The G/P/S model was introduced by Damien Djaouti, Julian Alvarez, and Jean-Pierre Jessel in 2019 [17], where they spotted a gap in the classification of serious games, primarily because previous classifications focused solely in one field, but this model can classify any Serious Game by the same set of criteria, as they provide a “broad view”. More specifically, the G/P/S model relies on three aspects:

1. **Gameplay**, which refers to the type of gameplay used. This aspect is intended to provide information about the game structure of the Serious Game: how it is played. Gameplay is a combination of rules, input, space related setup, time related setup and drama related setup[57]. A game can also be play-based, which means that there are no goals to achieve playing the game or game-based that has goals to achieve while playing.
2. **Purpose**, which refers to the designed purpose. This aspect accounts for the eventual purpose(s) apart from entertainment intended by the designer of the Serious Game. Purpose has to do with the reason that the game has been released. There are educational/learning oriented games or advert games which target to broadcast advertising. Both categories share a common goal: delivering a message to the audience. Additionally, the purpose is classified by training (improving performance or skills in a specific sector) or data exchange between certain groups of people for a common goal.
3. **Scope**, which refers to the targeted application(s) of the title. This aspect suggests the actual use(s) related to the Serious Game: the kind of market, the audience: who uses it. Scope has to do with the audience the game is designed for, having 2 big categories which are market and public. Some market examples are, military, healthcare, education, corporate, politics, scientific research.

Next, we will begin presenting social policy simulation games classified by the well-known G/P/S model.

## 3 Presenting some social policy simulation games

### 3.1 The Sudan Game

The **SUDAN GAME**, an interactive model of the country in the time period leading up to the Sudanese referendum on the secession of the South. While many simulations are designed to educate about their subjects, the SUDAN GAME is intended to be a prototype for policy making via gameplay[40]. The SUDAN GAME is implemented in a game called COSMOPOLIS[66], a massive multiplayer online (MMO) game.

In this model, tribe members interact to learn new facts about a set of key beliefs. As tribe members' beliefs diverge or converge, Sudan becomes decreasingly or increasingly stable. Players can intervene to increase particular portions of Sudan's population's knowledge of different issues, thus increasing the country's stability. The SUDAN GAME is interesting both because it is based around a current, real-world political issue, and also because it represents a class of policy games associated with state instability in two-group states. The game is heavily inspired by Sudan's current geopolitical state. Its purpose is to hook into the model to make it amenable to real-time human manipulation.

In the game, the player takes on the role of a UN official in Khartoum, tasked with easing the tension present in relationships between the Sudanese tribes. As the official, the player talks with the different Sudanese leaders to learn their perspectives on how the different tribes should be influenced, and then asks one of the leaders to make a particular intervention on the population. A number of 20 interventions is considered as a maximum number of turns for the player, although it's a subject for debate. The player should try and get a hostility number equal or below 0.2, after 20 interventions. If this is achieved, the player is considered victorious.

In summary, the game pushes the players to successfully develop complete solutions that equal or improve on the range of hostility values for the country. The game also educates players about the Sudanese culture and state. Since it's a MMO game, it allows players to use their creativity to reach their goals.

- Gameplay:  
Type: Play-Based.  
Goals: None.  
Means: Move, Manage, Select.
- Purpose:  
Purposes: Informative message broadcasting.
- Scope:  
Markets: Politics, Humanitarian  
Target audience: General Public

## 3.2 Tropico

**Tropico**, was released in 2001 by PopTop Software Inc.[34], where a player takes on the role of governing a small Cold-War Era Caribbean island and managing its economy, population and industries. On the island of Tropico, every citizen has individual needs and faction sympathies, which vary depending upon player decisions, actions, and the availability of certain services or facilities, and can become part of and form families of other Tropicans [41]. There are six political factions on the island, most with mutually contradictory goals, and player success is dependent on appeasing the majority of residents in order to avoid being voted out of office in one of the game's periodic elections, deposed in a military coup d'état, popular revolution, guerrilla rebellion or foreign intervention. The player may define various victory criteria before the game begins, which includes general citizen happiness, the size of the island's treasury or the size of his personal Swiss bank account. Before playing, the player must "create" a character by choosing various attributes, including how they rose to power, their background, positive traits and negative traits. These initial character creation steps will affect some things on the island[64].

The player will experience dictatorship, democracy, trade, export and tourism in the pursuit of their own ultimate goal. Although the drama a player will experience is richly detailed, the ultimate conclusion is the dominant aspect of the game. In any given playing of the game the user will have, at the outset, one of a variety of different goals, each of which will necessitate different – in many cases, mutually exclusive to each other – strategies to accomplish. These decisions will create a vastly different experience for the player and the characters in the game.

- Gameplay:  
Type: Play-based.  
Goals: None.  
Means: Create, Manage
- Purpose:  
Purposes: Subjective message broadcasting.
- Scope:  
Markets: Entertainment  
Target Audience: 12 to 25 years old, General Public

## 3.3 FatWorld

A video game called **FatWorld** teaches its players about the underlying politics of obesity and nutrition and the socioeconomics in the United States[24]. A player sets up an entire virtual world by establishing its political regime, by setting up an economy, introducing market regulations, subsidies, and special

interest groups. The user then slips into the role of a citizen of this FatWorld and configures their characteristics, e.g. specific food allergies, walks around in the city, buys houses, opens up a restaurant, pays taxes etc. To bypass malnutrition and overweight, the citizen can choose to do exercises and eat healthy or indulge in a more sedentary lifestyle. The life a player chooses to live in FatWorld will have an impact on the character's well-being and health, regardless if the player sets any deliberate actions.[10]

This game illustrates the complexity of nutrition policies from the perspective of 'daily life'. The game's purpose is to broadcast an educative message, to teach its users about nutrition.

- **Gameplay:**  
 Type: Game-based.  
 Goals: Avoid, Match.  
 Means: Move, Manage, Select.
- **Purpose:**  
 Purposes: Educative message broadcasting, Informative message broadcasting.
- **Scope:**  
 Markets: Healthcare.  
 Target audience: 8- to 25-year-olds, General Public.

### 3.4 September 12th

**September 12th**, a news-related game created by video game researcher Gonzalo Frasca in 2003[22]. This game presents the player with an unnamed village in the Middle East. The village is inhabited by a number of terrorists and many innocent people. The player is able to shoot missiles into the village, but the delay between pulling the trigger and hitting the target, and the area effect of the explosion, makes it very hard to kill a specific target. If the player kills innocent people their virtual relatives will mourn their loss and become terrorists to avenge them. This game provides no goals or judgment of a player's choices. It shows players only the consequences of their actions. This military game is a type of "interactive essay" about "military response" that was chosen by the US government after the 9/11 tragedy.

September 12th is intended to make people aware about the counter-effects in using violence to resolve the problem of terrorism[51]. This game provides us with the assertion "missiles are awful" and nothing else to work with, without offering alternatives or nuance[15]. In other words, the game tries to teach us that violence is not solved with violence.

- **Gameplay:**  
 Type: Play-based.

Goals:None.

Means: Shoot.

- Purpose:

Purposes: Subjective message broadcasting.

- Scope:

Markets: Politics.

Target audience: 17 to more than 60-year-olds, General Public.

### 3.5 Kabul Kaboom

**Kabul Kaboom**[21] is the very first newsgame founded by Gonzalo Frasca in 2001. The player's goal is to collect food falling from the sky while avoiding falling bombs. After playing for a short while it becomes clear that there is no way of winning this game. The game always ends in failure. This guaranteed failure, initially unknown to the player, allows the player to discover and experience firsthand the author's opinion about the event it simulates[70].

Kabul Kaboom is able to express a critique of the United State's foreign policy following the incidents of September 11th[71]. In this game the rules guarantee that the player is going to lose by being hit with a bomb. The meaning of the game is understood as the player enacts the rule system, communicating how a foreign policy that involves dropping food and bombs on the same country will ultimately end in failure and hurt the people that the food is meant for.

- Gameplay:

Type:Game-Based

Goals:Avoid

Means:Move

- Purpose:

Purposes:Subjective message broadcasting.

- Scope:

Markets:Politics,Humanitarian

Target Audience:17 or more year olds,General Public.

### 3.6 Lagom Island

**Lagom Island**[16] is a turn based resource management simulator in which the player manages an island with the goal of creating the "right" landscape – a sustainable and desirable island. The game would begin with either a blank slate or a degraded landscape so that players are not punished for interfering with an already perfect environment. The player takes control of a group of settlers

arriving by boat to the island. To begin with, game time moves at a rate of one month per turn, but after a while it will speed up to a rate of 6 or 12 months per turn. The player has a suite of actions and resources that they can use to make decisions about “development” or “habitation” of the island.

The game includes a predefined scoring index that translates elements such as food, housing, waste treatment and recreation as currency into the game. There is also a user-defined happiness index, in which the user sets up their own reward system by ranking their priorities, such as consumer goods or biodiversity. The game will rank players against the pre-determined metrics, as well as their own index.

The goal of this game is to capture revealed preference data from players. Through players’ behavior in the game, we can infer the value that players place on different ecosystem services. In the game, players would reveal their preferences for various elements of an ecosystem through managing trade-offs between these elements in a dynamic, whole systems, framework.

- Gameplay:  
     Type: Play-Based  
     Goals: None  
     Means: Move, Select, Create
- Purpose:  
     Purposes: Data exchange.
- Scope:  
     Markets: Entertainment  
     Target Audience: 17 to 25 year olds, General Public.

### 3.7 Microsoft Flight Simulator X

With fuel, insurance, and maintenance costs increasing, the cost of flight training is continuing to rise as well. These increases, added to an already expensive endeavor, make affording flight training a more difficult task for flight students. To counter these effects, simulation has become widely used to support flight training curricula as a lower cost alternative.[13]. For this reason, **Microsoft Flight Simulator X** (MFSX)[49] was used in order to train pilots. The pilots were separated in 2 groups, one group was trained only in a real aircraft and the other group was trained in MFSX. Eligibility for the study required that participants have no prior flight training, little to no experience using MFSX, and comfort using a computer. Preference was given to individuals who answered affirmatively to having a strong desire to learn to fly. From the group of volunteers meeting these requirements, eighteen were randomly selected to participate.

Although the sample size of the study Mark N., Wayne A., Wendy S., Paul A. and Steve G.[13] did was small, the results suggest that positive transfer is achieved when using MFSX prior to training in an aircraft. A larger sample size would need to be tested in order to verify these results.



- Gameplay:  
Type:Play-Based  
Goals:None  
Means:Move
- Purpose:  
Purposes:Educative message broadcasting.
- Scope:  
Markets:Education  
Target Audience:14 or more year olds,General Public.

### 3.8 Ambush

**AMBUSH** was part of a DARPA “DARWARS” project[44] and uses the Operation Flashpoint[65] game as a tool to teach teams of people to perform specific military missions. This game-based system has been deployed to over 100 sites around the world. Its original mission was to teach defensive behaviors to convoy units that are ambushed. But a number of scenarios have been created to teach additional skills since its first fielding, like route clearing, natural disaster relief, orienteering, search and rescue, and interrogation skills. It is also been served as a distribution center for scenarios that are created by other organizations like Los Alamos National Labs and units that train with the game. Recently a unit in Iraq used the game to create a Machinima training video showing the right and wrong decisions they made in trying to apprehend a group of insurgents[8].

The main scope, of using simulation games in military, is to prepare soldiers for the situations and obstacles that may appear in the real world, to make them able to take decisions faster and safer. Military simulations are simulations in which theories of warfare can be tested and refined without the need for actual hostilities.[61]

The conclusion, that many researchers reached is that military games can improve the user’s motivation, they help to motivate users in the training. But there is still no clear indication that they improve their performance or their decision making. There is still much room for researchers to explore.

- Gameplay:  
Type:Game-Based  
Goals:Avoid,Destroy  
Means:Manage
- Purpose:  
Purposes:Data exchange

- Scope:  
Markets:Military  
Target Audience:12 or more year olds,General Public.

### 3.9 (After)Fantasy

**(After)Fantasy** is a board game-based social simulation,created by Centre for Systems Solutions (CRS), Michalina Kułakowska in 2024[14].It was designed to teach players valuable skills in cooperation, crisis management, and co-organizing activities. Set in a fantastical world, the game mirrors real-life challenges faced by groups and organizations.

Created for non-governmental organizations(NGOs), activists, social workers, and students, the game is suited for groups of 9 to 18 participants. Players take on the role of fictional elves, gaining firsthand experience of the difficulties that can arise during collaboration, such as prejudices, conflicting ambitions, or differing working styles. Through its magical setting in the world of Motus, (After)Fantasy provides a safe space to explore these obstacles and develop strategies to overcome them.

- Gameplay:  
Type:Play-Based  
Goals:None  
Means:Manage
- Purpose:  
Purposes:Educative message broadcasting.
- Scope:  
Markets:Education,Corporate  
Target Audience:General Public.

### 3.10 Up to You!

**Up to You!**[2]is an engaging and immersive game,it allows students to explore the interconnectedness of Sustainable Development Goals (SDGs) through active, hands-on learning rather than passive study of scientific facts.The Up to You simulation helps students navigate the complexity, uncertainty, and ambiguity inherent in the sustainability transition. It is supported by a Moderator Handbook, providing all the necessary guidance to prepare and facilitate gameplay for any chosen group.The game contains the teacher's toolkit,which offers practical training material for teachers to use the simulation and integrate issues of sustainability in blended teaching settings. It contains methodological support for moderation of participatory events and a set of activities to be run with students engaging them in the issue of sustainability, and developing a well-needed personal connection to it.

- Gameplay:
  - Type:Game-Based
  - Goals:Match
  - Means:Manage,Select
- Purpose:
  - Purposes:Educative message broadcasting.
- Scope:
  - Markets:Education
  - Target Audience:Student.

### 3.11 Virtual U

**The Virtual U Project**[46] is a simulation product created to help improve the management of the nation's university systems. Virtual U simulates running a university or college and assists management in allocating resources within the university. Virtual U was published in 2003 by William F. and Massy[45]. Participants will take the point of view of a university president. They will set institutional and departmental budgets and make decisions in areas such as faculty hiring and compensation, enrollment management, incentives for teaching and research, finance, facilities, and even parking. By taking the point of view of the university's president, users get a unique opportunity to see the operation of the institution as a whole.

Virtual U allows the user to explore the university as a system. The player can choose the kind of institution they wish manage: public or private, large or small, prestigious or not. This game helps the user improve their decision making by putting him in a seat of power and allows him to cultivate his managing skills.

- Gameplay:
  - Type:Play-Based
  - Goals:None
  - Means:Manage,Create,Select
- Purpose:
  - Purposes:Informative message broadcasting.
- Scope:
  - Markets:Education
  - Target Audience:17 to 60 year olds,Students,Professionals.

### 3.12 Re-Mission 1

**Re-Mission 1**[59], developed by HopeLab Industries, is a computer game that can be used by pediatric cancer patients to educate and prepare them for what they will experience both with cancer progression and from treatment[9]. This game enables players to assume the role of chemotherapy, pictured as futuristic nano-soldiers. These soldiers can enter the bodies of patients and eradicate cancer by shooting drug molecules. Based on real medical cases, this game is used inside clinics to present how chemotherapy works to young patients and also is distributed to the general public to raise their consciousness about cancer. Pediatric patients who play this game were found to have improved motivation and self-understanding of their illness[36].

- Gameplay:  
Type: Game-based  
Goals: Avoid, Match, Destroy  
Means: Move, Shoot
- Purpose:  
Purposes: Educative message broadcasting, Informative message broadcasting.
- Scope:
- Markets: Healthcare  
Target audience: 8- to 25-year-olds, General Public.

## 4 Identifying applied markets of simulation games and some examples

### 4.1 Use cases for Governments

Simulations for governments can range from municipal to a national level. Governmental games may focus on different kinds of tasks situations such as, different types of crisis management, for instance, dealing with terrorist attacks, disease outbreaks, biohazards, health care policy issues, city planning, traffic control, fire fighting, budget balancing, ethics training, and defensive driving[67][48]. Additionally, they might tackle tasks like political literacy, development of negotiation and persuasion skills. The main advantage of these simulations is that they can be run repeatedly. They can also be carried out with varying degrees of severity, at different locations, etc., often with low costs in personnel and material resources.[68]

- The **FuturGov**[23] serious game was created as part of the project The Future of Government 2030+: A Citizen-Centric Perspective of New Government Models research project combined foresight and speculative design methods to examine new methods in governance that could emerge

from changes in social, political and technological trends[73]. The tool is designed to encourage policy discussions and can be played by 4 to 8 participants, with an approximate duration of 2 hours. The game:

- Uses participants’ anticipatory assumptions about the future to foster conversations, negotiations, and collaborations in a participatory setting.
  - Examines emerging power dynamics while providing opportunities for critical reflection and deliberation.
  - Challenges participants’ hopes and expectations for the future, stimulating imagination, discussing emerging trends, and encouraging strategic thinking about future policy proposals.
  - Challenges participants’ hopes and expectations for the future, stimulating imagination, discussing emerging trends, and encouraging strategic thinking about future policy proposals.
  - Promotes collective intelligence and social collaboration to develop pathways for addressing future challenges and understanding the consequences of present-day decisions.
  - Facilitates structured discussions to explore diverse perspectives on a specific policy and analyze the socio-political landscape.
- \* Gameplay:
    - Type: Game-Based
    - Goals: Match
    - Means: Manage, Select, Write
  - \* Purpose:
    - Purposes: Educative message broadcasting, Informative message broadcasting, Training
  - \* Scope:
    - Markets: Governments, Education
    - Target Audience: 18 to 60 year olds, Students, Professionals

The conclusion that Vesnic and Alujevic made, was that FuturGov can generate rich conversations, negotiations and collaborations, it sets an environment where debate can take place. Moreover, the game used as a tool to promote Futures Literacy has been successful. The game contributes to the players developing political literacy and seems quite adaptable to a number of different contexts and use cases.[72]

- Due to the lack of interest of students for courses such as the introduction to the American government and the recognition that young people are fascinated by video games, there was an attempt to build a governance simulation on the popular computer game **SimCity**[18]. Although the video-game industry designed these sophisticated simulations to be played by a single participant rather than a large group, a simple set of rules was created that allows students to run them collectively. The rules are the following:

1. One student is assigned as the major of the city.
2. All the other students play members of the city council.
3. To perform any action, students must secure a majority vote of the class and the major's signature.
4. Lastly if the major does not consent to a bill, the class can override the veto with a two-thirds vote.[74]

The students had the chance to play as Democrats or Republicans. There is a point system in the game where students decide if they want to score points primarily by lobbying to improve social services or by lowering taxes. The point system differs for each student depending on their original choice. The game ends when a certain score, defined by the professor, is met or when the city is ruined in debt.

The conclusion of this experiment was that, although the use of SimCity-based simulations will not revolutionize political science and civics education, the integration of these simulations might generate enthusiasm among uninterested students. This experiment, has the ability to make students, who were disconnected from politics, interested about governance.

– Gameplay:

Type: Game-Based

Goals: Avoid, Match

Means: Manage, Move, Select, Write

– Purpose:

Purposes: Educative message broadcasting, Informative message broadcasting, Training

– Scope:

Markets: Entertainment

Target Audience: 8 to 60 year olds, General Public, Students, Professionals

## 4.2 Environmental Management

Serious environmental management games can improve understanding of practical environmental sustainability challenges by offering opportunities to obtain first-hand experiences that may be otherwise too costly, difficult or dangerous to reproduce in reality. Environmental management games can be applied in educational settings to promote awareness about sustainable resource planning and management among citizens.[42]

- In **SimEarth**[33], the player takes over the control of Earth. The player has the ability to manipulate Earth in any time period he desires. He controls the atmosphere, the geosphere, and the biosphere, forms continents, lets meteors rain, and observes how humanoid and non-humanoid civilisations rise and fall. He can choose to play specific scenarios on Earth,

to terraform Mars and Venus. In a menu on the left, tools can be chosen to change the surface, unleash catastrophes or plant animals and biota at specific places. The game begins in the geological age and ends in the nano-tech age, where the civilization can leave the planet.[62]

In summary, SimEarth holds a lot of potential for surprising outcomes that intrigue the player. Its possibilities are countless, in every run it shows divergent emergent behaviours. SimEarth remains a hybrid between a pure bottom-up and a top-down simulation. But this is exactly what opens up the possibility to play.

- Gameplay:  
Type: Game-Based  
Goals: Avoid, Match  
Means: Move, Random, Select
- Purpose:  
Purposes: Educative message broadcasting.
- Scope:  
Markets: Entertainment  
Target Audience: 8 to 25 year olds, General Public.

- The **PHUSICOS NBS simulation**[3] is a multiplayer, browser-based online game published in 2023. Designed for 8 to 40 players, with 1 to 3 facilitators per session. It explores the challenges of implementing Nature-Based Solutions (NBS) for disaster risk reduction.

Participants assume the roles of various stakeholders, each with distinct values, worldviews, and interests. Players evaluate different risk-reduction strategies, discussing the options while considering the co-benefits and trade-offs of nature-based solutions.

The simulation emphasizes stakeholder negotiations, prioritizing problems, planning and implementing solutions, and resolving conflicts through dialogue. Players collaboratively experiment with and test risk-reduction strategies, receiving instant feedback on the outcomes of their decisions, cultivating a dynamic and interactive learning experience.

NBS are gaining traction in international policy and business discourse. They offer huge potential to address both causes and consequences of climate change while supporting biodiversity[63]. However, NBS are cost-effective measures. The PHUSICOS NBS simulation demonstrates the benefits of NBS while aiming to capture the complex governance settings in which decisions on gray- and green[7] disaster risk reduction solutions are discussed, negotiated, funded and implemented.

- Gameplay:  
Type: Play-Based  
Goals: None  
Means: Manage, Write, Select

- Purpose:  
Purposes: Training
- Scope:  
Markets: Ecology, Education, State & Government  
Target Audience: 17 to 60 year olds, General Public, Students, Professionals
- The **Climate Science Crisis Simulation** was made by Trust in Science [32]. Designed for 12 to 60 participants, this simulation lasts approximately 3 to 4 hours. Players take part in the fictional Regain Trust Conference, tasked with discussing policies and measures to address the fallout from a solar geoengineering controversy and, crucially, to prevent future crises of trust in scientific expertise. Participants assume diverse roles—scientists, decision-makers, lobbyists—each bringing unique perspectives and complexities to the table, creating a rich and dynamic environment for dialogue and problem-solving.
  - Gameplay:  
Type: Play-Based  
Goals: None  
Means: Manage, Write
  - Purpose:  
Purposes: Educational message broadcasting, Informative message broadcasting, Training
  - Scope:  
Markets: Education, Ecology, State & Government  
Target Audience: 8 to 60 year olds, General Public, Students, Professionals
- **Stop Disasters!**[56] is a free to play game developed by Playerthree and United Nations. It is a disaster simulation strategy game with the educational goal of making players understand the risks underlying 5 types of natural disasters and how simple measures may be effective in preventing and mitigating the impact of those disasters. The game is free to play and is considered to be a social awareness game[52]. Focused on environment, social responsibility and education issues. In the game players are tasked with the mission to prepare a community living in a disaster prone area to prevent and mitigate the impact of those disasters. To do so, the player has a set of (disaster type specific) actions related to several subjects from construction materials, to early warning systems and education that, when properly used, help the player save people's lives and livelihoods when the disaster actually occurs[53].

The game successfully managed to raise the awareness of the players towards natural disasters. However, many players felt that they did not have a high competence in the game and that it required some effort.



- Gameplay:
  - Type: Game-based
  - Goals: Avoid, Match
  - Means: Create, Manage, Select
- Purpose:
  - Purposes: Educative message broadcasting, Informative message broadcasting.
- Scope:
  - Markets: Healthcare, Ecology, Humanitarian
  - Target audience: 12 to more than 60 years old, General Public.

### 4.3 Business administration

Managerial simulation games used for simulation of economic processes is an effective didactical technique. Using managerial simulation game is useful for business students of the third grade of bachelor study program and of the first grade of master degree study program at the universities. By using these games students are able to understand enterprise running and also have the possibility to collate existing theoretical findings thanks to experiential education. Through managerial simulation game students experiment with an economic model which represents selected part of real economic system.[55]

- **JA TITAN**[1] is a computer simulation that allows student teams to manage fictitious companies and compete with each other in the production and sale of a fictitious product. Before the game begins, students create a virtual company, establish management, and determine the roles that each member will have. Eight virtually created companies can participate in each game. The goal of the management teams is to achieve the highest performance index points, which is a metric that shows how well the students are managing their virtual companies. More specifically, this index reflects on the company's shares in the market. The PI index includes six business factors: total profit, supply potential, demand potential, productivity growth, market share, which are important for evaluating a business performance[54]. So it's essential for the players to take note of these factors and increase the PI index leveraging their business skills.

When implementing the game, the lecturer plays the role of moderator, who is responsible for providing instructions, completing rounds, evaluating the order in the game, and motivating students for better results. At the same time, the use of a simulation game created a competitive atmosphere that motivates the vast majority of students to reach better performance levels.

- Gameplay:
  - Type: Game-Based

Goals: Avoid, Match

Means: Manage, Select, Write

– Purpose:

Purposes: Educative message broadcasting, Informative message broadcasting, Training.

– Scope:

Markets: Education, Corporate.

Target Audience: 18 to 25 year olds, Students.

- **BizArena** was introduced by Gawel et al. [4]. In BizArena, a single game is played by several players who are grouped into teams. The purpose of the game is to establish and run a company which develops products (through R&D activities), then manufactures them and ships to retail offices operating in various local markets, where it finally tries to sell them to customers. The companies, which are comprised of the players, try to compete with each other, trying to satisfy their customers at the best possible way. Each customer group has its own unique profile. Players must try to adjust the characteristics of their offer to the profiles of the customer groups. The more accurate the adjustment, the greater the possible sales. Greater sales do not necessarily mean higher profit; players must balance income with the expenses necessary to run a company, including human resource expenses (salaries, benefits, training sessions), research and development expenses, and premises expenses. [25]

BizArena is a turn-based game—in each turn, players make managerial decisions in the following areas: marketing and sales, research and development, operations (manufacturing, inventorying, and shipment), and human resources. Turns are closed by the teacher.

BizArena allows for the achievement of two main didactic goals. The first is to make students aware that the effects of operational activities require time to emerge. The other didactic goal of the BizArena simulator is to make students aware of the fact that managing a business requires the coordination of the decisions of various managerial areas. [26]

– Gameplay:

Type: Game-Based

Goals: Avoid, Match

Means: Manage, Select, Write

– Purpose:

Purposes: Educative message broadcasting, Informative message broadcasting, Training.

– Scope:

Markets: Education, Corporate

Target Audience: 8 to 60 year olds, General Public, Students, Professionals

## 4.4 Electricity Markets

There has been observed a decline of fresh-enrolled students and an increase in the number of dropouts in electrical engineering schools, this might be related to engagement, motivation and differences in learning preferences. For this reason, there has been developed an online , asynchronous simulation game to teach electricity markets concepts named **EMGA(Electricity Markets Game)**[28].

EMGA's main goal is to introduce students to the short-term electricity market structure, emphasizing the importance of forecasting tools for decision-making. In this game, the students would be divided in teams of 1-3 students, each team take the role of an energy portfolio owner that participates in the day-ahead electricity market. The game features an environment with several unknown quantities such as prices , available wind energy. Their objective is to maximize their revenue by bidding during a number of days to obtain the top position in a leaderboard, while having historical data in their hands to forecast unknown variables and develop their bidding strategy.[29]

The overall feedback of the game was positive and it was found that EMGA being used as a compliment to the lectures was effective, but it should not replace them completely. It could be seen that the general perception of the EMGA platform regarding experience generation, conceptual understanding, and skills development was positive; indicating an improvement in learning effectiveness.

- Gameplay:  
Type:Game-Based  
Goals:Avoid,Match  
Means:Manage,Select,Write
- Purpose:  
Purposes:Educative message broadcasting,Training.
- Scope:  
Markets:Education,Scientific Research  
Target Audience:18 to 25 year olds,Students.

## 4.5 Economics

Game simulations have also been used in economics , one of the first uses is in financial economics[47].In Economics learning, the game simulation method was known since the 1960s. It is a learning model known as experiential learning[75].Most researchers use virtonomics games (business simulation games) in order to model the economic market.[50]Business simulations can be of various types and they can be conceived at various levels. They may be confined to a department or functional area inside a firm (sales, marketing, operations, human resources, accounting); they may refer to the entire firm, and to the decisions that allow it to maximize profits; or they may be holistic, in the sense

of taking the economy as a whole and the behavior of the various agents (firms, households, the financial institutions, the government and its agencies)[30].

Economics is a science that tries to explain the way people are making decisions, so any simulation games that their goal is to enrich the user's decision making can be considered a good enough simulation of the economic market.

- **The International Trade Game** developed by the Third World development charity Action Aid[6][69]. It has been amended to be suitable for students beginning a course in economics, economic development or international trade, although it could be used with students studying related subjects.

Students are divided into teams, each of which acts as a separate 'country', with between four and ten students in each team. There are five or six countries in a game. Countries compete against each other to 'manufacture' paper shapes (circles, triangles, rectangles, etc.) and sell them to an international commodity market trader at posted prices, which vary with supply and demand. The objective for each country is to make as much money as possible. There are three types of country in a game:

1. Two rich industrialized countries.
2. One or two middle-income countries.
3. Two low-income countries.

Students are not told this; they find out as they play the game. The game requires a large flat room, with loose tables and chairs. Each game can be played with between 20 and 60 students. The game takes between 45 and 90 minutes to play. This is followed by scoring, reporting by students and adjudication by the lecturer, who will probably want to draw various economic lessons from the game.

The International Trade Game has a wide range of potential learning outcomes, and with suitable focus, especially during the process of debriefing, a number of economic topics might be identified and developed more fully. These topics range from elementary trade theory to issues of imperfect information and even debates surrounding international inequality and first and third world relations. Group working and interacting with others are among the most significant skills cultivated in the game. The process of negotiating is also a very strong element within this game.

- Gameplay:  
Type: Game-Based  
Goals: Match  
Means: Manage, Select, Write
- Purpose:  
Purposes: Educative message broadcasting.

- Scope:  
Markets: Education, Scientific Research  
Target Audience: 18 to 25 year olds, Students.

- **The Virtual Economy** is a sophisticated online Web-based model of the UK economy with extensive supporting materials. It was developed jointly by the Institute for Fiscal Studies and the Biz/ed group at the University of Bristol with the support of the Nuffield Foundation and published in 1999[31][69]. The model is based on the home of the UK Chancellor of the Exchequer. It is designed to encourage students to explore the operation of a macroeconomic model and does not have the structure of ‘rounds’ and ‘point scoring’ typical of macroeconomic games. The model of the UK economy at the heart of this package is similar to that used by the Treasury and the Bank of England to model the effects of policy changes. Students can see the macroeconomic and microeconomic impact of changes in various macroeconomic instruments.

The main scope of the game is to help students understand the macro economy, the interaction between the main macroeconomic variables and the ability of government, via economic management, to shape economic performance. Additionally, students are encouraged to refine their presentation, analytical and evaluation skills.

- Gameplay:  
Type: Game-Based  
Goals: Match,  
Means: Manage, Select, Write, Create
- Purpose:  
Purposes: Educative message broadcasting, Informative message broadcasting, Training.
- Scope:  
Markets: Education, Scientific Research, Corporate  
Target Audience: 18 to 25 year olds, Students.

## 5 Conclusion

Policy games are safe environments to test strategies in advance, and can help decision-makers to create several possible futures. The players build the future conditions of the system step by step by moving from the current reality to a new vision. In the debriefings, participants ‘look back’ from those futures. A simulation game can help to bring different interest groups back to discussions, to spread information about the new ordinance, and to reduce ongoing tensions. Furthermore, it allows participants to look at the problem from a different perspective and it emphasizes the importance of finding compromises[35]. For a simulation game to be considered a viable educational or training tool,

they must provide some means of testing and progress tracking and the testing must be recognizable within the context of the education or training they are attempting to impart[11].Simulation games have a wide range of applications in various fields.Higher education, the health sector, the military, government organizations and the corporate sector are all potential clients of game based solutions.

In addition,social policy simulation games provide educative or informative messages,have the ability to offer training or data for scientific research.In our opinion,social policy simulation games,even though they offer all these options, are not trademarks in the fields which they are applied to.That means,that they cannot replace the current education,training,message broadcasting methods that are currently being used. Although,there are many use/research cases of simulation games,it is difficult to find successful implementations of them, with the exception of Microsoft Flight Simulator X(MFSX) which we think has potential,but more study needs to be done.Social policy simulation games are good supplementary methods to enhance the current methods being used,improving interaction and learning effectiveness with the subjects. Another trend we noticed is that social policy games are not used frequently,they are spreading to the general public,thus they tend to not have a long "life span",meaning they are forgotten after a few years.Since the digital games market is constantly changing, the development of and research on serious games needs to react to these changes quickly[12].

In this paper, we presented 23 simulation games.Our goal was,first, to demonstrate the wide range of applications in various fields these games have,second,to highlight that these games were not designed for entertainment only and last but not least we tried to offer games that are widely different with each other. Specifically, the games we identified have diverse gameplay(type,goals,means) methods, purposes and scope(markets,target audience).The G/P/S model was used in order to classify the games.

## 6 Discussion

From our research,the following questions were raised:

1. Will Simulation Games replace the current teaching/training methods used in the future?

Even though,simulation games offer safe environments to test strategies in advance, and can help decision-makers to create several possible futures,in our opinion, they cannot ever replace the current teaching/training methods.The reason is that they offer practical training of real scenario where the theory of a subject is taken into action.However,simulation games cannot cover the majority of the theory.They can only raise awareness,interest and enthusiasm for the subject and help understand the theory that has been taught.In consequence,simulation games are used as a supplementary method to enhance the teachers or trainers goal.

2. Why other big companies such as Microsoft are not designing social policy simulation games?

At the end of the day, companies (big or small) will produce whatever makes them profit. Serious and simulation games are not popular in the gaming market, additionally designing a quality game might take years or even decades and will cost millions to the company. Therefore, the risk to profit ratio might be too high for companies to take and they choose to stay to the industry standards.

3. Why are Serious Games and Social Policy Simulation Games not very popular?

This question is heavily linked with the previous one. This means that one reason serious and simulation games are not popular enough is that companies are not keen on making this type of games, because of the risk to profit ratio they involve. Another reason might be that players—the customers use gaming as a tool for entertainment only and are not interested in learning. The customers use gaming in order to escape from real life for some hours and serious or simulation.

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