

Review of Haptic and Computerized (Simulation) Games on Climate Change

ISAGA conference, August 27, 2019

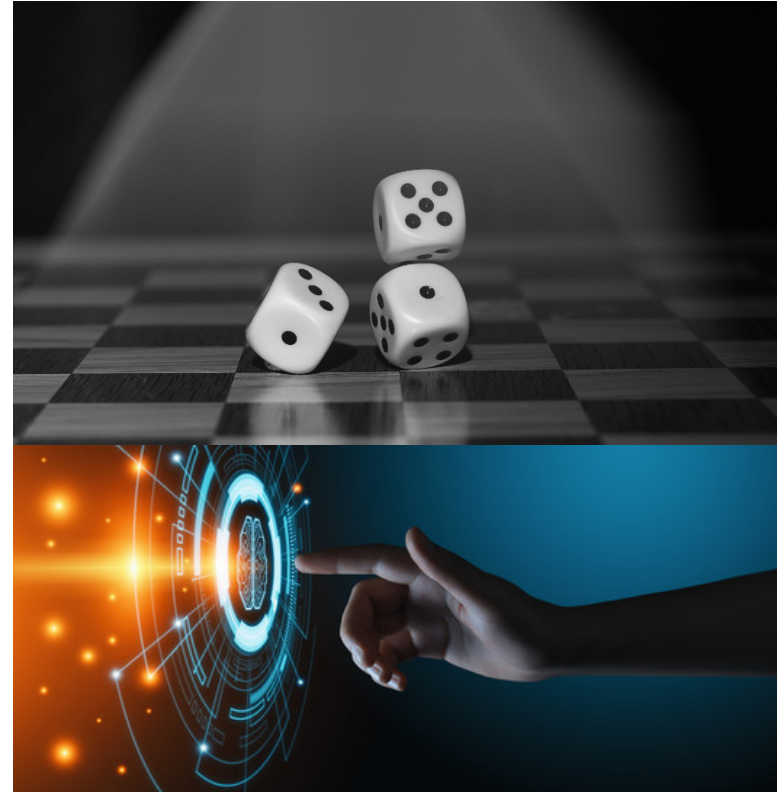
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Agenda

- Motivation for the review
- Existing reviews
- Our study
 - Goals
 - Methods
 - Results
 - Conclusions
- Outlook



Motivation: climate change as challenge



- Interactive learning tools as a key in climate education (Stermann et al. 2012)

Motivation: «post-fossil cities» project

Goal and Scope

- Develop a generic simulation game that allows finding and evaluating pathways towards possible future cities
 - by showing, through numerical simulation, whether and how they respect physical (metabolic) constraints;
 - by revealing, through playing the game, possible trade-offs between the goals of involved stakeholders.
- Apply the simulation game to explore pathways to the post-fossil "Swiss City 2050"
 - a fictional built environment covering all Switzerland and sheltering 10 million people, including structures and services;
 - being both net fossil carbon free in 2050 and a substantial atmospheric carbon sink by 2100.

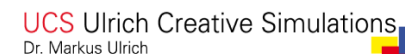
Funding agency



Research programme



Project partners



Existing reviews

There are a few...

In: Gaming/Simulation for Policy Development and Organizational Change. Jac Geurts, Cisca Iodema, Elise Roelofs, eds. Proceedings of the 28th Annual International Conference of the International Simulation and Gaming Association (ISAGA), July 1997, Tilburg, The Netherlands, pp. 301-311.

Games/Simulations About Environmental Issues Existing Tools and Underlying Concepts

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1. Introduction

The method of simulation and gaming (Duke, 1974; Heitzmann, 1983; Gredl, 1993; Dolin and Suskind, 1992) is well suited for dealing with complex issues as characterised by Sterman (1990) or Doner (1989). The method has a sign in the application to environmental problems and sustainable development.

This paper gives a survey of simulation games on environmental issues and objectives, their underlying models and their characteristics (for a detailed to Ulrich, 1998). The intention is twofold. First, to give a practical assistance looking for simulation games on environmental issues, thus fostering their conflict resolution and related fields. Second, to contribute to a clearer understanding of simulation games and, in particular, of the types of models of simulation games. In Ulrich (1997a), three simulation games have been evaluated to their underlying models. In this paper, we focus on the particular strengths and model types to specific learning objectives and scopes of simulation games.

Article

Climate Change Gaming on Board and Screen: A Review

Diana Reckien¹ and Klaus Eisenack²

Abstract

Climate change (CC) is an increasing societal concern for many world, and yet international negotiations continue to make it an issue that is proving difficult to address using traditional approaches and education. This article reviews the development of games and simulations in recent years as an alternative to CC issues and communicating with decision makers. It gives an overview of CC games and analyses a selection of 52 sophisticated CC games and compares the temporal development of climate in CC game development, game formats, and game subjects appeared around the time of UN climate negotiations in CC an increasing number of commercial game developers entering management games dominate the scene, but we see a rapid of online games or games with an online component. Both for issues are frequently addressed and as yet few games focus on

Keywords

adaptation, analysis, CC, challenges, climate change, climate change simulation, computerized simulation/games, decision development, gaming, global, knowledge base, language, local, societal, mitigation, negotiation, review, role-play, simulation/game format, games, mitigation, negotiation, review, role-play, simulation/game format, societal concern, sophistication

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This article is published as a part of the symposium: Climate Change and Simulation/Gaming

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This article is a part of a symposium titled: Sustainable Development and Simulation/Gaming

Edutainment for Sustainable Development: A Survey of Games in the Field

Korina Katsaliaki¹ and Navonil Mustafee²

Abstract

Background. The ever-increasing demand for natural resources has led to the

continuing depletion of resources. If of effective environmental management development practices by society at their awareness of sustainability and change. Use of decision games for in this direction. Games present g (educational entertainment) for teaching learning outcomes.

Aim and Method. In this article, we use on sustainable development, analyzing the stated focus of the games, game roles, their target age, game validity in game development, learning out included in this survey.

Conclusion. Our findings suggest that development have generally increased sustainability and have enhanced their strategies. Our classification of the instructors and potential learners in their teaching and learning needs.

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TOPICAL REVIEW

Adaptive and interactive climate futures: systematic review of 'serious games' for engagement and decision-making

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Keywords: serious games, climate change adaptation, social learning, climate services, decision making

Abstract

Climate change is already having adverse impacts on ecosystems, communities and socio-economic activities through higher temperatures, prolonged droughts, and more frequent extreme weather events. Understanding, scientific knowledge about climate change, and its potential for behavior to effect adaptation. 'Serious games'—games used for purposes other than entertainment—are one way to reduce this adaptation deficit by enhancing opportunities for learning and enabling people to act. Games can provide communities with the opportunity to explore different climate futures, build capability and capacity for dealing with challenges, and socialize adaptation priorities with diverse publics. Using systematic review (this paper identifies, reviews, synthesizes and assesses the literature on serious games for climate change adaptation. To determine where and how impact is achieved, we draw on an evaluation framework grounded in social learning, to assess which combinations of cognitive (knowledge), normative (norms and approaches) and relational (how people connect and build) learning are achieved. Results show that factors influencing the overall success of learning and catalysing learning for adaptation include generating high level and intra-level trust between researchers, practitioners and community participants; debriefing and evaluation practices; and the use of experienced and knowledgeable facilitators can help inform future game design, and research methodologies to develop robustly engaging with stakeholders and end users, and enhance learning effects for resilient climate change adaptation.

1. Introduction and background

The adverse effects of climate change are already becoming clear. Higher average temperatures, more frequent extremes and increased climate variability are being documented globally, with attendant effects on a range of ecosystems, and coupled human-environmental systems including urban infrastructure, agriculture, and more (IPCC 2013, IPCC 2014a, IPCC 2014b). Despite more detailed scientific understanding of the impacts of anthropogenic climate change and growing awareness of the need for widespread adaptation across multiple domains and sectors there remains a knowledge-action gap, to catalyse adaptation behaviours (Leemkowi et al 2015, Eisenack et al 2014, Clayton et al 2015). One way to reduce this adaptation deficit is through the development and application of 'serious games', to enhance opportunities for learning and practice and behaviour change. Serious games—games used for purposes other than entertainment—are becoming more widely used in climate change research and practice (Chen et al 2007, Crookall 2011, Eisenack and Reckien 2013, Schell and Suskind 2013). In its recent review of serious games for climate change, Reckien and Eisenack (2013) observed that the number of climate-related

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Review

Facilitating sustainability transition through serious games: A systematic literature review

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ABSTRACT

Exploring aspects of how innovative methods can truly attain a sustainable society is necessary for the future of our planet. This paper focuses on serious games, and how users can increase their understanding of sustainability issues and their familiarity with sustainable development strategies. Users of serious games consist of all possible target groups that are interested in attaining knowledge of sustainability through the use of games that are designed for a purpose beyond entertainment. In this case for sustainability education. This paper follows the systematic literature review method to deliver a study of serious games featuring sustainable development practices and policies in order to provide a thorough analysis of their dynamic features. 77 games were explored in this study. The findings show the growing number of serious games that seek to educate in sustainability and the categorization of these games according to the triple-bottom line of sustainability, giving clarification hints to users wishing to select the relevant tool that offers an understanding of specific sustainability issues. The purpose of such research is to reveal the contribution of serious games as effective tools in facilitating sustainability education and to group them according to their nature and direction in relation to sustainability. Limitations in their effectiveness are also identified and a research agenda for more relevant serious games is proposed that will enhance holistic knowledge and make it easier to clarify their pedagogical basis. The recipients of the findings will be all those future users and trainers who are interested in accessing sustainability education patterns through the use of serious games. This study will enable them to select the serious games that best serve their needs.

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Reckien and Eisenack 2013



Article

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Climate Change Gaming on Board and Screen: A Review

Diana Reckien¹ and Klaus Eisenack²

Abstract
Climate change (CC) is an increasing societal concern for many countries around the world, and yet international negotiations continue to make slow progress. CC is an issue that is proving difficult to address using traditional approaches to information provision and education. This article reviews the development of climate and CC games and simulations in recent years as an alternative and novel way of addressing CC issues and communicating with decision makers. It gives an overview of published CC games and analyses a selection of 52 sophisticated CC games in detail. The results allow comparisons of the temporal development of climate games, actors involved in CC game development, game formats, and game subjects. Many climate games appeared around the time of the UN climate negotiations in Copenhagen in 2009, with an increasing number of commercial game developers entering the field. Role-play and management games dominate the scene, but we see a rapid increase in the number of online games or games with an online component. Both local and global mitigation issues are frequently addressed and as yet few games focus on adaptation to CC.

Keywords
adaptation, analysis, CC, challenges, climate change, climate change games, climate change simulation, computerized simulation/games, decision making, developer, development, gaming, global, knowledge base, language, local, manual simulation/games, mitigation, negotiation, review, role-play, simulation, simulation/game format, societal concern, sophistication

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- Data collection in 2011
- Ca. 95 climate games found
- 52 sophisticated games analyzed in detail
- Issues studied:
 - Temporal development
 - Actors involved in game development
 - Game formats
 - Game subjects
- Role-play and management games dominate
- Online games on the rise
- Mainly mitigation, little adaptation

Goals of the study

- Providing an overview of the development of climate games in the recent years
- Identifying potentials for further developing the field
- Updating the systematic review of Reckien and Eisenack (2013)



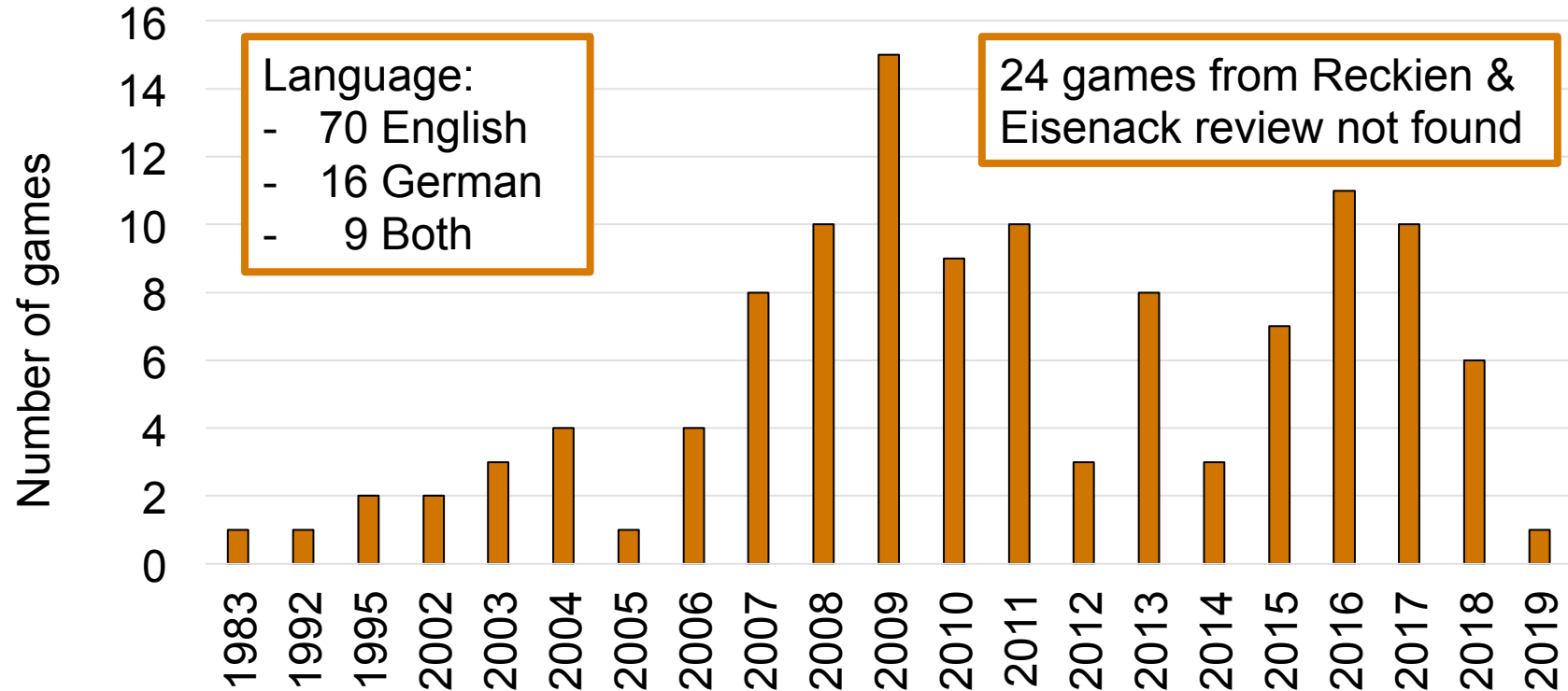
Systematic review

- Climate game: a game that explicitly address climate change and/or related topics (e.g. mitigation or adaptation).
- Key words for the search:
 - «climate game» in English
 - «Klima Spiel» in German
- Resources used for the search:
 - The Internet (Google was used as the main search engine)
 - App platforms for mobile phones
 - The journal "Simulation & Gaming"
 - SAGSAGA-newsletter
 - Personalized communication in the authors' network

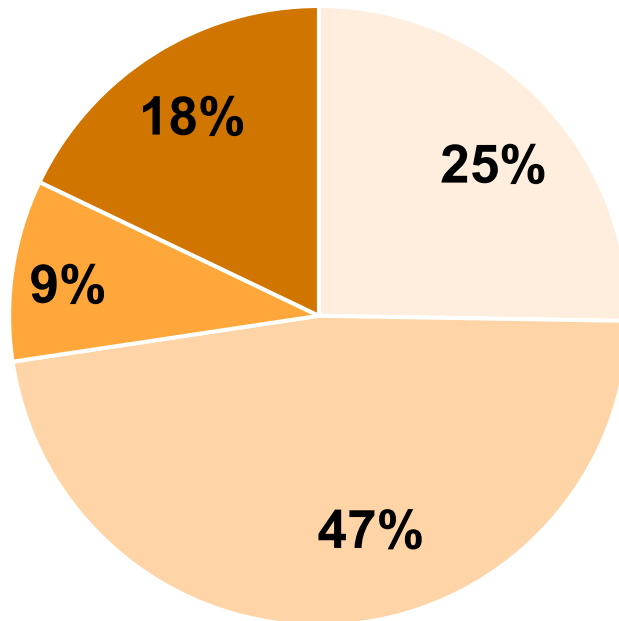
Systematic review

- Time of the search: winter 2018/19, data collection was finished in February 2019
- Focus: «sophisticated games». Selection criteria:
 - Climate change is an integral aspect of the story line;
 - The application shows typical characteristics of a game (e.g. having a goal and offer the player the possibility for interaction);
 - The model according to Duke and Geurts (2004, p. 256) is not oversimplified (e.g. simple quizzes were excluded from the review).
- Analyzed game characteristics: release year, type, scale, topic, language, organization type of game developers.
- Additional characteristics: goal and target audience

Annual releases of climate games (n = 119)

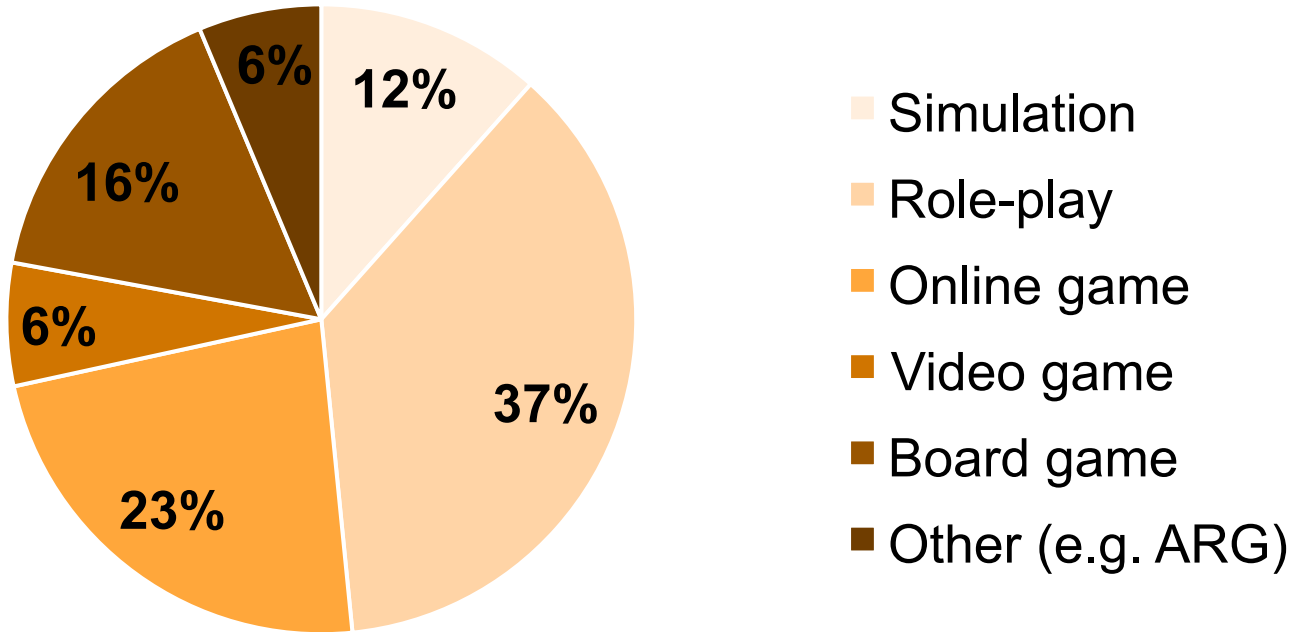


Type of developers (n = 95)

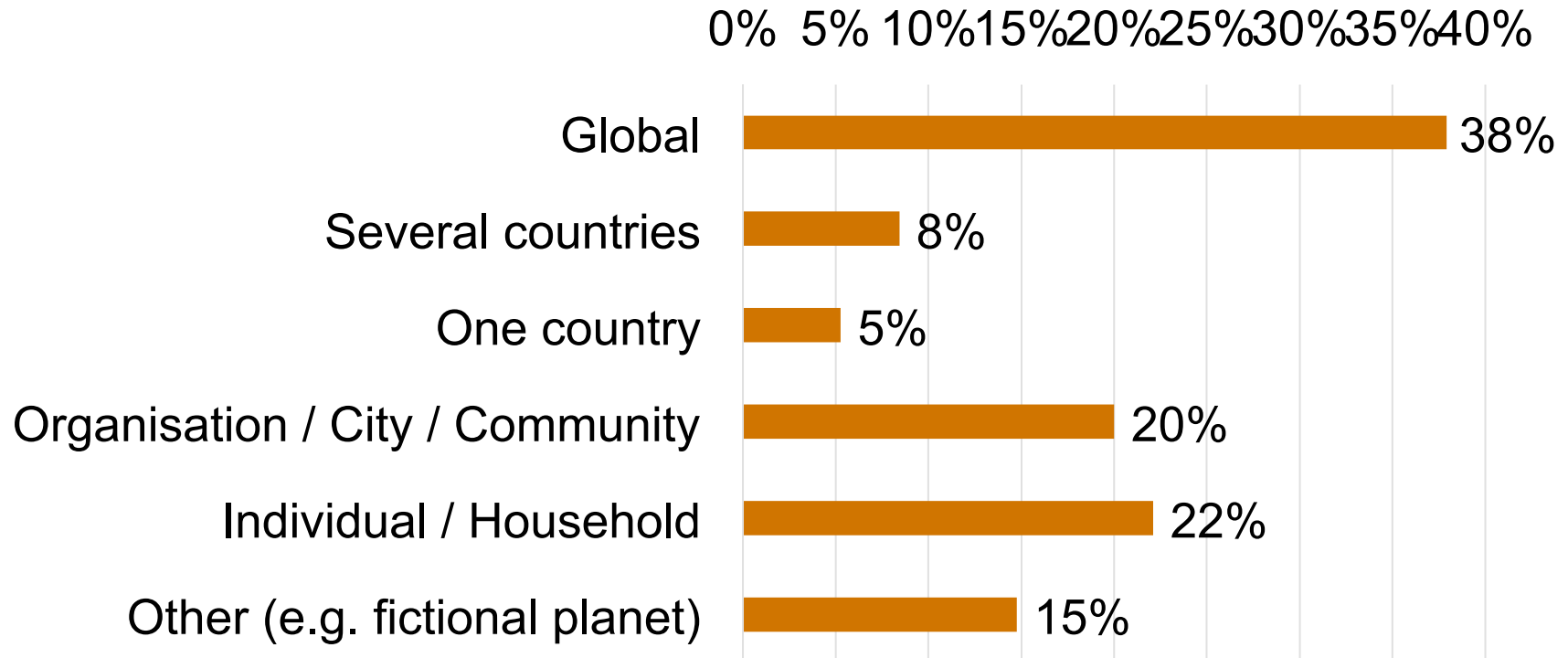


- Academic (universities, research institutions)
- Private (business, consultancy)
- Governmental (authorities)
- Non-governmental (NGOs)

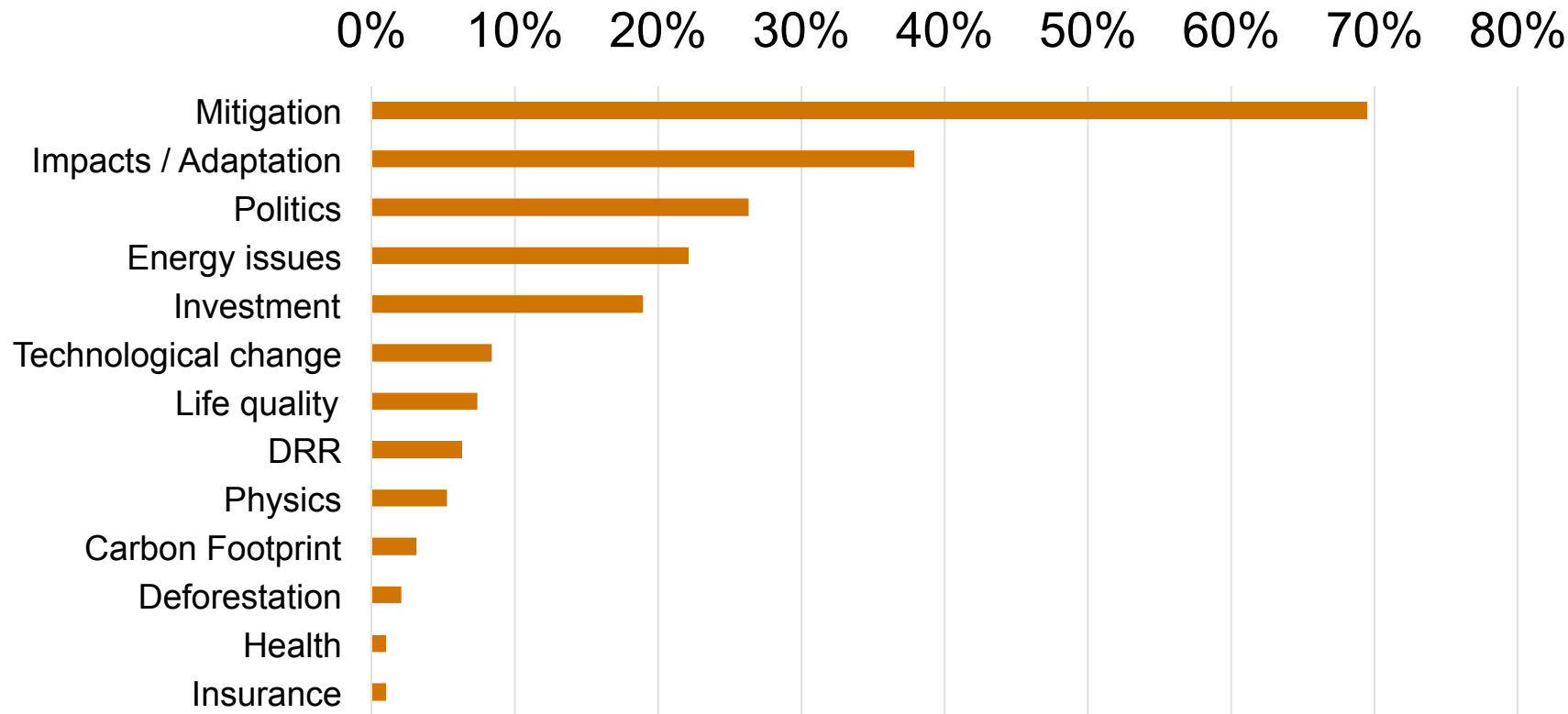
Type of games (n = 95)



Scale of the games



Topics covered by climate games



Conclusions

- The variety of games and enduring releases indicates a lively community
- Some games have a rather short life time (46% of the games listed by Reckien & Eisenack in 2013 not found)
- While many topics are frequently addressed, and many game types are being frequently applied, we see – amongst others - the following windows of opportunity to further developing the field:
 - Games connecting the individual or local level to the national and global dimensions of climate change;
 - Relevant topics such as "health" were addressed only by one game;
 - Video games presumably could reach out to new audiences, ARGs could be used to reach large audiences in an everyday setting, and thereby making a large-scale impact.

Review and project

Review

Further analysis reveals:

- Most climate games are designed for students (and only few for decision makers)
- Most climate games are designed to transferring knowledge (and only very few for empowering people to actually do something)

→ This reveals another gap to develop the field...

«Post-fossil cities» game

- For committed current and future decision makers
- To get to know the levers in their professional fields
- Workshop this Friday (11:00h)



Thank you for your attention!

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