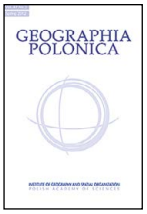

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CAN THE SERIOUS GAME SERVE AS A TOOL FOR EDUCATION IN FOUNDING LOCAL ADAPTATION SOLUTIONS TO CLIMATE CHANGE?

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Abstract

The article presents the scientific-based strategic board game Neighbourhood with Climate, which aims to become an educational tool for adaptation on a local scale to climate change in temperate climates. The game used in climate education supports citizen engagement, empowering people with the knowledge of nature-based solutions (NbS), which could be applied to prepare and protect themselves and their community from extreme weather in temperate climates. As it combines social engagement and environmental and economic elements, it fulfils the criteria for Education for Sustainable Development. In this game, unlike many other computer or board games, neighbours play on real maps of their estate or neighbourhood and work out the changes that can be implemented in the city. The paper can encourage scientists to create similar local educational tools for other climate zones and financial realities.

Keywords

climate challenges • serious game • nature-based solutions • education for sustainable development • city adaptation

Introduction

The climate change is undeniable. In summer 2023, the earth experienced the hottest three-month period on record: June-August 2023. July 2023 was the hottest ever month when it comes to surface temperature (Copernicus, 2024) and the year 2024 is on track to be the warmest year on record (WMO, 2024). Cities are particularly sensitive areas with the most urgent, topical challenges concentrated. Increased air temperature, prolonged hot periods, more frequent in the city than outside and tropical nights, during which the temperature does not fall below 20°C, can lead to some health problems connected with overheating of the body (Kozłowski, 1986; Baccini et al., 2008; Rabczenko et al., 2009; Gasparrini et al., 2015; Kuchcik, 2017; Ruuhela et al., 2017). The large share of impervious surfaces in the city leads to flush floods during heavy and intensive rains. These floods cause significant property damage, disorganize life in the city and take their toll on drownings (Griffiths et al., 2020; Szulczewska & Stankowska, 2020; Rau, 2022). The autumn of 2024 brought catastrophic floods in Spain, Poland and the Czech Republic, when water falling in the nearby mountains flowed through towns below, causing damage not seen in decades.

As adaptation to these phenomena is necessary most adaptation strategies for cities located in high latitudes aim to resolve the drainage problem of excess rainwater during heavy rainfall. However, for the cities from middle and south Europe, which are exposed more to heat and water stress – adaptation strategies concern all – lowering air temperature, reducing air pollution, keeping water, and providing shade and oxygen for citizens (Hajto, 2023; Jäger & Buzási, 2023).

The city's transformation is made up of the change of the smaller areas and the neighbourhoods and should be carried out with the understanding, acceptance and support of their citizens. The role of active citizens and local leaders in changing their neighbourhood is crucial, especially in a society where the sense of citizenship and responsibility for the common good has been destroyed by years of communism and the trust in government is one of the lowest in the world (OECD, 2024). Communications on the specific positive local climate change impacts can thus strengthen citizens' propensity to decide in favour of adaptation to climate change, whereas communications only on negative local impacts of climate change only strengthen the propensity to decide in favour of mitigation (Blennow & Persson, 2021; McPhearson et al., 2023).

This is where climate education becomes crucial, not only for children but also for adults. Since the 1990s, when a pronounced rise in global temperatures became a reality, education on climate change was envisaged by international organizations (UNESCO) as indispensable, but at the same time, it was completely absent from educational systems. It only emerged in education systems after the Climate Paris Agreement in 2015. However, it is not a separate course or subject, or even often a separate topic in a book. Also, in the 1990s, climate education became part of sustainable development, the overarching paradigm of the United Nations. Education for Sustainable Development (ESD) is a vision of education that seeks to balance human and economic well-being with cultural traditions and respect for the Earth's natural resources (Wals & Kieft, 2010; UNESCO, 2017; Borde et al., 2024).

Education for Sustainable Development advocates for cognitive learning (improving how we think and understand information), socio-emotional (building social skills, empathy and emotional intelligence) and encouraging positive actions and behaviours (Education for Sustainable Development: Sourcebook, 2012). Such type of education supports the understanding of the need for climate adaptation because it changes attitudes and behaviour and makes people open to new ideas.

There are many ways to encourage people to develop and make pro-environmental decisions like co-financing of pro-environmental investments, but also more connected

with education e.g. information campaigns, door-to-door leaflets campaigns, meetings, etc., and one of them could be serious game (computer or board game), played together by experts and citizens, local leaders, city officials etc. Serious games used for purposes other than entertainment are becoming more widely used in climate change research and practice (Martin et al., 2011; Reckien & Eisenack, 2013; Wu & Lee, 2015; Neset et al., 2020). Games, especially boards, develop creativity and force to find unusual solutions. They may become a useful tool for adaptative governance for complex social-ecological systems at the community-policy interface (Edwards et al., 2019). All available games about the dangers of climate change use a computer-generated or board-based image of a world, region or city, more or less real but certainly not entirely true. To convince residents to take action, it is best to present them with both the potential climate risks they may face and possible measures to adapt their immediate neighbourhood to climate change and let them choose the best one in their opinion. Then they could both identify with the problem and support the implementation of solutions, even if these require certain sacrifices, e.g. parking the car further away from home (Eisenack, 2013; Wu & Lee, 2015).

Therefore, the aim of the interdisciplinary project Co-Adapt – Communities for Climate Change Action (NOR/IdeaLab/Co-Adapt/0002/2020-00; https://coadapt.pl/en) – was to create an innovative game that would take place locally, on a real map (plan) of the city and would propose real, applicable solutions. This is what differentiates it from all others – the local scale and reality of the area. The game aims to familiarise players with dozens of basic nature-based solutions (NbS) that are inexpensive and versatile and can be realistically used to adapt to climate change in their environment. The game could help people develop solutions and make collective decisions regarding specific actions in the estate, where they live. Such a game could empower citizens in responding to new climate change challenges with bottom-up involvement.

This paper aims to present the concept of a serious game as a tool for activating local communities to transform their environment for the better. The board game Neighbourhood with Climate, as one of the first in the world, was created to learn and choose the best climate adaptation solutions for a given neighbourhood or housing estate on a very local scale. The article explores the game's development process and highlights the nature-based climate change adaptation solutions integrated into its design. The aim of the article is also to encourage scientists to create similar tools for their climate zones and financial realities, or to contact the authors who share the templates from the game to grow the public's understanding of how to adapt to climate change.

Material and methods

The work to create the game consisted of a few stages. Initially, it was necessary to learn about different games and to decide on the target group, strategy, gameplay modes, and aesthetics. A key aspect of the game's design was tailoring it to the target group: adults who typically don't play games but are co-owners of the property where changes will occur. This required a straightforward, accessible format that would be intuitive and engaging for people without gaming experience. Solar Pank Aesthetic was chosen for the game Neighbourhood with Climate. It has been decided that it needs a simplification, a no-win situation, and realism in graphics but not reality.

An extensive review of serious games related to climate change education and awareness (board, computer, or created for mobile phones) was made. The most important are three publications: the Environmental Game Design Playbook prepared by IGDA Climate Special Interest Group (Whittle et al., 2022), and two papers reviewed together c. 70 different games concerning environmental issues, mainly climatic (Reckien & Eisenack, 2013; Flood et al., 2018). The conclusions from the playbook related to design and

narrative factors that impact the persuasive character of the game were the main framework upon which the games used in the Co-Adapt project were based. A review of several games made it clear that virtually all games take place in a created world that resembles real, reflecting it, but not true. This is particularly important when activating an adult, and often older, section of society (Au & Lee, 2017). Most of the games are in English, and none are in Polish.

An experienced board game developer was involved in the project from the start. The team developing the scientific heart of the game tested a variety of strategic board games which developed compromise and joint decisions, such as the Peace by piece. A strategic simulation game about peacebuilding and stabilisation of a conflict-affected state (Dziewulska et al., 2021)

In parallel, to select the best solutions, a literature review was conducted on NbS, their environmental effects, and applicability. There are two directions of taking action in the housing estates – reducing air temperature and alleviating water problems (Revi et al., 2022). As thermal stress is growing, the most urgent problem is reducing the temperature of surfaces horizontal and vertical and limiting the heat exchange between the interior and exterior of buildings.

One of the most efficient ways to lower surface temperature is to increase the shaded area, mainly by planting trees, especially deciduous ones and with big canopies, but also using periodic fabric canopies and covers over playgrounds or benches. The air temperature doesn't decrease linearly with the increase in shaded area but depends on the tree species, canopy type, or the type of shaded surface (Gillner et al., 2015; Kántor et al., 2016; Rahman et al., 2019). Greenery not only reduces surface and air temperature but absorbs air pollution and produces oxygen on a local scale (Błażejczyk et al., 2014; Edmondson et al., 2016). The other method of lowering the air temperature is using white or bright colours for walls, roofs, or pavements, which changes the albedo of the surface to decrease the absorption of solar energy (Gilbert et al., 2016; Gallardo et al., 2022).

Less spectacular and not immediately noticeable in terms of meliorating local climate is improving the building's thermal insulation, which prevents heating up during summer and losing heat in winter (and warming the air around). Adding climbing plants reduces not only energy for heating/cooling but also air pollution.

The air movement, which also plays an important role in limiting heat stress, is forced when the areas of different heat exchange properties are adjacent (Błażejczyk et al., 2014; Szulczewska et al., 2014). Although water reservoirs are provided mainly for managing water, lower air temperature is either. Adaptation to climate change also equals, above all, adaptation to flash floods and droughts in the city. The basic solution is retention and keeping rainwater in the place of the rainfall, in local terrain depressions, on lawns, green roofs, purposefully designed rain gardens etc. (Cieszewska & Pusłowska-Tyszewska, 2022).

Finally, after a couple of study tours visiting the best European examples of climate-adapted districts in i.a. Copenhagen, Oslo, Malmo, or Vienna, and numerous adaptation solutions in a few Polish cities, a few dozen nature-based ones were chosen for the game. When selecting the list of solutions, it was important to consider both the melioration of thermal and humidity conditions and rainwater retention. In assessing the "climate improving" solutions, their impact on air temperature and humidity, oxygen production, absorption of CO_2 and other pollutants, interception, and infiltration were considered. The review of the literature on which the selection was based focused on findings from temperate latitudes and plant species growing in Poland, as well as reducing the air temperature, not the land surface temperature, which thus significantly limited the list of studies. The heart of the game, i.e., the environmental effects of the solutions proposed in the game, is the result of not only a literature search but also of calculations

of the retention capacity of facilities designed to retain rainwater on the surface.

Nature-based and other solutions that meliorate local climate chosen for the game are:

- Deciduous and coniferous trees (with large or small crowns) and microforests – according to different studies, sizes, and species, trees have lower air temperature of 0.5°C-3.5°C, lower surface temperature up to 19°C (Gillner et al., 2015; Kántor et al., 2016; Rahman et al., 2019) absorb CO_2 and produce oxygen (oak with a trunk circumference of 150-190 cm up absorb to 13 tone of CO_2 and produce 34 tonnes of oxygen per year) (Zaborowska & Żuławińska, 2023). The sum of benefits of medium or large trees is even several dozen times that of small ones. Trees capture water and provide shelter for birds;
- Shrubs, and hedgerows – their presence increases the ecosystem services of trees when planted together. In the process of photosynthesis, they absorb CO_2 and produce oxygen, reduce noise, capture water etc. (Edmondson et al., 2016);
- Mowed lawns and flower meadows, flower beds – they absorb CO_2, produce oxygen, lower air temperature, and increase water infiltration. Meadows are much cheaper to maintain and provide food for pollinators, without which most plant species will become extinct (Armson et al., 2012; The Lawn Institute, 2023);
- Ground cover plants – in shaded and inclined places, they turf the surface and do not require too intensive care, watering, or pruning. They limit evaporation from the ground, capture water, slightly reduce air temperature and noise, absorb CO_2 and other air pollutants;
- Social orchards and/or vegetable gardens in the ground and a box – like other clusters of trees lower air temperature, absorb air pollution, and produce oxygen, but also provide food, intercept rainfall, provide water infiltration, but most of all, they play a role in social integration, environmental education, counteract social exclusion, etc.;
- Green wall (cheap and effective) and vertical garden (expensive to set up and maintain) – green wall is a great solution in the city where climbing plants provide a very large biologically active surface taking much less space to develop than trees and shrubs. The overgrown vines are on the walls due to the large surface of the leaves, but they can compete with lawns and have a much more significant impact on the surroundings. A large Virginia creeper occupying only about half a square meter of land, during the growing season, can produce foliage comparable to seven lime trees with a crown diameter of 10 m. Green facades can reduce the urban heat island effect by approximately 2°C, improve air quality, thermal comfort and human health, with savings in electricity consumption of 5% to 10% (Borowski & Latocha, 2014; Rahman et al., 2019);
- Green and brown roofs – need special technical requirements and it is practically impossible to implement them on existing buildings. There are two main types: intensive green roofs (covered with tall vegetation: perennials, shrubs, and even trees) and extensive green roofs (covered with low, dry-loving vegetation). Brown roofs are covered with a substrate layer allowing plants to grow spontaneously, just like they would at ground level. All of them capture water, absorb air pollution, reduce the costs of stormwater drainage, reduce costs (Kania et al., 2013);
- Using permeable surfaces (with or without vegetation), reinforces lawn – they enable water infiltration, reduce the costs of stormwater drainage, absorb CO_2 when covered with vegetation, and eliminate the need for winter maintenance of the surface with salt (Iwaszuk et al., 2020);
- Trellis with plants and textile roofs to provide shadow and improve the well-being of residents trellises with plants over the benches or textile roofs can be mounted;
- Bright colours on walls, roofs, or pavements – when practised on a large scale, they can significantly reduce the urban

heat island, although it does not significantly improve the subjective biothermal conditions in the neighbourhood, but rather on a city scale.

The next group of solutions focuses primarily on managing rainwater:

- Retention pond, rainwater barrel, underground rainwater storage tank, swale drain (with or without vegetation), infiltration trench – those techniques keep water on the surface and reduce the sewage load during heavy rains. Fountains and bird drinkers play a more useful and decorative role, less meliorating the climate, but they are also important for social integration or aesthetic impression. Most of the "water" solutions also meliorate climate. They slightly lower air temperature and increase air humidity; those with greenery increase biodiversity, and some of them could play a role in the pre-treatment of street sewage and rainwater.

Moreover, for educational purposes, the game also includes 8 solutions that are related to the use of renewable energy or biomass. These are:

- Photovoltaic panel on the roof or ground, solar lighting, solar collector, micro wind power plant, ground heat pump, small biogas plant, and composter.

Results

The Neighbourhood with Climate board game allows the local community to transform their neighbourhoods into more resilient to climate change. The game is adapted to local environmental and spatial conditions so people can play in a group on their real neighbourhood maps, stimulating higher motivation for participation in transformation. From a methodological perspective, the game fulfils the definition of a 'simulation game' (Balcerak & Woźniak, 2014). The game intends to give players a broad scope of decision options and provides rich feedback related to real-world parameters. Still, the game rules limit the freedom of decision-making and focus on increasing player engagement and motivation, which results in a more structured and repeatable experience than in 'pure' simulation.

44 climate adaptation solutions were selected for the game Neighbourhood with Climate and presented as a collection of 44 double-sided solution cards. Every solution is characterized by a graphic symbol on the front of the card, accompanied by a concise summary description on the reverse side. The benefits (six groups: CO_2 absorption, pollution reduction, oxygen production, microclimate improvement, rainfall interception, and water infiltration) are quantified on a scale ranging from 0 to 5. Similarly, the game assigns a numerical rating, ranging from 0 to 5, to denote the costs associated with both the initial investment and subsequent maintenance of each solution. For instance, planting a large coniferous tree may have a cost rating of 3, with a maintenance cost of 1. In comparison, a classic lawn might also have a cost rating of 3, but its maintenance cost could be higher at 5. On the other hand, a biogas plant may be assigned a cost rating of 5, but its maintenance costs might be offset by a negative rating of -2, reflecting potential net savings (Fig. 1).

Furthermore, for each solution, the game identifies four additional benefits, referred to as "bonuses," in the form of heightened biodiversity, increased people's satisfaction, enhanced cooperation, food provision (vegetable gardens and orchards), and economic savings. These bonuses are rated on a scale from 0 to 2.

All those solutions are more detailed and described in the Game Toolkit, which will be available online with examples of plant species and benefits for people, the environment, and the budget. The toolkit is primarily intended to support the game leader, who should familiarize themselves with it to effectively guide players through the game. The players, however, only need to refer to simplified definitions provided on the cards.

In addition to the cards, the game uses round tokens representing most pointing solutions from cards (trees, different types

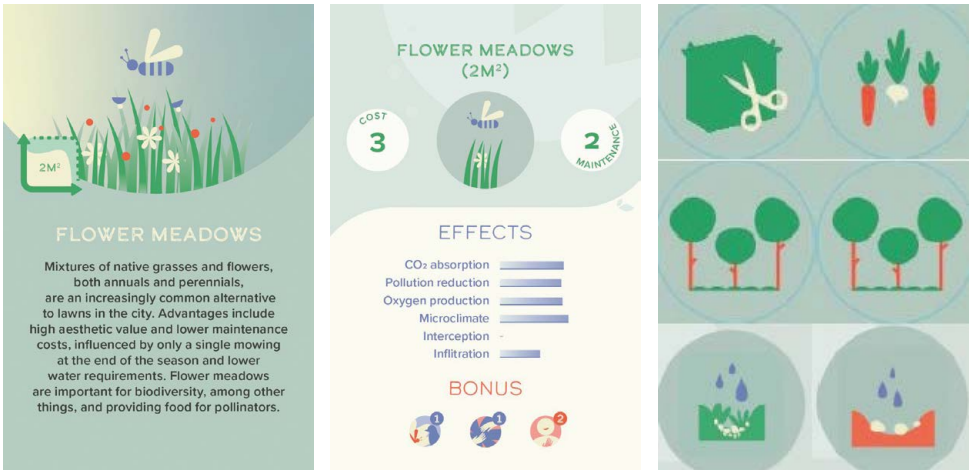

Figure 1. The example of both sides of the cards and part of the pattern for tokens

of roofs, infiltration trenches, water barrels, composters, etc.) and wooden cubes illustrating area solutions (lawns, meadows, permeable pavement without vegetation, etc.) (Fig. 1). The game set also includes a map, a card for taking notes and adding up points, and a game description. One set of game components is suited to play with a group of three to five people. The players can play cooperatively, where each team devises optimal solutions for the selected area.

The map is derived from internet services like the openstreetmaps.org. The leader of the game with at least elementary knowledge about adaption to climate change with NbS can additionally mark on a printed map the north direction as well as the growing trees using e.g. Tree Crown Map or www.google.map (Fig. 2). The markers on the map include small squares (resembling the modifications of flat surfaces) and larger circles (resembling the alterations of buildings and other large structures). A facilitator well-versed in climate change adaptation can provide valuable insights, answer queries, and enhance the overall understanding of participants throughout the game.

Before the game, there is an explanation of the rules of the game and the adaptations used. Players are also given time to familiarise themselves with the cards. The game's basic scenario has a limit of 32 points for investment costs and 24 points for maintenance and time.

After the game, players signal the finish of the decision phase to the game facilitator and provide the final map setup (in the form of a photo) for calculating the game score. The game facilitator inputs the data into a dedicated Excel sheet, which calculates the effects of all decisions taken in the game (with options of calculating additional regional or site-specific impact). Then, the effects of six environmental benefits, four bonuses, and two cost parameters are summarised. As an extra measure of feedback, the game is finished with three narrative events related to climate change. Each event lists environmental parameters that foster the neighbourhood's resistance to catastrophic events such as drought, heat waves and torrential rain.

What's crucial is that all the suggested solutions contribute positively to the environment. No group experiences losses; instead, one group excels in adapting to a specific area or utilizing resources more efficiently than the other. In essence, it's a situation where everyone emerges as a winner.

After the final scoring, the game is concluded with a debriefing discussion with participants. The debate is focused on several

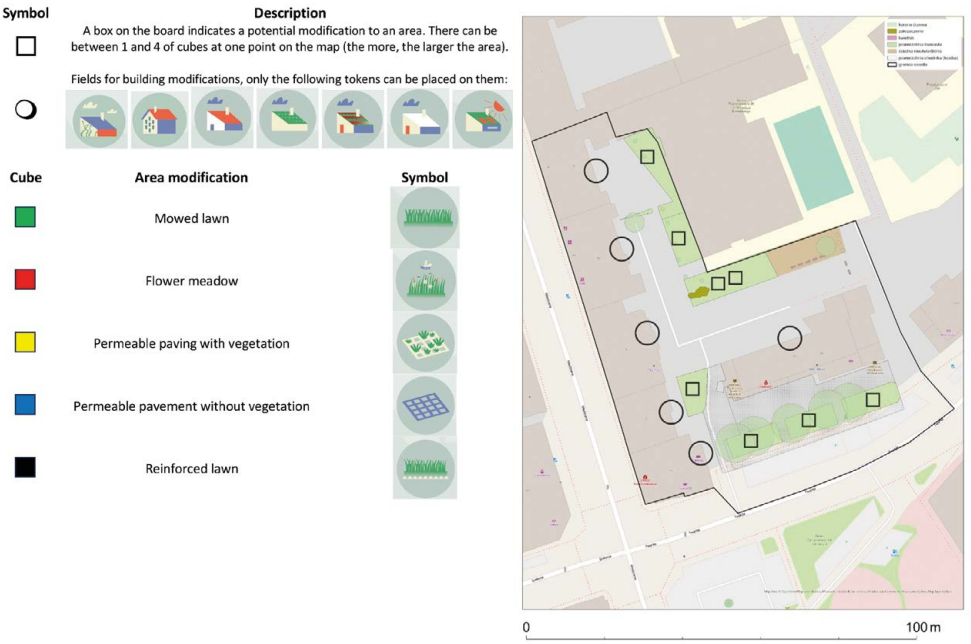

Figure 2. The map assistant, example of the map already prepared for a game and after the gameplay session

key issues, and it aims to foster the learning outcomes of the game. The debriefing includes:

- Reflection on the decision-making strategy of each team;
- Main, climate-related problems of the neighbourhood identified by the players;
- Areas requiring special attention in the neighbourhood;
- Specific local conditions (social, technological, and urbanistic) limiting possible tools for climate change adaptation;
- Possibility of practical implementation of solutions designed during the game.

The results of the game are unsuitable for planners to use directly due to numerous approximations and generalizations in the game's core mechanics. If the game aims to develop some solutions that could be implemented and involve real estate and potential modifications, it is essential to prearrange agreements with both the landowner and the creator of the estate development project. Also, regulations and standards exist to govern the minimum distances for planting trees in proximity to both underground and aboveground transmission lines. Requirements for fire routes are specified in separate regulations. Moreover, the design and implementation of rain gardens that enable rainwater infiltration into the ground also require appropriate arrangements. But if the game is solely conducted for educational purposes, it becomes permissible to disregard legal restrictions and envision an idealized solution.

Discussion

The strategic, serious games could be one of the most interesting and effective educational tools in climate change adaptation action methods. In addition, as they combine social (cooperation, joint solution development), environmental (nature-based solutions) and economic (cost savings, cost analysis) elements, they fulfil the criteria for Education for Sustainable Development (Wals & Kieft, 2010). The main advantages of this form of education include high engagement of participants, the possibility and pretext to initialize discussion among members of the local community and to inspire collective action, fostering a proactive approach towards enhancing living environments, adapting to climate change, and mitigating its effects (Feinstein & Mach, 2020). Some analyses of learning outcomes show that educational interventions are most successful when they focus on local, tangible, and actionable aspects of sustainable development, climate change and environmental education, especially those that can be addressed by individual behaviour (Anderson, 2012). These aspects are included in the Neighbourhood with Climate game, which can become a very effective educational tool.

One example of a board game designed to facilitate the collaborative design and implementation of interventions within communities is Water Ark, which employs interactive gameplay mechanics to encourage stakeholders to collectively explore, develop, and negotiate solutions for water resource management challenges (Cheng et al., 2019; Tsai et al., 2021). Another strategic collaborative board game, Submersions, teaches how to limit the risk of marine submersion and adapt to the coastal town of Sea-city (https://protect-slr.eu/). Next game, Marchi confronts the players with different planning and management strategies, ecosystem services and benefit indicators, monitoring, reassessment of their decisions and empowering them through the learning process (Laterra et al., 2023).

Most games consider the global dimension mainly, less the regional scale. These games frequently simulate international climate negotiations and/ or compute the consequences of global decisions. There are not many games that explicitly link global and local perspectives (e.g. Climate Challenge) (BBC, 2011), only a few that primarily focus on an intermediate scale between global and local or on decision-making at the European level (e.g. Keep Cool) (Eisenack, 2006).

The numerous games and tools, primarily in English, were designed to enhance understanding of climatic processes and global

climate change (Wu & Lee, 2015; Johnston, 2023). Serious games on climate issues could involve getting information about climate-related vulnerabilities in the city/neighbourhood and simulating different climate adaptation and mitigation measures (Neset et al., 2020; Whittle et al., 2022). Good examples of such games are both board (EKOS) and computer games (OCELLUS) created in Urban System Lab in New York. During both games, players alternate between building social, ecological, and technological systems and responding to various extreme events in the USA. Others are DAYBREAK (https://daybreakgame.org/), in which people try to prevent many environmental crises in different continents and countries or COOL YOUR CITY – a game with colour-coded LEGO blocks that represent different land use types in which players design perfect city (Covaci et al., 2024).

All these games share one disadvantage—they take place in a more or less imaginary, unreal space and do not directly relate to our everyday lives. The CLIMATE ADAPTATION GAME is online, developed by the Swedish Meteorological and Hydrological Institute (SMHI, 2019), and funded by the European Union to increase understanding of what a warmer climate implies and how to adapt to it. In the game, players, after several decisions, make the imaginary city more resilient to extreme weather. The game is suitable for education in sustainable development and when starting to work with climate adaptation. It has been used by high school teachers around Sweden and played by municipalities and decision-makers.

The first game that was similar in concept to NEIGHBOURHOOD WITH CLIMATE was GREENIFY, the action-based learning tool designed to teach adult learners about climate change and motivate informed environmental and sustainable actions in the real world. It uses growing social networking as a primary communication form and associated peer-group formation as the main motivator. The GREENIFY challenges players to complete real-world missions in four categories: personal (e.g. choosing green product choices), energy (e.g. transportation choices), resources (e.g. usage of water and electricity), and communication (e.g. debating issues and sharing knowledge with others) (Lee et al., 2013). But still – this game is not played on a real map, but in a computer reality close to reality.

Probably the only adaptation game in the world at the moment, besides NEIGHBOURHOOD WITH CLIMATE, and which is played on real maps of the area where the players live, is The Adaptation Game TAG (https://zerocarbonmerri-bek.org.au/tag/) whose slogan is: Prepare for climate crisis in your town. This board game was created for residents of Merri-bek (the city in the suburbs of Melbourne) to connect and help prepare their community to be more resilient to climate change, and become 100% renewable power. It is played in a few Australian cities locally on workshops and encourages citizens to take small actions in their own homes (related to energy, zero waste life, or smart travel) and prepare and protect themselves and their community from extreme weather such as heatwaves, heavy rainfalls that can cause floods. It also promotes the strengthening of neighbourhood relations through, for example, social gardening.

NEIGHBOURHOOD WITH CLIMATE has in common with TAG its localness, the fact that neighbours play together and come up with solutions, the spread of knowledge, and playing at special workshops usually organised in local government buildings. What makes them different is the different NbS popular in Europe, in climates of temperate latitudes.

Adaptation largely depends on locality in terms of location and climatic, socio and economic conditions (Feliciani, 2014). Therefore, a game created for Australia's climate, climatic hazards there and financial realities cannot be simply transferred to Poland.

Conclusion

The game can serve as a valuable resource in environmental education within schools (in a simplified version, with fewer solutions)

and universities. Furthermore, it is an effective tool for educating officials and developers as it leads to real solutions that can be implemented in a specific settlement. The game played in groups in workshops can, therefore, have a community-creative character.

The game can be used to train local leaders to help transform cities to be more resilient to climate change. The Neighbourhood with Climate can be used to show people the advantages of change, to let them work out their decisions, to identify with them, and to accept their costs. An idea from the Warsaw City Council is to use the game to evaluate projects for the participatory budget.

Games like Neighbourhood with Climate are an important element in spreading real knowledge about climate change adaptation and mitigation. Without public acceptance, it will not be possible to make legislative changes that will protect the climate on the one hand, and people on the other. The importance of using games in climate education is confirmed by the financial resources provided, among others, by the European Union or governments of individual countries for the creation of this type of tools and conducting training. The involvement of scientists is essential and plays an increasingly important role in disinformation and fake news.

The game's authors plan to introduce an evaluation survey to analyse the decisions taken and to assess how knowledge about the possibilities of adapting to climate change in our city is changing.

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