

The geo-information serious game as support for planning decisions on the adaptation of residential areas to climate change - a case study of the City of Warsaw (Poland)

*dr Piotr Wałdykowski*¹, *dr Joanna Adamczyk*¹, *dr hab. Agata Cieszewska*¹, *dr hab. Renata Giedych*¹, *dr Gabriela Maksymiuk*¹, *dr Krzysztof Klimaszewski*¹, *dr hab. Magdalena Kuchcik, prof. PAS*², *dr Dorota Połowska-Tyszevska*³

¹ *Warsaw University of Life Sciences SGGW*

² *Institute of Geography and Spatial Organizations, PAS*

³ *Warsaw University of Technology*

Warsaw is located in the central lowland part of Poland, on the banks of the Vistula River. Within, there are natural boundaries between the river valley and areas located at higher elevations, which affects the functioning of the city's natural system. The town is diversified in terms of urban structure and socioeconomic factors. Regardless of spatial differences, spatial development of the city takes place in different city parts and only sometimes with consideration of long-term assessment of residents' quality of life from the perspective of climate change risks. Using geospatial analyses, we have identified hazards on a city-wide scale (e.g. river flood risk, urban heat island - UHI index, earth mass movements) and local conditions that affect the real possibility of managing adaptation to climate change (e.g. contribution of biologically active surfaces, share of impervious surfaces, social structure, economic conditions). Geoinformation was the basis for selecting the first neighbourhoods to be tested by differentiating the typical geographic conditions requiring a distinct approach to managing a site in the face of climate change.

With the participation of market game production specialists, the appropriate selection and generalization of geospatial variables for the game will enable the construction of a universal Serious Strategy Game enabling the informed use of knowledge about conditions in climate change adaptation. The goal is to develop a universal decision support method for designing local climate change adaptation solutions. These solutions aim to improve residents' quality of life, which is nowadays often discussed in terms of ecosystem services (cultural, regulatory, living space services) and their scope, especially in urban areas.

Strategy games are currently considered one of climate change action methods' most effective educational tools. The proposed game targets local communities interested in improving their quality of life with climate change adaptation interventions directly in their settlements. The game is adapted to local environmental and spatial conditions. It explores various choices (e.g. pro-adaptative actions) and consequences, as well as stimulating higher motivation for participation in climate change transformation. Implemented in the game simulations of the impact of individual solutions on the effects associated with adaptation to climate change have an additional educational effect. For example, residents can analyze in practice the role of trees and other plants in mitigating the impact of the urban heat island. (How many trees should be planted to lower the temperature of the yard 5 degrees lower in summer?). As an outcome of the conducted gaming workshop, each involved community will be engaged in planning an adaptation design in their neighbourhood.

Developed the workshop method, including the game will be available in an open-access toolkit offered to communities for engaging citizens in introducing changes within their local communities and other cities worldwide. It integrates best practices collected from communities that are already involved in climate change actions. This knowledge and experience will be incorporated into co-designing the game with highly motivated communities that mitigate the so-called motivational gap. The toolkit also

includes a collection of methods stimulating motivation for adaptative action in local communities.

Keywords: geo-information serious game, planning an adaptation to climate change, urban heat island, climate change