Gamification of participatory modeling in the context of sustainable development: existing and new solutions

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Abstract: Serious games and gamification tools have gradually expanded their application in participatory settings, while already being widely used in the context of sustainable development in general. Their popularity is explained by their ability to create an engaging and experimental environment, which evokes critical thought, meaningful interaction between the participants and experience-based learning.

Although game design principles and tools are, to a large extent, universal, their application differs from one field to another. The simulation modelling field has a long history of using game elements to make complicated models more user-friendly and understandable for wider audiences. Management flight simulators, microworlds, policy exercises and strategic simulations are among the most common examples. Meanwhile, the urban planning field often makes use of interactive 3D maps, including the most recent advancements in applying XR technologies to make the interaction with the system more tactile and collaborative in a multi-user setting. Serious games are used in participatory projects as a supplementary approach to provoking discussion among the stakeholders and stimulating critical thinking. Gamification in the participatory modeling field is commonly used at the initial and final stages of the process or by incorporating a role playing component into the process (e.g. in companion modeling and social simulations). Based on the existing research, we have two main observations: (1) in each of the above-mentioned fields there are traditional ways of using gamification and visualization instruments and there is a lack of 'cross-pollination' between various application fields in terms of choosing gamification tools, (2) gamification tools are commonly used at one or two stages of participatory modeling process but rarely over the entire process of participatory modeling. We suggest that by introducing more gamification elements throughout the whole PM process we can produce a more gameful or, at least, a more engaging experience for stakeholders.

As a preliminary step towards wider use of gamification in the participatory modeling process, we first analyze how existing gaming solutions from various fields can be applied in the context of different stages of participatory modeling. In our research we critically reviewed the use of gamification from two perspectives: (1) to which extent it could help to mitigate the challenges of participatory modeling process (e.g. biases, groupthink, conflicts, etc.) and consequently contribute to better learning and communication between the participants, (2) how it could contribute to the creation of engaging experiences for the participants during participatory modeling process. As a result, we propose a framework for gamification of each stage of the participatory modeling process taking into consideration the already existing solutions, as well as the insights from the game design and behavioral science fields.

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