The Application of Games to Engage Citizens in Climate Change Policy Development

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Abstract: This paper introduces the Games Realising Effective and Affective Transformation (GREAT) research and Innovation project. The project will examine the emerging ways Applied Games could be used to facilitate the social engagement of European citizens in determining future policy priorities and policy interventions to the existential challenge of climate change. This full paper is a provides detail of the work in progress but moreover provides a a conceptual analysis of the methodologies applied to this emerging domain of study. The project is funded by the EU Horizon programme with UK Associate partners funded through UKRI and coordinated by the DIPF, Leibniz Institute for Research and Information in Education, Frankfurt and involves seven partners located across Europe, Serious Games Interactive (SGI) Denmark, Centre for Social Innovation (ZSI) Austria, International University of Rioja (UNIR) Spain, Frederick University, Cyprus, Playmob and The University of Bolton (UoB) as UK associate partners. The project incorporates collaborative design and citizen science methods and brings together researchers with expertise in the areas of games, data analytics, and policy development. This integrated investigation will be articulated by case studies of the use of games in facilitating dialogue between citizens and policy stakeholders including policy makers, policy implementers, political parties, campaigning organisations and affected citizens. This will be achieved by leveraging the central role of games in contemporary culture by combining academic studies with practical experimentation of novel applications of games. The context for the research is the global challenge of climate emergency, and each case study incorporates a research cycle addressing a policy issue and research questions, using multiple pilots to generate both quantitative and qualitative and data to further inform research activity.

keywords: Applied games, Climate, Learning, Analytics, Policy

1. Introduction

The GREAT project involves partners across Europe and aims to enhance citizens dialogue with governments and policy agendas relating to actions to mitigate climate emergency, using applied games to facilitate this by specifically addressing the development techniques deployed to engage players and how these could be meaningfully applied to wider societal challenges.

It is well established and documented that the digital games industry in financial terms is a larger economic sector than either of the music or film industries, $180.3 billion in 2021 (Wijman 2021). Digital games trend of pedagogical paradigms calling for active constructive, and playful learning. Serious games are considered a major emerging technology that is expected to enter mainstream use, Steiner et al (2015) In parallel, the proportion of citizens declaring dissatisfaction with functioning democracy in their countries has risen markedly. The deterioration has been especially evident within high-income, consolidated democracies, where the proportion has risen from a third to half of all citizens." (Foa et al., 2020). Similarly, the distrust of news sources and scientists fuelled by an increase in fake news is at an all-time low (United Nations 2021). This dissatisfaction and mistrust correlate with increased scepticism. This has occurred in an environment where the volume of date generated through citizens interactions and transactions with media is increasing. The analysis of data has increased to the point that it has significant economic impact with the effect it is argued that social media is polarizing society (Vrontis et all 2022). The GREAT project aims to address this dilemma by applying games technologies to achieve positive transformation restore community engagement and satisfaction with democracy and democratic processes in establishing policy priorities for addressing the challenges presented by climate change. By utilising the opportunities presented by the collection and storage of citizen generated big and small data to bring together communities, in an open, ethical process.

2.   Methodology

There are two distinct aspects to the methodology. The first being the overarching methodology applied to delivery of the project, this incorporates all aspects of the successful delivery of the project this is provided in Figure 1 below:
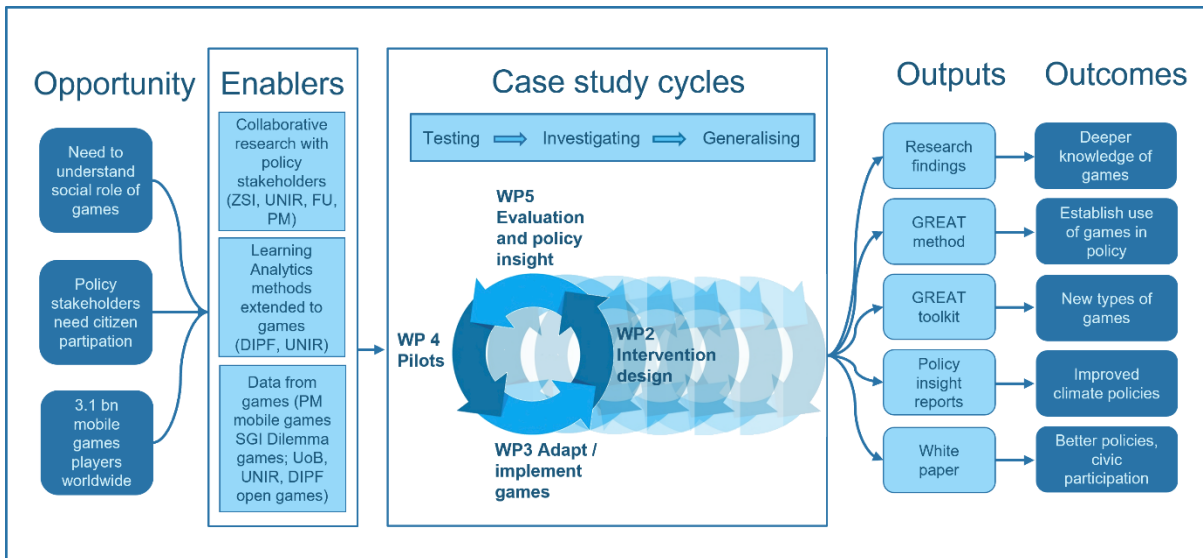

Figure 1: The Overarching Project Methodology

Situated within the overarching project methodology is the research methodology, which is the focus of this paper, specifically the Case Study cycles as detailed in Figure 1 above.
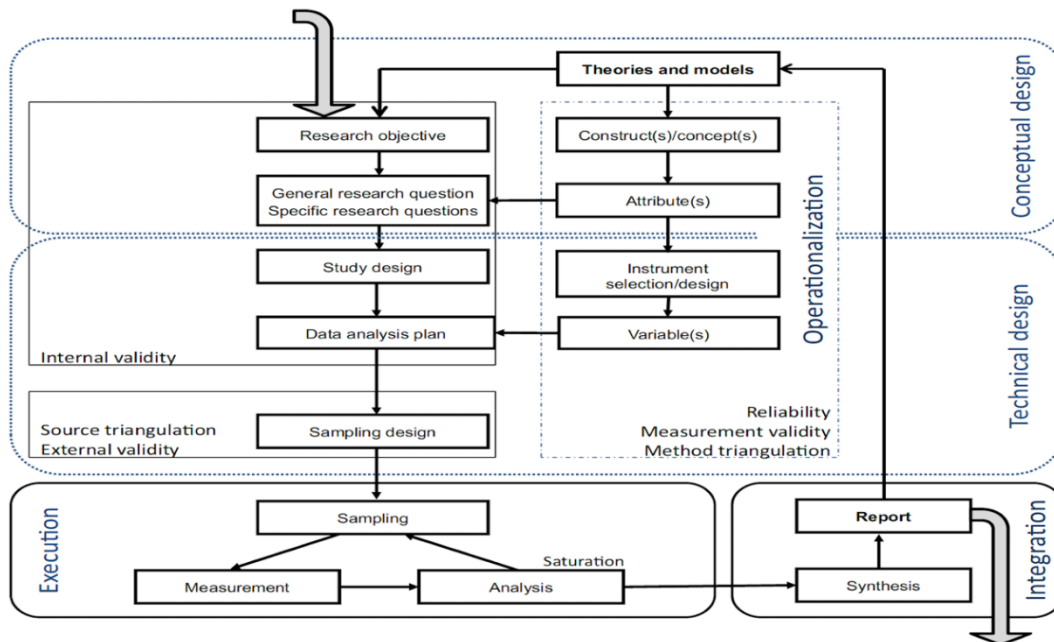

Figure2: An adaptation of the MIR Framework (Tobi and Kampen 2018

The research methodological approach is based on an established interdisciplinary framework an adaptation of the Multi Interdisciplinary Research (MIR) (Tobi & Kampen 2018) framework to refine methods and instruments of research based on synthesis of established community intervention/ co design evaluative methods)

2.1 Conceptual Design: The Research Objective

The research objective of the project is to apply games to gain valuable insight into their cultural role through several case studies, these are analysed and evaluated with a view to examining the efficacy of digital games as communication conduits between citizens and policy makers, transparently and to provide actionable insights.

The project is oriented to the examination and critique of the cultural and communicative value of games as a conduit for citizens who may not normally engage in socioeconomic debates, and could be, potentially, sources of valuable insight for policy stakeholders.

The games and interventions co-designed and implemented within the GREAT project are not bespoke solutions primarily their function is to be deployed as research tools to explore the effectiveness of the approach and pilot methods which could provide rich data sources for future adoption. Our approach to the research is based upon these assumptions:

- Games constitute a rich source of data that can reveal a great deal about players' engagement, preferences, and attitudes. This data is closely guarded by publishers and developers heralded as a competitive advantage to them in optimising their games. It is our contention that this data constitutes a significant opportunity to draw out insights into social preferences and attitudes at scale, this may require new methods of gathering, collation, and analysis.
- The online interactions of game players generate a stream of data, and analytics methods could be adapted to reveal connections between game-world interactions and players' engagement with and attitudes towards their physical world experiences, concerns, and priorities.
- Policy stakeholders are seeking informed insight into citizens preferences and attitudes and could be open to engaging with this input. This assertion is evidenced by the active engagement of policy makers from the European Union in the adoption of the project and the participatory Citizen Science approach that engages stakeholders from the onset an example was the first pilot cycle with the governmental authorities in Frankfurt, Germany.
- Using as an example, the project addresses the global social challenge of sustainability and the climate change crisis. The project also presents opportunities to examine the transferability of the methods developed in the iterative sense as the research is undertaken. Subtopics that have emerged in the exploratory pilots.

include energy costs and consumption, government subsidies for green initiatives, the impact on disadvantaged sectors in society, and transport. These subtopics will serve to inform the development of case studies as the project progresses. The collaborative participation of commercial digital game companies and data analytics academic specialists who will also a focus on economic viability and effective business models (Hollins et al 2018)

2.2 Conceptual Design: The Research Objectives and Questions
The conceptual design of the project research objectives and questions are provided below:

2.2.1 Research Objectives
- To Establish ways in which games can be designed to provide a link between citizens and policymakers.
- To Understand the actual and potential impact that games can have on citizens' engagement in social issues and challenges, and on policy stakeholders' awareness of citizens' attitudes and preferences.
- To Assess the benefits and risks to individuals and society of using games to promote engagement with societal challenges.
- To assess the impact of games and playful techniques on participants' attitudes, knowledge, and behaviour towards climate change, and the effectiveness of different game design elements in achieving these outcomes.
- To develop recommendations and guidelines for policymakers and practitioners on the use of digital games and playful techniques as a tool for engaging citizens in climate change-related decision-making processes.
- To examine the potential of digital games and playful techniques in fostering intergenerational and cross-cultural dialogue and collaboration on climate change issues.
- To develop a framework for evaluating the impact of games and playful techniques on citizen engagement and participation in climate change-related decision-making processes, and to use this framework to assess the effectiveness of the GREAT project's interventions.

2.2.1 Research Questions
- Are digital games effective in providing a link between citizens and policy makers?
- What is the impact of digital games on citizens' engagement in social issues and challenges and on stakeholders' awareness of citizens attitudes and preferences?
- What are the benefits and risks to individuals and society of using digital games to promote engagement with societal challenges?

- What are the most effective types of digital games and playful techniques for engaging citizens in discussions and decision-making related to climate change and sustainability?
- How can games and playful techniques be used to effectively communicate complex scientific and technical information related to climate change to a broad audience?
- What are the potential impacts of games and playful techniques on participants' attitudes, knowledge, and behaviour towards climate change, and how can these impacts be measured and evaluated?
- How can digital games and playful techniques be used to foster intergenerational and cross-cultural dialogue and collaboration on climate change issues?
- How can games and playful techniques be designed to promote empathy and emotional engagement among participants, and how can these emotional experiences be used to motivate action towards climate change?
- What are the potential benefits and limitations of using game-based scenarios and simulations as a tool for testing and evaluating different policy options and their potential impacts on climate change?
- What are the most effective game design elements for promoting engagement and learning in climate change-related games, and how can these elements be integrated into game design?
- How can the impact of games and playful techniques on citizen engagement and participation in climate change-related decision-making processes be evaluated, and what are the most effective methods for doing so?
- How can the insights and lessons learned from the GREAT project be applied to other contexts and settings, such as other global challenges or other fields of research and innovation?
- What are the potential risks and limitations of using games and playful techniques for engaging citizens in climate change-related decision-making, and how can these risks be mitigated?

2.3 Technical Design: The Study Design

Social dilemmas have been represented in games designed to raise awareness. In the context of the climate change crisis this has been characterised as asking players to make decisions to balance potential positive and negative outcomes to provide illustrations of the consequences of their decisions. An example of this approach is 'World Climate' a role-play simulation of the United Nation climate negotiations this game provides feedback on the impact of policy decisions on climate change (Rooney-Varga et al 2018).

Deploying two distinct approaches the GREAT project extends this practice by aiming to capture the interaction data that reflects players disposition to social dilemmas posed by the climate crisis. The first approach of embedded quizzes in commercial games and the second (informed by harvested data from the first approach) supported dilemma based applied games.

- Targeted Data is harvested within the games from focussed samples, Quiz-style games are designed by commercial partner Playmob with mobile devices as the main platform, to effectively capture anonymised player data relating to knowledge, sentiment, and behavioural choices. Players are provided with the additional option to provide supplementary demographic data which will inform the analysis. The primary distribution mechanism is via media embedded within existing popular mobile games. In addition, the quizzes will also be embedded into partner websites and applications related to the social issues of interest or will be accessed via unique QR codes. These options enable audience-specific data streams by geo-location, partner or date or time to be rigorously analysed.
- The moderated dilemma games provide an opportunity to explore topics in greater depth. Expanding on the experience and expertise of applied game developer Serious Games Interactive (SGI) these games will be played by cohorts of players who have agreed to participate for a specified duration. The activities will be stimulated and coordinated by a human facilitator on the game platform. The consequent interactions within these collaborative games will generate opportunities for the collection of rich data and the formulation of insights into climate change policy issues. Inevitably, there is a balance to be achieved between the richness of the data generated in these collaborative games and the number of players that can participate.

2.3.1 The first relates to the dilemma-based learning (Dibl) games which will provide rich qualitative data sets. (Commercial Partner SGI led)

This element of the study design is where the citizen scientific approach to co creation occurs. in Dilemma Based Learning (DiBL), stakeholders participate in the scenarios collectively this is a fully facilitated supported activity. The stakeholder group will discuss and reflect together as the scenarios develop through discussion, With this approach the GREAT project team develop a narrative and support this with images and videos. The stakeholder

groups are involved and challenged in co creating the dilemmas and choices. When the group come to consensus on how the narrative should develop to fully incorporate consequences for actions and symmetric feedback throughout the story. The approach to developing the scenarios is as follows:

- Narrator's perspective

What is appropriate for the stakeholder group 1st, 2nd or 3rd person?

Examples of this are .: 1st person: I am in England, 2nd person: You are in England, 3rd person: Peter is in England.

- Should Short or branching narrative be used?

If several different branches of the story are desired, telling different sub-stories according to the participants' choices. Should the narrative be short and straightforward or be more complex and involve branching?

- Deep involvement of the stakeholders?

What degree of "immersiveness" is desired for the participants (this is dependent upon the narrator's perspective) . Should the stakeholders be personally involved in the story? Should they feel immersed in the story at a visceral level and in how the theme unfolds. Examples could be through role-playing by the facilitator, roles or unexpected external events.

- Fictional or 1:1 with reality? Where would the scenario be geographically located?

Should the story be factually based, or should it be fictional? Where should the story be geographically located?

- A 'Blended' experience or stand-alone digital?

Should the solution only take place in the virtual world, or should there be other elements, such as physical objects? The dilemma can include props (e.g. cards, game board, checkers), actors (e.g. actor), roles (e.g. authorities, groups) or events (e.g. an arrest or action). Draw out knowledge/behaviour in the classroom or do physical things in the classroom that influence choices digitally. Facilitator, stakeholders and externals can, for example, have different roles.

The data generated in the DiBL games could also, potentially, inform the future design of games for social impact in representing the emergent complexity of game play. Emergent complexity (Hollins 2011) is that which emerges from the interactions of the player with the technical environment (each of which is a traceable component) and these interactions being immeasurable and not reducible to the sum of their differences.

The commercial games deployed in the project will be supplemented with non-commercial open-source games developed by the academic partners in the consortium the University of Bolton (UoB), University of Rjoca (UNIR) and (DIPF). This will provide the opportunity to obtain additional data and insight, but with the primary purpose of testing the degree to which the GREAT methods are independent of the technology used to facilitate the research. As opposed to creating sophisticated delivery mechanisms and authoring environments, these open-source games focus on the demonstration of how the process of intervention design, implementation, data gathering, analysis, and generation of insight can be carried out without dependency on proprietary technologies. Open data analytics will be used to analyse both the results of gameplay and interactions with users and stakeholders. 'Data analytics' refers to both statistical methods and machine learning techniques, used pervasively in the media, government, the military, health and education, as well as in policy and science which are the focus of the project.

It (the data and process) is 'open' in the sense that the methods used are exposed and elaborated whilst the data remains confidential and anonymous. Whilst it is recognised that data analytics and indeed artificial intelligence provides insight there are critical ethical considerations that must be accommodated. It is argued (Lewandowsky and Pomerantsev 2022) 'the opacity of algorithms does encourage platforms to drench users in information that may be detrimental to democratic health. Even ignoring the specifics of content, algorithmic opacity also contributes to a general imbalance of power between platforms and users that can only be unhealthy in a democracy' leading to 'a battle between technological hegemony and survival of democracy'.

In this context, the project explores ways in which data analytics can be deployed ethically and in ways that actively reinforce democracy and dialogue, committing to the concepts of open scientific data and open analytics methods (Muslim et al 2020) and in recognising the generated data from confidential information and interactions through channels, workshops and focus groups is appropriately deeply anonymised. Once

anonymised the sources of data will be transparent, the analytics deployed in the project inspectable, and the analytics processes described in plain English terms.

2.4 Citizen Science and Co creation in the research methodological Process.

Co-design, Participation and Citizen Science Participatory methods are applied at the core of the project. The key audiences, including policy stakeholders, will participate and inform the design, prototyping and research phases of the topics to be covered and how best to present them.

It is essential that the project facilitates authentic input, interaction, and collaboration throughout the programme with the target audiences constantly receiving feedback and optimising as the project progresses.

The project will engage with audiences based on the International Association for Public participation (IAP)2 model, which increases the impact on the decision of engaged actors by moving along the spectrum of participation: inform - consult - involve - collaborate - empower. (IAP2 2022) This spectrum of engagement equally will be reflected in the game content itself and the co-design leading to it. Equality, Diversity, and Inclusion (EDI) is a critical element of engaging audiences, and the project has developed the programme to consider accessibility, internet access, health requirements and language needs. A citizen science approach is applied to all aspects of the research. This requires Participation beyond gathering opinions (= consulting), forming part of a research method focussing not on the explicit, quantifiable, and reproductive knowledge of the users but on revealing the tacit aspects of human activity, as Spinuzzi suggests, it is "what people know without being able to articulate" (Spinuzzi, 2005) Following good practice in citizen science, the project offers different degrees of participation from consultation to empowerment.

Stakeholders will contribute to the co-design and choose what kind and level of engagement they want to reach. This can range from co-design of graphic elements to the definition of research questions and the co-analysis of the collected data. The project will run a total of 5 iterative cycles. The first cycle will serve as a Preparatory Cycle with a tightly defined group of internal Test Users. Thereafter, at the start of each new cycle we will hold engagement workshops with around 20 participants in 5 languages (English, Spanish, German, Greek and Danish). The workshops will take place both online and in-person to ease participation and recruiting will be done via the partner networks, to ensure we attract a diverse set of participants. As the project offers different levels of engagement, these workshops will also offer the possibility to engage with the collected data and add a human understanding to the open data analytics (above). At the start of cycle 2 we will hold engagement workshops with policy stakeholders to provide them with a sense of ownership of the project, and we will continue to consult with - and feedback to - these primary stakeholders throughout the project.
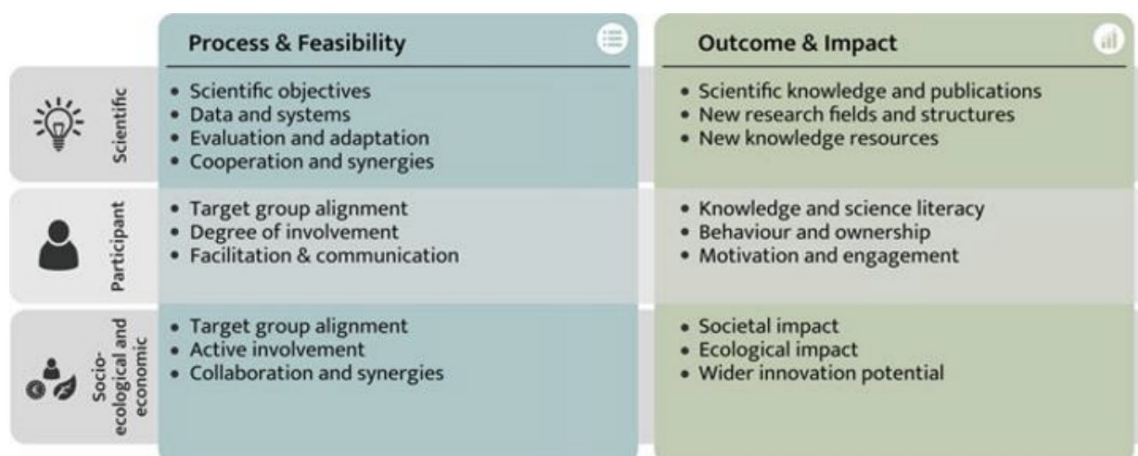

Figure 3: Methods for participatory approach and impact assessment. Keislinger et al (2018)

To assess the effects of the active integration of key stakeholders in the scientific process, we will apply a comprehensive evaluation and impact assessment framework developed by partners Centre for Social Innovation ZSI in Figure 2 above that has been specifically designed and successfully applied in citizen science projects. This framework goes beyond the assessment of scientific achievements and specifically considers impact on the individual citizens, society at large and other socio-economic impacts.

2.5 Technical Design: Sampling Design

Dues to the exploratory nature and scale of the project the use of established (controlled) sampling methods will be limited in the project. For the initial stages 'convenience sample' design will occur through existing networks of the collaborative partners before more controlled targeted sampling will occur.

3. The Study (Cycle) Design Activity

There are two distinct approaches to the cycle design within the great project:

- Cycle phase 1: intervention design. The policy theme and the research questions for the case study are defined in a collaborative process with stakeholders. The games and interventions are designed in a three-stage process, with policy stakeholders and citizens involved in collaborative design throughout, in workshops, focus groups and interviews. Stage one develops design challenges and use cases, answering the question "What will this game achieve and how". It will identify authentic dilemmas which concern them and the kinds of information which they would find valuable, and the user groups who can provide this information. Data from game play, and activities with stakeholders will identify needs for insight, to meet the nuanced needs of our target audience. Publicly available information on the climate crisis and other social issues will be collected and analysed to provide insight into the dilemmas selected by the project. This will help ensure optimal levels of user engagement, satisfy the needs of audiences, and identify opportunities for future iterations. The output of this stage is a design hypothesis, which specifies the expected engagement of users, the usable information which will be generated, and the value that this information will have to policy stakeholders. Stage two develops design briefs, answering the question "What game characteristics are required to meet this design challenge". It will provide detail on the specific issues and challenges raised by a dilemma, identifying or authoring appropriate thematic content, and specifying sources of data, analysis, and outputs. Stage three develops wireframes, answering the question "How can this design brief be implemented", providing a specification which can be analysed for the technical development.
- Cycle phase 2: preparation of case studies, the intervention theme and research questions, and the games activities to inform the research instrument design, and schedule of case study activities defined. In parallel the wireframes produced in phase one will be implemented. Although the main purpose of the GREAT project is not the creation of games, nevertheless the project will produce several new games in rapid development cycles. This is feasible because the consortium includes two commercial games providers whose development systems enable us to reconfigure existing technology for use throughout the duration of the project. A development group will be established to manage the agile development process..
- Cycle phase 3: data gathering and analysis. Activities will range widely from small scale activities to large numbers of users, gathering both quantitative data from the games, and qualitative data from interviews and focus groups. The case studies will seek to answer the research questions and test the design hypotheses developed in phase one. They will involve the whole information flow of game play, data gathering, analysis and engagement with policy stakeholders, evaluating the transferable methods developed by the project. The case studies will also provide feedback on the effectiveness of game designs and the dynamics of communication patterns with user groups. In all cases, the respondents in GREAT research will be volunteers who have given their informed consent to participation. Three different strategies will be used to identify participants in trials:
- Cycle phase 4: conclusions and insight. In this phase the conclusions of the case study are formulated. These include the preparation of scientific outputs for publication, feedback for the design of instruments, processes, and participant engagement. In collaboration with stakeholders, the insight from the cycle is drawn out, insight briefings prepared for policy stakeholders, and their feedback elicited. The GREAT method is reviewed and updated. Phase 4 is carried out in collaboration with stakeholders and constitutes a preparatory stage for the next iteration of the cycle. Engagement and targeting strategies are reviewed and optimised after each cycle.

3.1 The second relates to the quiz games within games approach which in turn we anticipate will we anticipate will supply large quantitative data sets. (Commercial Partner 'Playmob' led)

Quiz-style games are designed to be embedded within mobile devices as the main platform. The function of the quiz is to capture players' knowledge, sentiment, and behavioural choices. Building on the platforms and expertise of commercial partner Playmob, the project will gather a large quantity of responses data from an estimated user base of of 3 million players, with an expectation of a response from 300,000 players based on previous activities. The data is generated from players of the games and from specific targeted subsets of groups

of users. This quantitative data is anonymous, protecting the privacy of players. Players also have the option to provide supplementary demographic data which can inform the analysis.

The primary distribution mechanism of the games is by media embedded within established successful mobile games. In addition, the content can also be embedded into partner websites or applications related to the social issues of interest and these can be accessed via unique QR codes. All options enable audience-specific data streams by geolocation, partner or date/time to be analysed*.*

4.   Conclusions.

In conclusion this paper provides an early summary of the planned methodologies and interventions of the EC funded GREAT research and Innovation project. A project that investigates the potential of digital games and gameplay to engage citizens across Europe through codesign activities to provide input into developing policy priorities on climate change. The GREAT project makes a strong contribution to the impact of the Horizon Europe Strategic Plan by realising this potential (a key sector of the *cultural and creative sector*) to achieve a *continuous engagement with society, citizens and wider economic sectors.* A key contribution is to enable gameplay to become more than entertainment, simulation, or learning, by situating it in authentic social issues.

The GREAT project also conceives and applies innovative data gathering and analysis methods to understand players' attitudes and preferences in relation to policy and closes the loop by feeding them forward to policy stakeholders.

Acknowledgements

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