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Place-based decarbonisation for transport

Serious Games for Serious Energy Solutions – studying diversity and collective decision making

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July 2022



Reference as:

Harris, Z. M., Campbell, M. F., Kioupi, V., Oluleye, G. (2022) Serious Games for Serious Energy Solutions – studying diversity and collective decision making. Leeds: DecarboN8. DOI: <https://doi.org/10.48785/100/131>

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Engineering and
Physical Sciences
Research Council

This project was supported by DecarboN8. DecarboN8 is funded by the EPSRC Energy Programme, grant agreement EP/S032002/1.

Serious Games for Serious Energy Solutions- studying diversity and collective decision making

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Executive Summary

Aims

Diverse groups have been shown to result in higher levels of innovation and collaborative decision making. For the UK to meet our net zero goals in an innovative and timely manner while also representing the diverse needs and aspirations of the population requires adequate diversity within the policymaking sphere. The aim of this project is to use a serious game to understand and assess the impact group diversity has on collective decision-making, set within the context of sustainable development.

Methods

Two online workshops took place in winter 2021 using the New Shores game. New Shores is a serious game in which participants must develop an island to provide personal and community wellbeing, whilst being mindful of the impacts this development will have on the environment, which is represented as a series of climate change events, such as flood and hurricanes that occur the more the island develops. Group 1, a heterogeneous (75:25 ethnic minorities: White, mixed men/women, 18-65+, lower ranking employment/unemployment) and group 2, a homogeneous group (managerial level, White men over 40 years old) were recruited. Participants remained anonymous to each other and could only communicate via a chat function. Each session was facilitated by a moderator from the research team. An EDI survey was completed before the sessions and a post-workshop survey was completed by participants. The chat scripts were analysed to assess for levels of collaboration and collective decision making and the final status of the island was analysed to assess levels of innovation.

Findings

Key differences were observed between the homogeneous and heterogeneous groups both in the state of the island at the end of the game and the levels of co-operation and decision-making observed. The final state of the island was similar between the two groups, with group one having built more resilience into their island compared to group two. The accumulated income was much higher in the homogeneous group with more personal wealth unequally distributed between players. The number of natural disasters were similar on the two islands, however the homogeneous group suffered more losses (houses) as a result of not protecting them.

Overall, the heterogeneous group worked much better together than the homogeneous group. They established an open discourse and the need for collective action much earlier and as a result, they outperformed the homogeneous group in terms of collective decision making, which was reflected in their island performance. The sole focus of the homogeneous group was development, whereas the heterogeneous group showed balance between conservation-driven and development-driven action. The homogeneous group used humour and passive aggression to comment on the uneven distribution of wealth or the selfish actions of certain players. Group one was much more open in terms of pooling resources and sharing money and creating actionability as a group. In the postgame survey, participants acknowledged that they worked well together in the heterogeneous group and that they acted in a self-interested manner in the homogeneous group.

While small scale and exploratory, our findings warrant further development of the New Shores serious game with the goal of trialling it more explicitly amongst policy and governance actors.

1. Introduction

The need for innovation that is equitable and benefits all members of society is imperative in the context of climate change, an unprecedented threat requiring a host of technologies and behavioural changes to limit its negative impacts on our planet (IPCC, 2018, IPCC, 2022) Globally, creating a zero-carbon environment to combat climate change has become one of the biggest policy issues of our time. The UK has ambitious goals of achieving net zero carbon by 2050. The UK’s Net Zero Strategy outlines the government’s plans and key policies through which to achieve this by 2050, considering itself as a pioneer in green innovation (UK Government, 2021). These plans must involve a just transition, ensuring no-one is left behind and the diverse needs of the population are met (Rising *et al.*, 2021). Beyond this, communities must be empowered to be part of the change and possess the ability to influence such change (Robins & Rydge, 2019).

Diversity in decision-making is essential to ensure the most innovative and relevant outcomes are achieved, and that these decisions are reflective of the diverse needs of the groups they are trying to both represent and help. Studies have shown that more diverse groups lead to better brainstorming sessions (McLeod *et al.*, 1996), higher levels of critical analysis (Nemeth *et al.*, 1992) and are more likely to result in radical innovation (Díaz-García *et al.*, 2012; Bocquet *et al.*, 2019). Data from 2021 shows that at all levels of policy making, the diversity of the UK population is not adequately represented, the only exception being the UK civil service (Figure 1). Across the UK policy landscape, these changes have occurred in past 10-15 years and despite these increases shortfalls still exist including lack of female ethnic minorities and presence of ethnic minorities in the higher grades (Uberoi and Tunnicliffe, 2021). A historic lack of diversity amongst policymakers has led to outcomes which may be at odd with the needs of diverse local, regional and national communities. With this in mind, it could be argued that by increasing the levels of diversity within groups of policymakers in the UK, more innovative and appropriate solutions can be developed.

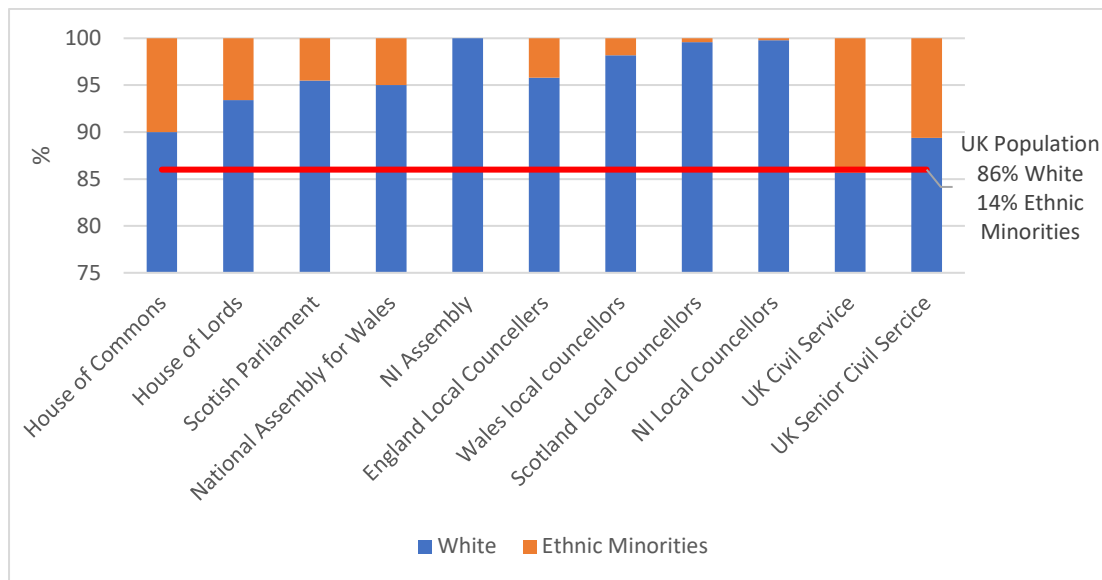


Figure 1: Distribution of White and Ethnic minorities in UK policymaking organisations. Data source: Uberoi and Tunnicliffe, 2021.

Integral to both the plans and actions taken is innovation. Diversity in Research and Development teams can promote innovation efficiency by providing informational and social benefits throughout the innovation process. It is on this basis that *Serious Games for Serious Energy Solutions* was devised. The purpose of the study was to develop a methodology for a larger bid to try and understand, broadly, what baseline level of diversity is required to effectively decarbonise the UK energy system. In the context of this project, it was about understanding what impact group diversity has on problem

solving and solution innovation. Embedded within this understanding was also the question of collective decision-making by which we mean how well the group functioned collectively. This would be done using an existing serious game that involved issues of environmental sustainability.

2. Project Overview

2.1 Initial project

The initial project aimed to take a place-based approach in the North, focusing on the city of Bradford and the local authority's commitments to the UK's decarbonisation goals and those specifically in line with the Decarbon8 Network. The aims and objectives of the project were as follows:

- Identify an appropriate 'serious game', to be used to guide teams in problem solving through innovation.
- Develop a framework for assessing the level of innovation of serious game outcomes
- Develop a survey to understand levels of socio-economic diversity of team participants
- Develop a methodology for assessing the contribution of diversity to problem solving
- Test the framework of a place-based approach for understanding how place-based diversity affects how teams work together to innovate.

The project was structured into three work packages. Work package one focused on measuring innovation. This involved identifying a serious game that presented a difficult problem related to sustainability for teams to solve. The serious game would be chosen according to its accessibility, its relevance to energy and sustainability, and ability to catalyse on the individual traits and characteristics of participants in the group while allowing for multiple outcomes. Once the appropriate game was identified the project team would deduce what constituted innovation in the context of the game. Work package two focused on measuring diversity. For this aspect of the project the team worked with the Equal Group to ensure we developed an EDI questionnaire that captured diversity in a sensitive and equitable manner. This included diverse characteristics from several perspectives, including personal (covering all protected characteristics), socio-economic, educational, professional, neurological and social. Work package three focused on analysis of the serious game and hypothesis testing as to whether higher levels of group diversity led to greater levels of innovation.

2.2 Changes due to COVID and revised approach

The project faced several significant challenges which required a complete reconfiguration of the approach. Beyond the obvious effect of the COVID pandemic, our small team also experienced two significant job changes and one maternity leave. COVID meant there was no possibility of in person workshops which, in turn, severely limited our game selection. We adapted our methodology to find an online game.

While the original aim was to work with policymakers and the local authority in Bradford, both sets of stakeholders were overwhelmed with pandemic-related issues. During our initial recruitment period we received polite declines due to the above reasons coupled with an overall Zoom fatigue that made playing a serious game online an unattractive use of time. Our next line of thinking was to work with the general public and set up three to four sets of groups to each play the serious game. Two of these groups would be homogenous along some line of diversity as identified by the EDI questionnaire, for example gender or race. The other two groups would be heterogenous, again working off the basis of how the EDI questionnaire was completed. Again, because of the pandemic we struggled with recruitment, particularly in respect to recruiting truly heterogenous and/or hard to reach populations.

Our compromise was the decision to work with a recruitment agency and provide participant incentives. The project budget allowed for two serious games to be deployed, meaning we had to settle for one homogenous group and one heterogenous group.

2.3 Creating hetero and homogenous groups

We went back to our initial question of understanding what impact group diversity has on problem solving and solution innovation and the knowledge that the demographics of policy makers in the UK, in general, does not reflect the diverse demographics of the overall UK population. On this basis we decided to create homogenous and heterogenous groups that would, on a very small scale, replicate this imbalance. While recognising that our approach was far from perfect, we decided that our homogenous group should comprise individuals who were white, male, over the age of 40 and in a managerial employment role while our heterogeneous group would be 75 percent ethnic minorities with a mixture of genders, abilities and disabilities, and ages. No one from the heterogenous group was to be employed in a managerial role. The logic behind configuring one group employed in managerial roles and one group without was to try a similar dichotomy to policymakers versus the general public. The assumption was that people in managerial roles would be tasked with some responsibility to make decisions at a medium to large scale whereas those not in managerial roles would have less opportunity for this kind of responsibility in the workplace. We discuss this diversity further in section 4.1 of this report.

3. Methods

3.1 Serious game review and selection

3.1.1 What are serious games?

Serious games are games that have a purpose beyond entertainment. They are used to promote learning and behavioural change. Serious gaming is used in various areas such as education, healthcare, marketing and other businesses and industries. The power of serious games is that like 'regular' games, they are still entertaining, engaging and immersive. However, they also combine learning strategies, knowledge and structures, and game elements to teach specific skills, knowledge and attitudes. They are designed to solve problems in several areas and involve challenges and rewards, using the entertainment and engagement components provided when the user is playing games.

3.1.2 How did we select New Shores game for our study?

We reviewed several serious games to decide on the one that would be aligned with our aim to investigate how different teams make decisions around crucial sustainability issues related with climate change. The games were identified by making online searches using as key words serious games OR social simulations AND climate OR energy. The games reviewed included:

1. The [energy transition game](#), a game about transforming the energy system
2. [New shores game](#), a game about climate and democracy
3. [The world's future](#), a game about the interdependencies of the Global Goals
4. [Stress Nexus challenge](#), a serious game about the Water, Food, Energy Nexus.
5. [Climate Challenge](#), a serious game based on the tragedy of the commons
6. [Settlers of Catan, Oil springs](#), a board game that asks players to develop Catan but manage the complex socio-environmental problems that arise
7. [The Beer Transportation Game: How to decarbonize logistics by moving freight to sustainable transport modes](#), a serious game developed by academics for their students
8. [In the Loop](#), a serious game about circular economy

Because of COVID restrictions we had to first exclude the ones that were only for in person delivery such as In the Loop, Settlers of Catan, Stress Nexus Challenge and Climate Challenge.

We were left with the Energy Transition Game, the World Future, New Shores and the Beer Transportation Game. Energy Transition and the World's Future games were ruled out due to high associated costs (to hire facilitators from the games development team, purchasing the game, and paying fees per player) and high time demands (in excess of 6hrs game play and debrief). The Beer Transportation Game was mostly a game of calculations that while it allowed participants to work in groups, a "correct" solution needed to be identified. This game was excluded as it would not provide the challenging environment needed for groups of participants to make decisions, resolve conflict and come up with new ideas and innovations. Thus, we selected the New Shores game which is available for free and the instructions as well as moderator training are available online for free as well. One member of the research group attended moderator training that included playing test rounds of the game to understand how it is played and how participants engage with the game.

3.1.3 What is New Shores and how is it played?

The game takes the players on a newly inhabited island. Initially equipped with nothing more than a basic hut and a couple of action points, the players are soon thrust into a harsh reality of earning money, protecting their households, and developing public infrastructure. On their way, they discover that all these actions are interlinked; while exploiting the island's natural resources may quickly improve their living conditions, it may also disturb the island's ecological balance and lead to natural disasters. The game is only played online, and the set-up is easy and straightforward, the platform allows the moderator to create a new game and invite participants via their emails. Participants are then given a username and password to sign up and are allocated a nickname which they use throughout the game. The moderator and players communicate only through chat throughout the game and use the nicknames provided (Latin plant names) so that anonymity is ensured. The game can be played with participants participating as well in an online call so that they can talk to each other and maybe see each other's faces but for the purposes of our research project we wanted to encourage anonymity so we could check the biases participants would have concerning the diversity of the group playing the game. The game allows for the provision of pre- and post-game questionnaires and saves the chat transcript that can help with data analysis to deduce how different groups of people make decisions collectively.

The players need to discuss and decide on strategies that are mainly influenced by pursuing collective or individual goals such as building and protecting public infrastructure or building and protecting private property. In each round they have an operations phase in which they take actions on the island to develop it and a reporting phase in which they see the outcome of their actions on the environmental (CO₂ concentration, coal extraction, forest condition), disasters happening such as floods and hurricanes and the health, and culture and education levels of the island. As they witness the changes that occurred during the reporting round, they are then asked to make decisions for the next operations phase. The game was played for ten rounds and after the final round the initial and final state of the island were compared and the participants were asked to share their thoughts about it via structured questions from the moderator. They also responded to a series of questions around how they felt about playing the game, communicating through chat, what it means to win this game, what they achieved in the end and how they played as a group.

3.2 Workshops

Two online workshops were held in the winter of 2021. Two groups were constructed, a homogenous group which aimed to reflect policymakers and a heterogenous groups which aimed to reflect a more general public. Ten participants were invited to each workshop, but due to last minute drop-outs and

no-shows, there was a total of 7 participants in group 1 (heterogenous) and 8 participants in group 2 (homogenous). A recruitment agency was used to attract suitable participants for the workshop. Specifications were given to the recruiter to allow us to attract participants of specific demographics to form our groups (Table 1).

Table 1: Specifications given to recruiter for participant selection

Group 1 – Heterogenous	Group 2 - Homogenous
<p>Essential:</p> <ul style="list-style-type: none"> • 75:25 ethnic minorities: White • 50:50 split gender <p>Desirable:</p> <ul style="list-style-type: none"> • Non-managerial roles • Any age - no students, max 2 retirees (min 75% in FT employment) 	<p>Essential:</p> <ul style="list-style-type: none"> • Male • White <p>Desirable:</p> <ul style="list-style-type: none"> • Managerial role • Over 40

Participants were sent a link to the EDI questionnaire (Appendix i) ahead of time, as well as information about how to play the game including a short video. The workshops were run by a moderator from the project team. An online structure was created so that the other three researchers could observe the game, take notes, and flag any technical issues but in such a way that was not visible to participants in order to minimise distraction for participants. Participants were made aware that they would be observed by the research team in the Participant Information Sheet. The structure of the game started with a welcome from the moderator, followed by an overview and purpose of the game and a few housekeeping rules. As a reminder, all of this was communicated through virtual chat. This was then followed by a practice round of the game. Ten rounds of the game were played, then a post-game discussion took place. Prior to leaving the workshop, participants were asked to complete a short survey on their experience (Appendix ii). The same introduction text and question prompts were delivered to both teams to ensure consistency.

This study was given favourable ethics approval by the University of Surrey in July 2021 (FEPS 20-21 018 EGA).

3.3 Analysis

EDI data were plotted and described to get an understanding of the participant make-up. Outputs from the New Shores game were analysed to compare the state of the islands of the two groups at the end of the game. Comparisons were made between groups, assessing their individual and collective outputs. Findings from the EDI survey are discussed in Section 4.1 while the results from each group's game are compared and discussed in Section 4.2

Our first set of qualitative findings come from a coding of the two chat transcripts, (as a reminder, the only medium through which participants communicated with one another). Coding took place over the course of one day where the research team met and began by individually coding each transcript line by line. This was followed by a group discussion and then a subsequent group coding. During the first round of coding a grounded theory approach was applied, wherein each researcher coded freely. At the end of this free code, a list of codes was developed by each researcher and shared across the team, looking for similarities. The second round of coding was more structured and temporal in nature. Because each chat was saved as a time-stamped transcript, the research team went through the transcript, identify moments in the game when collective decision making occurred amongst participants and then ranking the robustness of that collective decision making (e.g. how many

participants were involved in the decision, how much dialogue was there) on a scale of 1 (least) to 3 (most collective).

Our second set of findings comes from the postgame survey each participant was required to complete after having finished the game. The aim of the postgame survey was to better understand how the participant felt about the overall experience, any take aways and reflections and, finally any assumptions that may have arisen about other players. It should be noted that while there is some similarity between the questions asked by the moderator to the group in the post-game discussion and the post-game survey, the former was voluntary and answers would be seen by the entire group whereas the survey was mandatory (the participant’s incentive was contingent on this) and completed on an individual basis. Findings from the chat transcript are discussed in Section 4.3 while findings from the postgame survey are discussed in Section 4.4.

4. Findings

4.1 Diversity

Group 1 was made up of four females and three males, ranging from 26-55 years in age and Group 2 was made up of eight males, ranging from 36-65+ (Figure 2). All participants identified as the same gender as registered at birth.

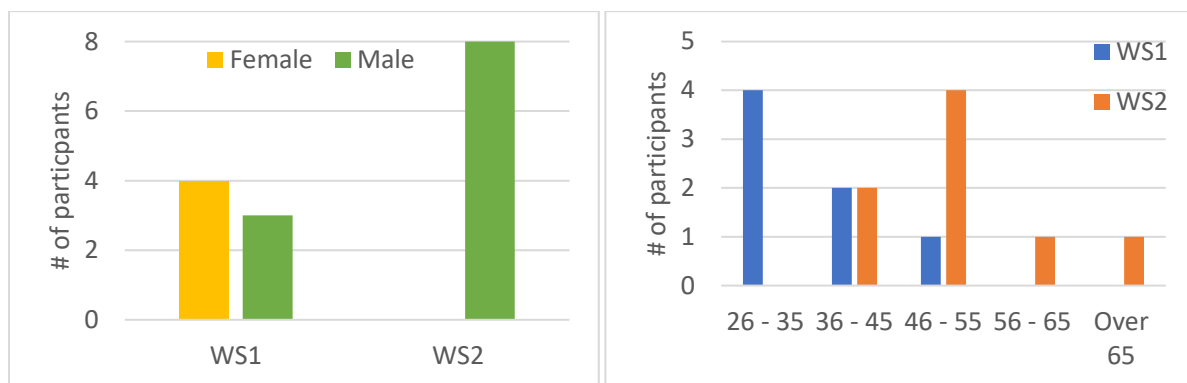


Figure 2: Gender and age range of participants by group (WS1 = group 1, WS2 = group 2)

Group 1 was made up of a more diverse group of ethnicities, whereas Group 2 was made up of only white participants (Figure 3). The participant in Group 1 who identified as ‘other’ specified they were ‘Indian Caribbean’. Three white participants specified further, one on Group 1 identified as ‘British’, in Group 2 ‘British’ and ‘Jewish’ were specified.

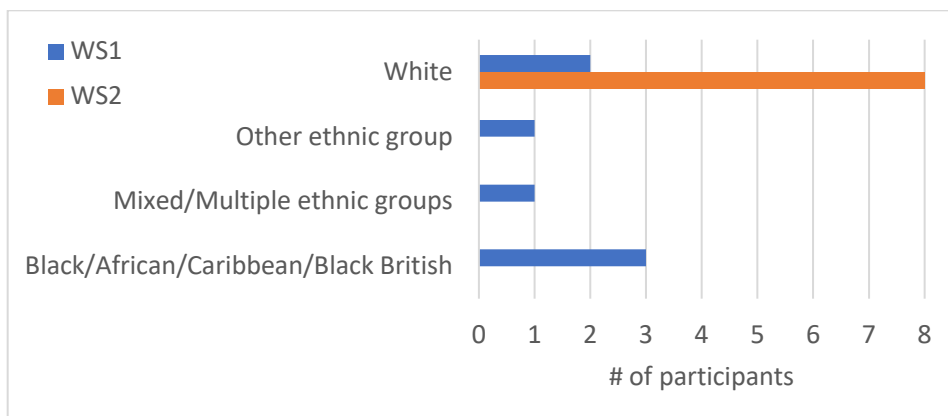


Figure 3: Ethnicity of participants by group

All of Group 1, and all but one person in Group 2 identified as heterosexual, the remaining participant in Group 2 identified as a 'gay male'. Many of the participants had some religious affiliation (Figure 4). Each group had one participant who disclosed having a disability. When asked about their mental health in the last year, Group 1 had two participants who considered to have suffered poor mental health whereas no one in Group 2 experienced this. Group 2 did not have any care responsibilities whereas almost half of Group 1 did. The marital status of participants can be seen in Figure 5.

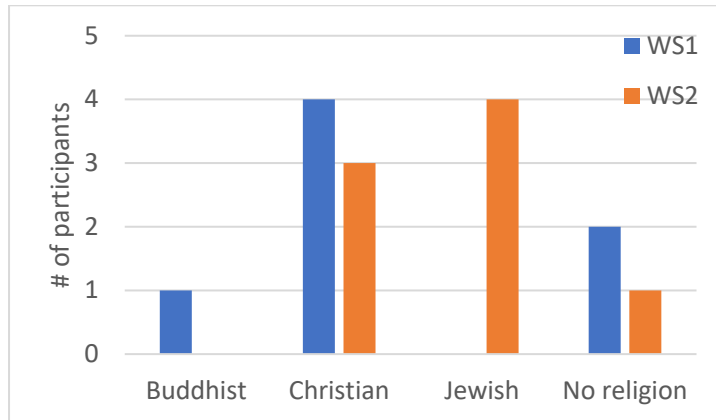


Figure 4: Religious affiliations of participants by group

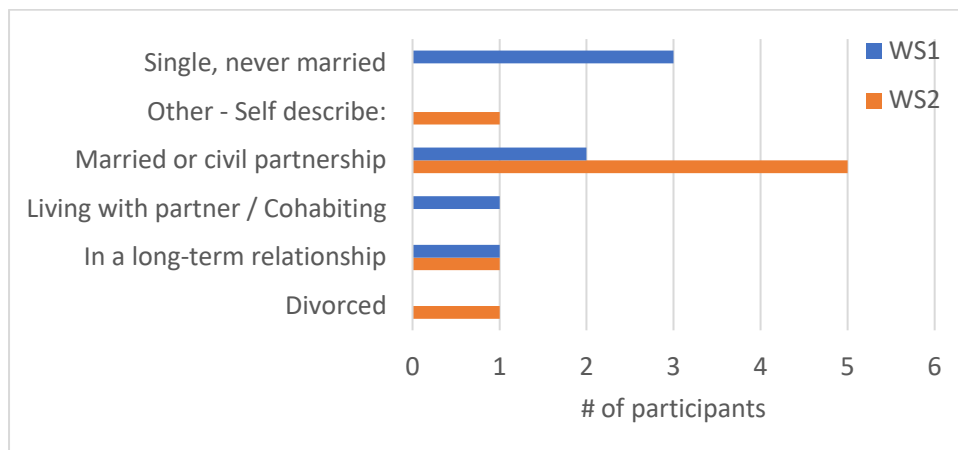


Figure 5: Marital status of participants by group. 'Other' self-described as 'Divorced but now in a long-term relationship'

The final part of the survey was about the level of education of the participants and their parents. All participants had a similar level of education (Figure 6).

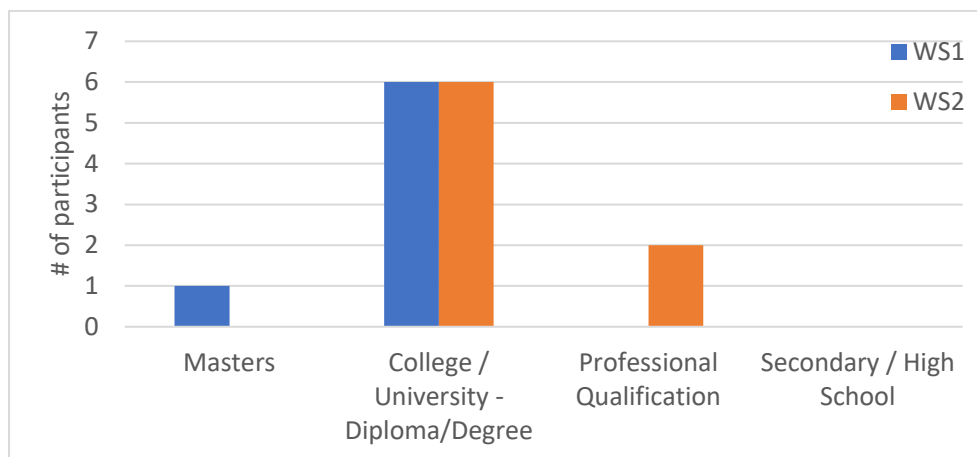


Figure 6: Highest qualification of participants, by group

The education levels of the participants' parents were generally higher for group 1 participants, than Group 2 participants as reflected in the highest level of education (Figures 7).

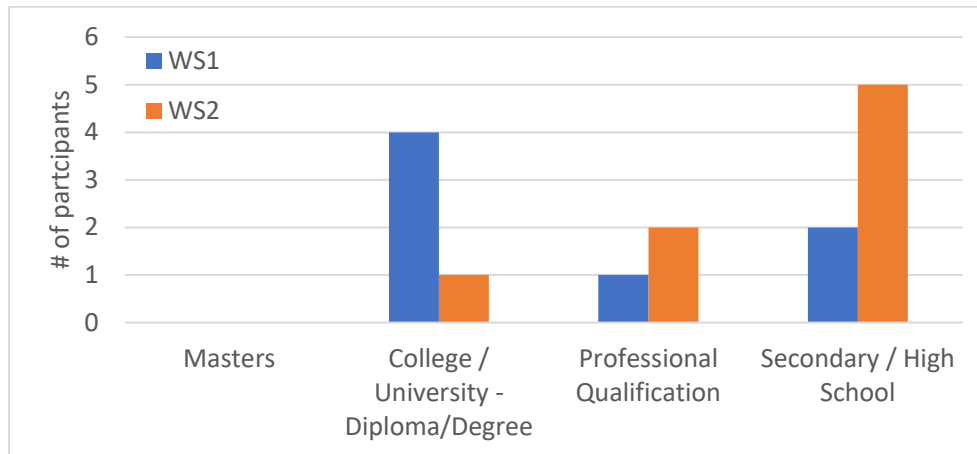


Figure 7: Highest qualification of participants' parents, by group.

4.2 Status of the Island

Figure 8 shows a visual graphic of the state of the island at the end of the game, each icon has been labelled. Group 1 managed to achieve higher scores in education and culture compared to Group 2, whereas both groups were equal in health scores (Table 2). Both groups had similar levels of development, but Group 2 built more private rooms and less public buildings compared to Group 1 (Table 2). Group 2 also had a much lower level of resilience in terms of protection of buildings from disasters (Table 2). In fact, two private homes were lost to climate related disasters.

Table 2: Final results of the island by group

	Group 1	Group 2
Island statistics	Education: 7 Health: 5 Culture: 3	Education: 3 Health: 5 Culture: 1
Final CO₂ concentration	75	71
Number of public buildings	8 of which protected 6	5 of which protected 4
Number of private houses	9 of which protected 7	7 of which protected 3 (started with 9, but 2 were lost to disasters)
Number of private rooms	8 of which protected 7	10 of which protected 1
Total level of development (number of buildings)	25	22
Total level of resilience (number of protected buildings)	20	8

Groups 1 and 2 had similar CO₂ concentration trajectories and final values with general increasing trend across the 10 rounds, but group 1 faced more floods and significantly higher number of hurricanes (Figure 9). Coal use was similar in both groups (Figure 10), showing increasing trends across the 10 rounds and aligning with the CO₂ emissions graph. The forest condition was similar on both groups' islands as it started declining initially, then improved to higher than initial levels because of the decisions made by the players (Figure 11). It again decreased but was almost stable in the last few rounds.

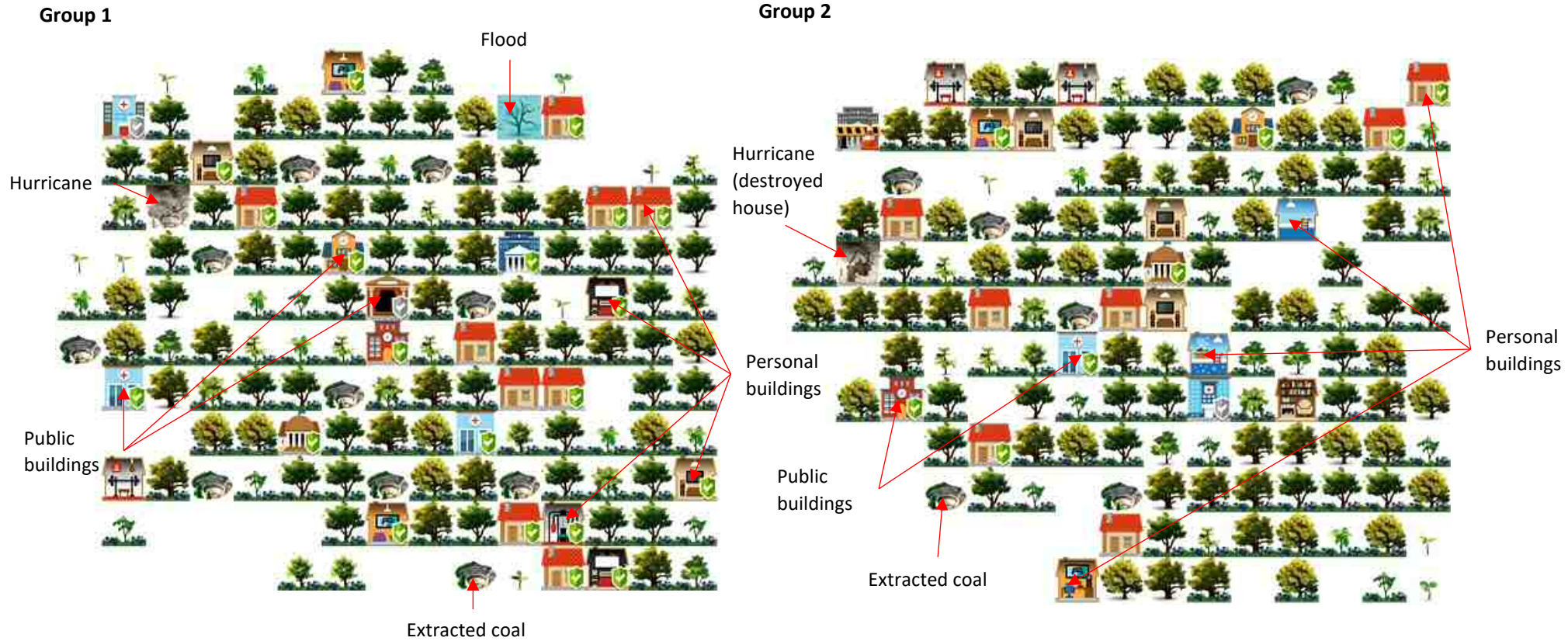


Figure 8: Final Island map of Group 1 and Group 2, with labels for cell types. Green shield indicates a protected building, silver shield indicates that the building in unprotected building due to insufficient funds invested, no shield indicates the building is unprotected and traffic cone indicates a building under construction.

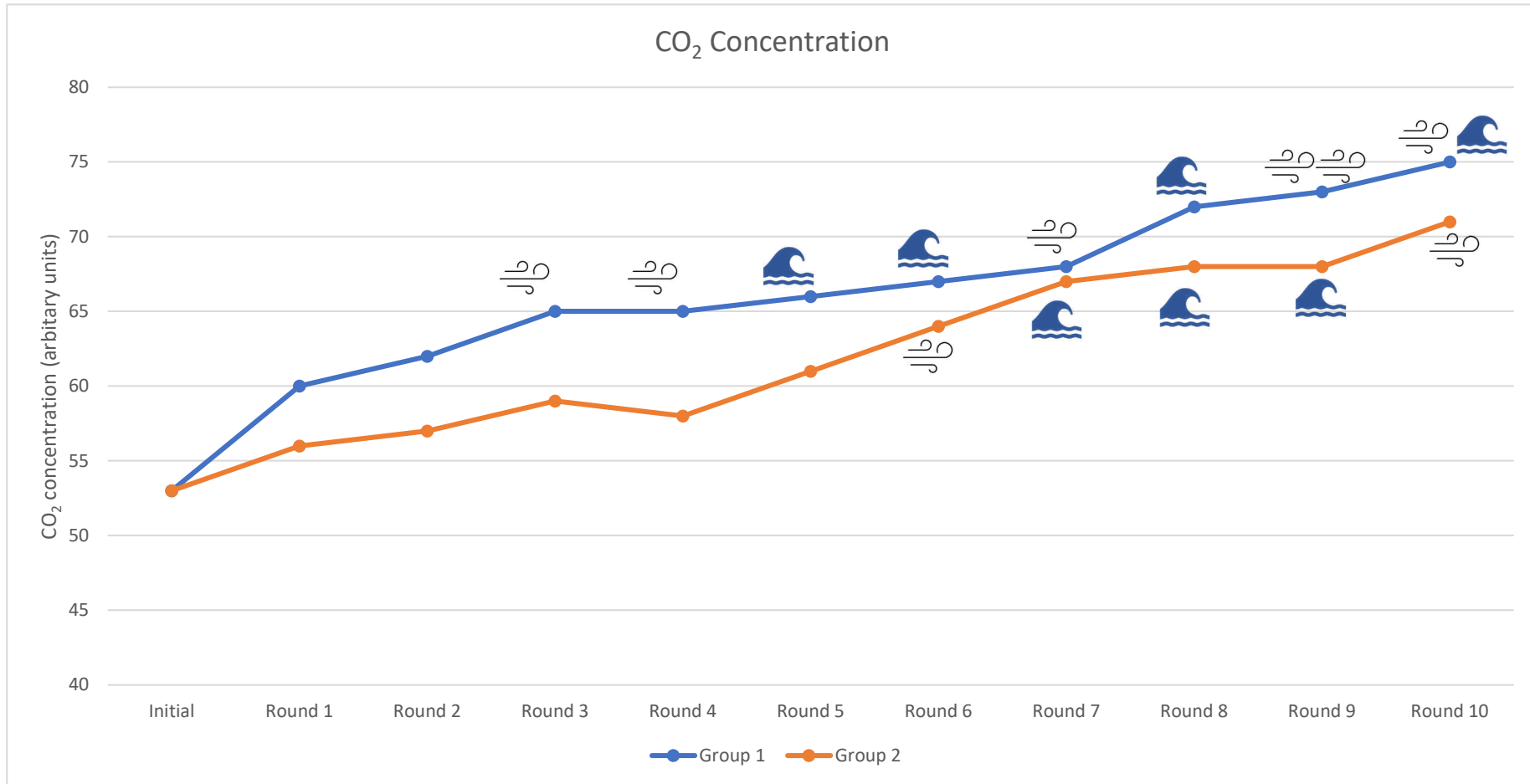


Figure 9: Changes in CO₂ concentration (arbitrary units) across the ten rounds of game play. Icons indicate rounds where there was a natural disaster, either a hurricane (☄) or a flood (🌊).

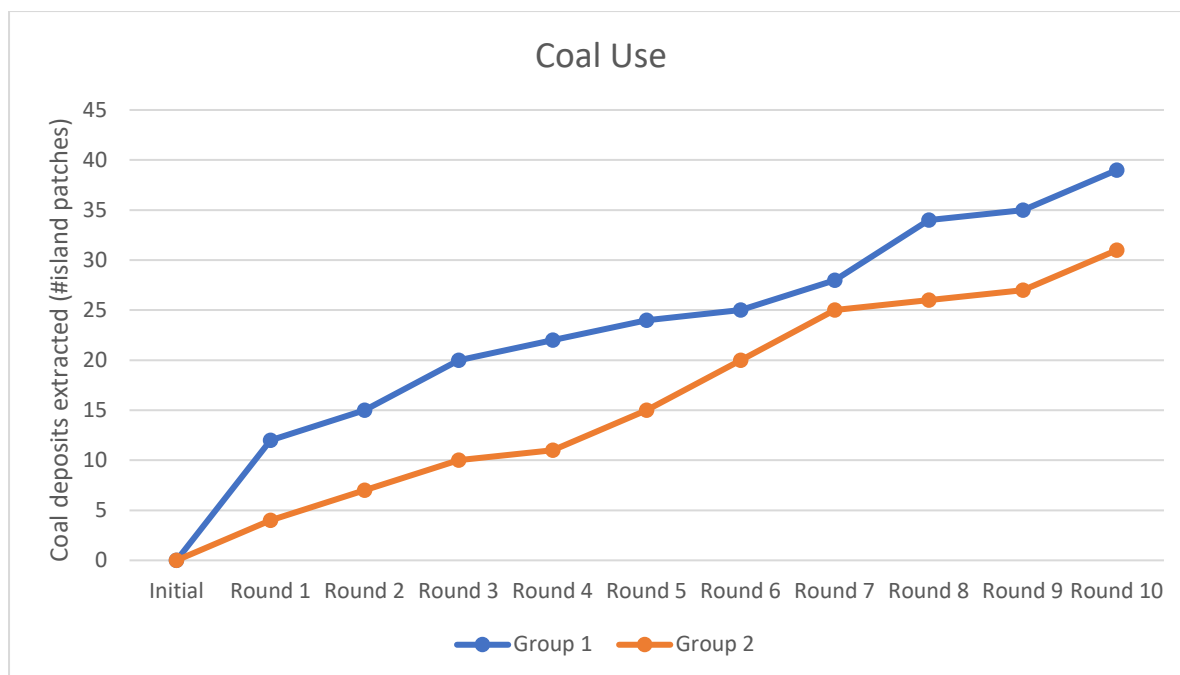


Figure 10: Changes in coal use (arbitrary units) across the ten rounds of game play.

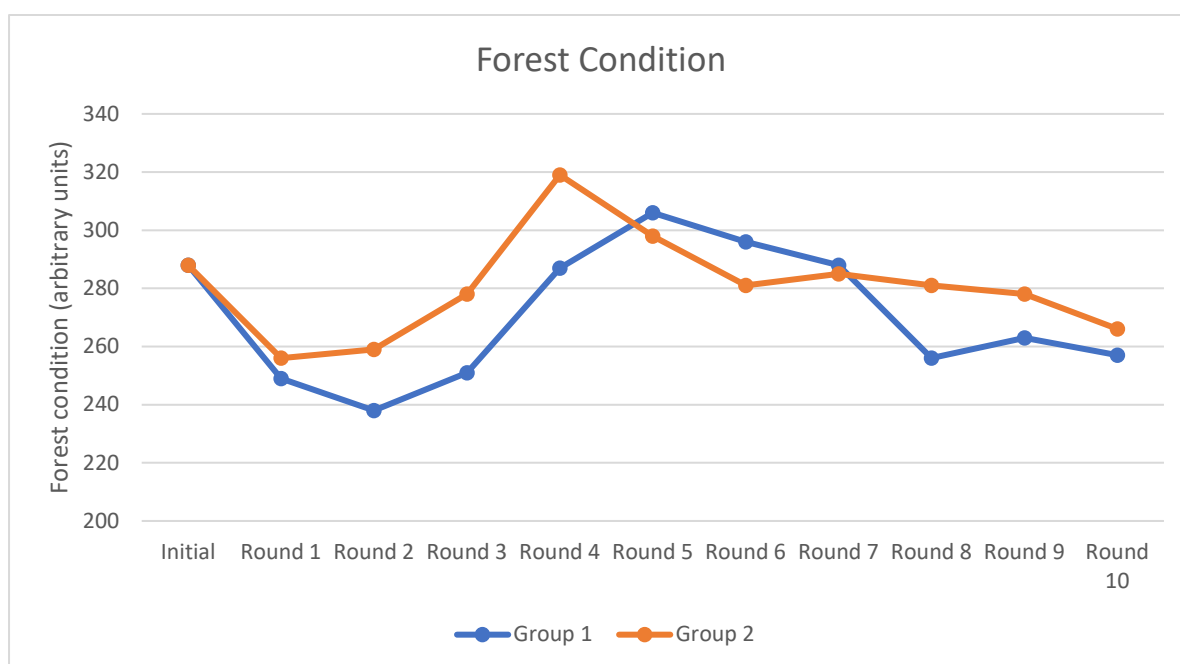


Figure 11: Changes in forest condition across the ten rounds of game play

Accumulated income in the final round was much higher for group 2 compared to group 1 (Table 3), the richest person of Group 2 was 13 times richer than the richest person of group 1 (Appendix iii). The final accumulated income was also 13 times higher in group 2 than in group 1. In group 2 there were big inequalities in terms of the players’ final standard of living; two people achieved very high standards (18 and 11 respectively) and two people went homeless (Table 3). In total, 3 people stayed in the same standard of living and 3 increased it, compared to 2 staying in the same standard and 5 increasing it in group 1. The highest standard of living achieved by group 1 was 2.6 times lower than that of group 2. However, there were less inequalities in the distribution of income when compared to group 2.

Table 3: Final Round results

	Group 1	Group 2
Accumulated income range	0 – 8.4	0.8 – 109.2
Total accumulated income	21	271.6
Standard of living range	1-7	1-18
Change in standard of living (Initial standard of living for all: 1)	No change: 2 Increased: 5 Homeless: 0	No change: 3 Increased: 3 Homeless: 2

While the total accumulated income across all rounds for the two groups was similar showing both were prospering on the island, group 1 invested 1.6 times more money in public buildings and their protection than group 2 did (Table 4). The total number of trees group 1 planted to balance CO₂ emissions and regenerate the forest was 2.7 times higher than that of group 2, however group 2 collected 1.6 times more berries than group 1, but showed similar figures of coal extraction and cut trees as group 1 (Table 4). Although group 1 suffered more hurricanes and floods there was no losses from these events. On the contrary group 2 experienced significant losses in terms of buildings destroyed and specifically private homes/private property lost to climate related disasters (Table 4). Lastly, group 1 players never posed sanctions to other players, whereas group 2 players posed sanctions to two members of their group to regulate their actions on the island (Table 4).

Table 4: Key actions taken by players and losses from natural disasters

	Group 1	Group 2
Total money spent in public investment	1892	1217
Accumulated income	4100	4506
Total number of trees planted	64	24
Total coal extracted	43	31
Total trees cut	318	291
Total berries collected	262	418
Sanctions placed	0	-4
Flood loss	0	-85
Hurricane loss	0	-30

4.3 Group Interactions

4.3.1 Group 1

Group 1 spent more time asking questions, making sure they understood the objective of the game. The practice round discussion lasted approximately 13 minutes as participants sought to clarify on issues such as if the forest condition was related to number of trees, the balance between development and risk of disaster. One tried sending a 'neighbour' some additional money. A second practice round was initiated so that everyone felt confident about how to play and as early as the second practice round there is already the initiation of a group discussion around what should be a priority (e.g. health centre) and collective decision making:

Betula: *i think we should protect the health centres as top priority*

Acer: *i wanted to contribute to the health centre but didn't have enough action points*

Moderator: *great Betula what others think?*

P3¹: *all do it in the next round and decide collectively*

Salix: *Yep I agree*

Laurus: *Why do u think that's important betula?*

Betula: *me too, so we will need to start prioritising as a group*

P3: *we all should contribute a small amount for public buildings in the next round*

This kind of collective discussion and decision making was strengthened and quickly progressed as early as the first round. Participants were open about their values and priorities while also being mindful of the larger community and need for group decision-making.

Salix: *I've got money so am gonna protect the health centre and my house next round*

Juniperus: *I think protect your own houses and buildings that are already there, then we can look to build more*

Betula: *@salix i agree.*

Phoenix: *i am going to donate money for the health centre next round*

Acer: *sounds like a plan*

Salix: *And plant any trees where there are spaces*

Betula: *as risk of floods would recommend investing in your own homes also*

What we see in the above conversation is a passage point in which some fundamental observations and actions are collectively acknowledged. The participants are aware of the environmental risks of living on the island (e.g. flooding) and are able to collectively agree that the first priority is to protect individual homes and existing infrastructure. Phoenix has indicated a future commitment to the health centre while Salix suggests some level of conservation. Again, it should be emphasised that early into the game there is a pragmatic attempt to balance development and conservation as well as individual and collective needs.

The above conversation alludes to the importance placed on the individual and further into the game participants were open to share their individual values while remaining committed to group priorities. A need to invest in education is proposed by Betula in the second round

The group also practiced civilised accountability holding. Betula asks the group: *Erm so those who didn't invest last time are you Gna invest instead of cutting?* No one makes a negative comment in response and in the next round Salix invests in the school while Phoenix contributes to the health centre and Fraxinus plants trees.

The question of individual and group values also comes forward as the group discussed what types of things should be built and what should be protected. Juniperus asks the group if they can protect the cultural centre. Laurus replies by asking why it needs to be protected, to which Juniperus explains: *Because it's supposed to be a town. You need things like theatres, etc. Fun things!* Picking up on this Phoenix then adds, *at some point I would like a cinema room but can wait a few rounds.*

While these might not have been the values of every participant, they are expressed in a way such that the individual participant is not going against the overall group decision. As a result, the other participants are not apt to challenge these individuals' opinions or desires for the island and the request to protect the cultural building is considered. A similar gauge of a good group dynamic was the use of good-natured humour such as Salix's: *I didn;t want to cut any more trees so I used my*

¹ A recurring error which occurs in New Shores is the replacement of the players name with 'P3'. In this instance we were unable to confirm which player this was.

remaining ones to pick berries! Wine all round. Although participants could not see, hear or identify one another there was another sense of community.

Transparency increased as the game progressed, particularly in round six as the natural disasters increased and there was a greater need for strategy and planning as well as balancing the need for money for investment:

Juniperus: *You sometimes need to cut to get cash to protect the buildings though. think if it's done in moderation it's ok?*

Betula: *yes agreed. We need to cut in moderation to invest*

Laurus: *Ok but no one agreed who would be cutting. So how do we moderate that?*

Betula: *that the discussion we are having now*

It was also interesting to note that the group wanted to invest in building a university. The cost to build it was calculated. As the university required significant investment there was some debate as to whether it was worth the environmental consequences (*Juniperus: @Betula do you want to chop big trees to build a uni (and extract coal)*). In the end a less environmentally devastating approach was taken as participants decided to contribute 5 coins and cut down less.

4.3.2 Group 2

Compared to group 1, the moderator had to work a lot harder to encourage conversation in this workshop. Few questions were asked, and the practice round was played without any chat discussion. For the first three rounds, there was no discussion at all in the operations round and the participants only reported on the statistics in the reporting stage as prompted by the moderator. By the end of the third results round, participants started to communicate with one another with suggestions of actions that should be taken. In round four there were discussions of actions to be taken in the operations phase. This is a stark contrast to group 1 who began discussing actions that needed to be taken from the very first round having made observations in the two test rounds.

There were differences in how ideas were being generated and discussed. In Group 2, most often a suggestion would come from one person and there would be little to no discourse, mostly just agreement with the suggestion. There was never a consensus reached about a specific course of action to take, nor a strategy decided. For example, in round 5 after the results, there was a string of loose suggestions and general agreement by the group, with only minor concrete action decided:

Fraxinus: *hospital?*

Betula: *Agreed*

Ulmus: *Yup*

Citrus: *yes*

Sorbus: *hospital for sure and look to protect the primary school?*

Fraxinus: *hospital is essential*

Fraxinus: *yes*

Ulmus: *Ok*

Betula: *Hospital yes protect*

Sorbus: *need to protect the high school too*

Betula: *Yes*

Moderator: *we will now have a 10 minute break until 18.26*

Fraxinus: *so we all need to contribute to hospital really*

Moderator: *please come back at 18.26 to start with operations*

Sorbus: *agree with fraxinus, im happy to start the build on a plot when we come come back*

One of the marked differences between the two groups was the use of humour, and use of emoji icons. Group 2 used notably more humour and ‘passive aggressive comments’. Group 2 used 13 emoji’s in their transcript [:) , ;) and :-)], whereas none were used by group 1. Where members of the group were building their own properties, comments indirectly questioning or calling into accountability were used, e.g: in round 9 following the results round where a house was destroyed:

Sorbus: *castanea's house gone*

...

Sorbus: *youve a gym still but no where to shower now*

Castanea: *not all bad then...*

And, also in round 9, fun is poked at the excessive amounts of personal rooms which Castanea has built:

Sorbus: *castanea.. ha*

Fraxinus: *havent you a privatew library too?*

Castanea: *i am building a library! can't get more cultured than that*

And in round 10, Sorbus indirectly prompts Ulmus to take more altruistic actions:

Sorbus: *ulmus, maybe last round to help us with the hospital, standing of living is 10.. you've a porsche in the drive too ;)*

It is interesting to observe this level of direct conflict avoidance in a group of managers, who would, presumably have some training and experience in conflict management and how to have difficult conversations. One might expect them to be more direct in their intentions. This group also made use of the ‘sanctions’ function in the game which allows players to remove action points from other players. This mechanism can be used as an indirect means of ‘punishing’ non-compliant players. When a player is sanctioned, they do not know why, or who placed the sanction. Although sanctions were used four times in group 2, there was never any chat discussion about it, which again reiterates the indirect confrontation within this group. Group 1 did not place any sanctions.

The focus for Group 2 was predominantly on the development of the island, with much more of the conversation centred around building private and public buildings. There was very little discourse about conservation of the island, i.e. using less coal, cutting fewer trees, planting trees. An awareness of the need to take a more conservation driven actions to protect the Island was acknowledged in round three but no collective decision making around how to achieve that. Reviewing the forest condition graph (FIGURE 10) suggests some action was taken, however after round 4 the forest condition continued to decline.

The suggestion to share money to enable more action only came about very late in the game. The first mention was in round five, however there was no response:

Fraxinus: *trying to build hospital beside health center*

Fraxinus: *why cant i?#*

Fraxinus: *i need some more money*

Moderator: *do you have money/action points Fraxinus?*

Fraxinus: *need about 49 more financial points*

Fraxinus: *anyone want to loan?*

Another ask came in round 8 from the same player, this time players responded but there was not confirmation of how this should be used/shared:

Fraxinus: anyone who has spare cash?

Betula: Yes

Sorbus: im brassic! [out of money]

An additional discussion took place in round 9 and 10, however for group 2, no money was ever transferred to another player. Each player acted and spent their money individually, which is a contrast to Group 1 who were more open about how much money they had and actively transferred to one another.

4.4 Post game discussion

After the New Shores energy game ended the game moderator asked both groups the same series of questions, starting with a general reflection as to whether the island did well. Group 1 (heterogenous) overall felt that the group did well, attributing the success of the group to the collective decision making. In the case of group 2 (homogenous) however, there was no real reflective response to this. Rather, some participants just focused on writing out the final stats of the island. This was followed by one reflective comment from Sorbus (*Finding the balance and working together is key*) which was less about if the island was sustainably developed and more about the lesson of the game, followed by a series of accusations toward other players (*Castanea comfortable though*). The overall sentiment that life is more individualistic was then discussed, using the same kind of passive humour to accuse others of not working collectively:

Betula: Yes difficult working collectively

Sorbus: yeah everyone has different goals is obvious#

Castanea: Collective goals are impossible. The invisible hand is the way forward

Citrus: Ill be moving in with Castanea

Sorbus: lol

Betula: Agree with last 2 comments

Castanea: I charge reasonable rent

The difference between the two groups becomes more pronounced as the moderator continued to ask reflective questions to the group, particularly the question about community (Table 5).

Table 5: Group responses in post-game discussion to moderator question: “Could you describe the community you have created in this game?”

Group 1	Group 2
“It was great everyone got along no one was sanctioned” (Phoenix)	“Castanea - still don’t see you taking responsibility for how you got so much cash? Public ally you were trying to take a different view to the actions you appear to have taken in the game” (Ulmus)
“it was a catch 22, the only way to make money to invest was detrimental to the island, so it was a difficult decision for the group” (Betula)	“for me for 3-4 rounds we didnt interact and was on our own road until we realised things wouldnt be built/protected without communicating. Once we realised it was working together some of us didn’t and a few saw their wealth increasing and like what they saw” (Sorbus)
“At first I felt a bit outcast as I didn’t agree with decisions but then just went along and understood why people were saying these things	“Individual wins over community” (Betula)

<p><i>But in beginning I was thinking more selfishly about what I would build” (Laurus)</i></p>	
<p><i>“At the beginning it was making sure e had the basics, then later on felt like we could be a little more selfish as long as we kept it in check” (Juniperus)</i></p>	<p><i>“The seemed to be a slow start to work together- some did and some appeared not to want to support common goals” (Ulmus)</i></p>

Again we see an overall higher satisfaction with the process and the outcome in group 1. Betula notes that the way the game was set up (i.e. tension between development and conservation) was such that decision making was very difficult. Laurus’s comment is particularly reflective and exposing of their thought process, while admitting this kind of statement (i.e. selfishness) could have received negative feedback from the group, it is possible that they felt comfortable enough with the group to admit this. The question of selfishness is again picked up by Juniperus who observed that so long as the collective was first prioritised it was then okay to be more selfish.

On the other hand, group 2 starts out with an accusation against Castanea rather than a generally reflection of the overall community. Sorbus acknowledges that the first several rounds had no group interaction, again a very different approach than group 1, and that the attempt to work together was met with resistance.

Overall, the post-reflections from both groups reflected the overall process and dynamic from each group. It is interesting that even at the point in which they were supposed to be reflecting , group 2 became more preoccupied on calling out individuals. It is also very telling that the overall take away from group 1 was the importance of collective decision making and challenge of balancing development with conservation. This contrasts with group 2 where, except for Fraxinus, there was an almost reassurance of the ‘nature’ of society in which people are fundamentally individualistic (Ulmus: *Happiness comes from within - it’s personal. This determines self v community and depends on each individual*). It is also interesting that Fraxinus, the only one in the group who held onto the importance of collectively (*happiness definitely comes from within and also from without helping others and working together*) eventually concluded that: *“i guess its about listening to different opinions and see who has most expertise and be guided by them”*.

4.5 Postgame survey findings

The majority of participants felt the game was a positive experience. One felt the game was repetitive and another felt it had steep learning curve. On the topic of group cohesion and support, everyone in group 1 (heterogenous group) felt they worked well with others and as a group overall. This contrasts with group 2 (homogenous group) whereas all but one participant in the homogenous group felt the group was “so so” or “didn’t work together at all”. A follow up question asked why and in the case of the homogenous group, one felt that the source of the problem was thought to be a lack of strategic planning, another felt it was a clash of personalities and a third an overall ‘each for their own’ mentality. Some did not offer any follow up remark.

An important aspect of this project was to understand how participants perceived the group and how well they fit in. Forty-two (42) percent of the heterogenous group felt that the other participants were less like themselves whereas 71 percent of the homogenous group felt that the other participants were less like themselves. In the case of the latter group, some cited issues such as “more aggressive” or “less individualistic.” In the case of the heterogenous group, those who felt the group was less like

themselves, one offered a follow up comment of: “Nobody interested in culture! Generally similar though” suggesting that this participant ultimately felt similarity to the rest of the group.

Building on this question of whether participants felt that other members of the group were more or less like them a question was asked regarding whether or not any assumptions of other players developed while playing the game.² Some participants felt that it was too difficult to make assumptions due to the format of the group interaction (i.e. chat function with all individual characteristics obscured).

However, several participants did feel that they made assumptions about the age of a participant (e.g. “*I guess Casteneaus is young and Ulmus too by the way they liked to generate wealth*” [group 2]). One participant from the heterogenous group commented that the group worked well together in a previous question but when asked if the other players were more or less similar, they felt they were less similar. This is perhaps clarified in the question regarding assumptions wherein the participant remarked: “*Seemed like people were very environmentally thoughtful which would lead me to think they are from white middle class backgrounds as I am not, the environment is not at the forefront of my mind as I have more pressing issues before this such as poverty and discrimination.*” Another participant from the heterogenous group identified another player as a manager-type which was interesting as no one in the heterogenous group would have had such a role. Most participants from the homogenous group were reserved in making assumptions apart from some players being older or younger. A participant from group 2 remarked: “*I thought that Sorbus was a woman as they deemed to be more altruistic and caring.*” All but two participants across the two groups felt that their participation and actions reflected their personality type, one did not elaborate on why and the other felt it was difficult to express their “true persona” through a chat (both group 2).

Finally, there were questions regarding the overall success or impact of the game. Ninety-three (93) percent of participants felt aware of how the group was or wasn’t functioning throughout the game and again 93 percent of participants felt that the experience made them more reflective about how collective decision making takes place. Seventy-five (75) percent felt this type of game could be useful in their workplace, a point we will return to in the discussion section. When asked for suggestions for improvement the dominant request across most participants was a request for the modernisation of the game as participants felt that the graphics and design were very outdated. Again this will be picked up in the discussion and way forward.

5. Discussion

5.1 Key findings

Addressing the grand challenge of climate change requires not only the brightest of minds but also a good number of diverse minds. Energy solutions are rarely one-size fits all; those making decisions around energy transitions and decarbonisation must come from and be reflective of the different needs and aspirations of a diverse society. *Serious Games for Serious Energy Solutions* illustrated a process through which two different groups of individuals were brought together and, without knowing anything about one another, attempted to collectively develop an imaginary island. While

² The exact question was: *Often, when we can’t see or hear other people we are interacting with it is easy to make assumptions about them. Please reflect upon your session and, without overthinking, indicate if you may have made any unintentional assumptions about other participants. Assumptions such as about gender, age, socio-economic background, diversity, disability, education etc. Please record any assumptions you may have made about other participants*

small scale and ungeneralisable to the whole of the UK, this project demonstrated an instance in which a more demographically diverse group of participants were more engaged in a group discussion and undertook collaborative action, resulting in more equitable actions when it came to development and conservation of the island than a more homogenous group.

The key findings of this study were:

1. Use of a serious game allowed users to interact in a 'low stake' format whilst allowing us to study their collective action, or lack of
2. Our heterogenous group displayed greater collaborative tendencies and decision-making when compared to our homogenous group
3. As a result of this collaboration, the heterogenous group had a more 'successful' island at the end of the game, particularly when it came to social equity amongst the participants

Serious games are gaining traction within the research community as an effective and interactive learning tool. We also see a proliferation of serious games structured around the challenges of sustainable development and/or climate change. However, most research to date concentrates on the serious game as a pedagogical tool for understanding abstract issues associated with the overall topic of sustainability and climate (see Liarakou *et al.* 2012; Matzner and Herrnebrück 2017). Our use of the New Shores game contributes to this body of research. This is best reflected in the moderator-led, post game discussion in which questions such as: *Do you think the island did well?* Comments showed a level of awareness and understanding of the educational and awareness-raising aspects of the game, irrespective of group. For example:

Salix [Group 1]: I think we managed to protect important buildings and services on the island.

Acer [Group 1]: I think it's a reflection of trying to get the balance right in real life.

Ulmus [Group 2]: Destroying trees and then mining makes money to invest but too much caused floods and hurricanes.

The above comments are illustrative of the longer discussion that took place after the game and again suggest that New Shores was successful in conveying some of the fundamental tensions and challenges of sustainable development and climate change. We believe this alone is a good demonstration of the value of such serious games. However, our project was equally interested in how a serious game can be used to understand and evaluate how the diversity of players affects how collective decisions are made. To our knowledge, this process-based aspect of the serious game has not received attention amongst the academic community.

Another unique aspect of our use of the serious game is the anonymous nature through which we conducted our game. This was not an original part of our study design but a result of COVID and the need to adapt the project to be completely online. In our study, the identities of the participants were anonymous, they could not see each other and were only able to communicate via text chat. Names were also kept anonymous so that other than the speech, which was written, there was no way for participants to know who the other players were. From previous work in this space, the role of visible indicators of differentness or similarity had a major role to play in the impacts of such diversity on group dynamics and decision making. 'Diversity beliefs' can be defined as: "*the extent to which individuals perceive diversity to be beneficial for or detrimental to the group's functioning*" (van Dick *et al.* 2008). Several studies have found that those who value diversity in their group, will have more positive outcomes, whereas those who do not value diversity, or place higher value on similarities between individuals have more negative outcomes (van Dick *et al.*, 2008; van Knippenberg *et al.*, 2007;

Homan *et al.*, 2007). This powerful phenomenon can conflate the outcome of these sorts of studies as it may not only be the homogeneity and differences in life experience which are driving innovative outcomes in a group but the perceived value of the inputs from others in that context.

Related to this is the idea of surface-level diversity, i.e. that which can be seen (race/gender) and deep-level diversity, i.e. similarities in beliefs, values etc. Phillips *et al.* (2006) posits that surface-level diversity is beneficial as it visually signals to others that that individual will have unique information and therefore is of value in the workplace. As our participants remained anonymous, there is no way that such factors were at play in our study revealing that the impact of diversity can be influential with the group without the need for visual cues or identification of group similarity or difference.

A potential driver for the differences that we observed in our study in the absence of visual diversity cues could be difference in 'cognitive diversity'. Olson *et al.* (2007) found that cognitive diversity, 'differences in executives' beliefs and preferences about strategic goals', was a strong indicator of effective team decision making. Whilst not essential for cognitive diversity, demographic diversity is a key means through which to increase cognitive diversity in a team and thus result in more strategic decision making.

5.2 Limitations

Again the small scale of our project makes it difficult to draw concrete conclusions around how and why diversity may have impacted how the heterogeneous group worked together, as well as which aspects of diversity may have had the most impact on the ability to work together. Some literature around decision making suggests that there is more evidence for the role of gender on decision making than for ethnicity and socio-economic background. In the context of board composition and corporate social responsibility, studies generally find the strongest evidence linked to gender, that is that having a critical mass of females as part of a board can lead to more successful outcomes, with the role of ethnicity and other protected characteristics less studied (Rao & Tilt, 2016). Further research into the entangled and discrete impacts of gender and diversity in anonymous decision making is required.

A key limitation to this study is the fact that we only had two groups to compare, so we must ensure that the results of this study are not extrapolated. However, the stark differences observed between the groups warrant the need for further investigation into the use of serious games as a means for assessing the impacts of diversity on collective decision making. Another limitation, as mentioned in section 4.5, was that participants felt that the interface and graphics of the New Shores game felt outdated. This feedback is unsurprising given the sophisticated nature of gaming platforms and graphics on handheld devices like phones. The level of engagement and usability is an important feature of serious games and should be considered in future work. Educational games in general, and serious games in particular, tend to be costly and technologically complex. Moreno-Ger *et al.* (2014) note that this is one of the significant barriers to more widespread adoption of serious games.

Serious Games for Serious Energy Solutions was a seedcorn project. It was never expected that we would have the budget or capacity to develop our game or improve upon an existing game. However, we believe the overall success of the project in respect to a) raising awareness of the complexity of climate change and b) understanding if and how diversity of participants affected collective decision-making was strong enough to warrant further research development.

6. Policy Implications

The original plans for this study were to engage directly with policy makers, however due to COVID-related issues this was not possible. However, we feel there are several useful policy implications.

First, there is the climate piece. Over 80% of the UK population believe that climate change is a concern (UK Government, 2021), demonstrating that addressing this issue is at the forefront of the public's attention. The New Shores game offers a unique and engaging platform to increase understanding of the complexity of the issues amongst the general public. Again, we saw evidence of how the game raised awareness amongst participants during our post-game discussion. Second, knowing that climate change is a concern amongst the broad public, it is imperative that climate change solutions are reflective of and appropriate for the UK public. Policy makers must understand that there is a built in level of accountability already at stake.

At a broader level, our project has demonstrated how and why a serious game can be used as a legitimate tool for the study of collective decision making. A significant part of this value is that participants can reflect upon their own group effectiveness after the game has been played. In our postgame chat both teams discussed how they worked together, whether participants listened to one another, the consequences of these actions, and how this could have been improved. This is just one of the reasons why the New Shores game could be a valuable tool within any kind of workplace, but particularly one in which there are clear hierarchies between and within employees and departments and employee demographics, such as gender, age, and ethnicity, are clearly segmented. As stated in section 4.5, 75 percent of our participants felt that the New Shores game would be a useful tool in their workplace. Everyone who works for a local council or within a particular NHS trust could promote a greater understanding of balance and tensions between individual actors. While the anonymity created through the use of only the chat function and provision of pseudonyms can make playing the game feel less natural, we believe that the anonymity becomes an even greater asset if used within a workplace where pre-existing assumptions and hierarchies of other colleagues would otherwise impact how players do or don't work together.

Serious Games for Serious Energy Solutions illustrated the value of engaging with diverse groups and voices, both demographically and cognitively diverse. Our study further supports the body of literature demonstrating the value of diverse groups in the level of collaboration and innovation of a solution. Not only did our heterogenous group work better together, but they also had a more balanced environmental and social ecosystem on the island. At present, there is a diversity imbalance in the UK with those from minority ethnic backgrounds making up a larger percentage of the general population but a smaller percentage of leadership roles in the government and policy arena (Uberoi and Tunnicliffe 2021). How might this impact how policy decisions are made and the equity of their delivery? This seedcorn project has just begun to scratch the surface of the impacts of diversity on decision making, using a serious game as a medium through which to study this. We would like to see this project progress, developing it further so that it can be trialled in an environment involving policy-making actors to further understand if and how a demographically diverse range of players impacts how collective decision making occurs and what decisions are made. Given the scale of the challenge we are facing globally, the need for diverse voices in decision-making has never been more pressing.

Acknowledgements

This project was supported by DecarboN8. DecarboN8 is funded by UK Research and Innovation, grant agreement EP/S032002/1.

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Appendix

i. EDI questionnaire



EDI Survey Questions

Questions about you...

Y1/ What gender do you identify as?

- Male
- Female
- Non-binary
- Transgender
- Intersex
- Prefer to self-describe: [free text]

Y2/ Is the gender you identify with the same as your sex registered at birth?

- Yes
- No – please provide your birth assigned sex: [free text]

Y3/ What age are you?

- 16 – 25
- 26 - 35
- 36 - 45
- 46 - 55
- 56 - 65
- Over 65

Y4/ How would you describe your ethnicity? (Please choose one option that best describes your ethnic group or background)

- White (please specify further if you wish)
[free text]
- Mixed/Multiple ethnic groups (please specify further if you wish)
[free text]
- Asian/Asian British (please specify further if you wish)
[free text]
- Black/African/Caribbean/Black British (please specify further if you wish)
[free text]
- Other ethnic group (please specify further if you wish)
[free text]

Y5/ How would you describe your sexual orientation?

- Bi/Bisexual
- Gay Woman/Lesbian
- Gay Man
- Heterosexual/Straight

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- Queer
- Other sexual orientation or prefer to self-describe: [free text]

Y6/ How would you classify your religious affiliation?

- Buddhist
- Christian
- Hindu
- Jewish
- Muslim
- No religion
- Sikh
- Other religious belief– Self describe: [free text]

Y7/ Do you consider yourself to have a disability or long-term health condition?

- Yes (visible disability)
- Yes (hidden disability)
- No

Y8/ Do you consider yourself to have suffered with poor mental health in the last year?

- Yes
- No

Y9/ Are you a parent/guardian or caregiver of a dependent relative (e.g. children under 18, or ageing parents)?

- Yes – Parent
- Yes – Parent of child(ren) with special needs
- Yes – Carer for one or more adult(s)
- No

Y10/ What is your current marital / relationship status?

- Divorced
- In a long-term relationship
- Living with partner / Cohabiting
- Married or civil partnership
- Separated
- Single, never married
- Widowed
- Other – Self describe: [free text]

Questions about formal education and training...

E1/ What is the highest level of education you have completed?

- College / University – Diploma (including the Legal Practice Course) / Degree
- Doctorate
- Masters
- Primary / Elementary
- Professional Qualification
- Secondary / High School
- Other – Self describe: [free text]

If you are currently studying, please select highest level obtained

E2/ My secondary school education was mostly:

- Home schooling
- Private / Fee paying school
- State / non-fee paying school (non-selective)
- State / non-fee paying school (selective)
- Other – Self describe: [free text]

E3/ If you attended university, which university did you attend?

- Russell Group
- Red Brick
- Oxbridge
- Other
- Non-UK based
- **Don't know**

E4/ What is the highest level of education your parent(s) / guardian(s) have completed?

- College / University - Diploma/Degree
- Doctorate
- Masters
- Primary / Elementary
- Professional Qualification
- Secondary / High School
- Unknown
- Other – Self describe: [free text]

Where there is a disparity - please select the highest achieved qualification

E5/ My parent(s) / guardian(s) secondary school education was mostly:

- Home schooling
- Private / Fee paying school
- State / non-fee paying school (non-selective)
- State / non-fee paying school (selective)
- Unknown
- Other – Self describe: [free text]

ii. Post-game Survey

Serious Games – Post-game Questionnaire

Thank you for taking part in the New Shores Game – we hope you found it to be a worthwhile experience. The following questions are designed to help us better understand your session, Your reflections and critical feedback is greatly appreciated.

Section 1: Playing the game. In this section we wish to better understand the experience of playing New Shores.

1. How are you feeling now the game is over?

[Open text box]

2. Do you think you worked well together as a group?

- Yes
- No

2a. Why?

[Open text box]

3. What needs do you think were generally prioritised?

4. The needs of the island (development, environment) were prioritised
- The needs of the group (collective wellbeing, cultural, social and community improvement) were prioritised
 - The needs of the individual (personal wellbeing, increasing personal wealth) were prioritised
 - There was a good balance between all these needs

4. What outcome would you liked to see on the island had the game continued?

[Open text box]

5. Do you think the other members of your group were more like you, or less like you?

- More like me
- Less like me

5a. Why?

[Open text box]

6. Do you think your participation as a player of this game is reflective of your personality type?

- Yes
- No

6a. Why or why not?

[Open text box]

7. Do you think anyone was acting in a selfish manner?

- Yes
- No

7a. If yes, can you describe this in more detail?

[Open text box]

8. Do you think anyone was acting in an altruistic manner?

- Yes
- No

8a. If yes, can you describe this in more detail?

[Open text box]

9. Often, when we can't see or hear other people we are interacting with it is easy to make assumptions about personalities. Please reflect upon your session and, without overthinking, indicate if you may have made any unintentional assumptions about other participants. Assumptions such as about gender, age, socio-economic background, diversity, disability, education etc. For each person, please indicate any assumptions you made:

Person x... [Open text box]

Person y... [Open text box]

Section 2: In this section we will ask a few questions to better understand how useful and engaging you found New Shores as a tool for collaborative decision-making and awareness-raising about decarbonisation

10. Whilst playing New Shores I was aware of how we were functioning as a group, regardless of if we were functioning cohesively or not.

- Yes
- No

11. This experience has made me reflective about how collective decision-making takes place.

- Yes
- No

12. This type of serious game would be useful in my workplace.

- Yes
- No
- N/A

13. What aspects of this experience do you think worked well?

- [Open text box]

14. What aspects of this experience didn't work so well, and could be improved upon?

[Open text box]

15. Please share any final thoughts you have about the New Shores game and experience of playing it.

[Open text box]

iii. Individual Players scores from New Shores Final Report

GROUP 1: Total scores of players in the final round

	Monitoring	Sanctions	Hurricane losses	Flood losses	Accumulated income	Standard of living
Castanea	0	0	0	0	0	1
Laurus	0	0	0	0	4.2	2
Quercus	0	0	0	0	0	1
Fraxinus	0	0	0	0	0.4	1
Betula	0	0	0	0	0.8	3
Acer	0	0	0	0	0.4	7
Phoenix	0	0	0	0	3.2	4
Juniperus	0	0	0	0	0	3
Salix	0	0	0	0	8.4	1

Red lines: people who did not participate on the day

Group 2 = homogeneous, representing policy-makers and uniformity

Total scores of players in the final round

Player	Monitoring	Sanctions	Hurricane losses	Floods losses	Accumulated income	Standard of living
Citrus	0	0	0	0	13.8	1
Castanea	0	-2	0	-85	109.2	18
Ulmus	0	-2	0	0	40.2	11
Abies	0	0	0	0	0	1
Betula	0	0	0	0	83.4	1
Fraxinus	0	0	0	0	2.6	1
Juniperus	0	0	-30	0	0	HL*
Sorbus	0	0	0	0	0.8	3
Larix	0	0	0	0	21.6	HL*

Red lines: people who did not participate on the day/ *Homeless