Skrifter från Forum för utomhuspedagogik No. 3

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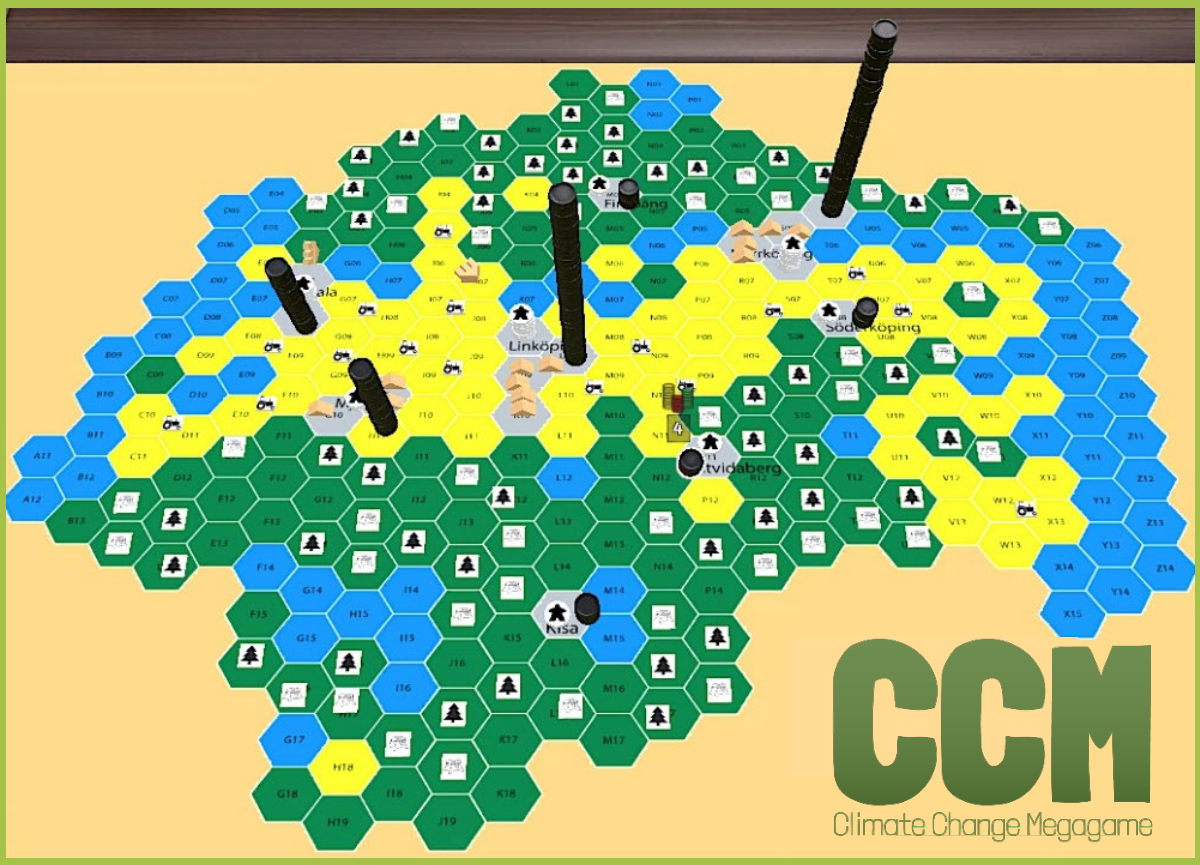

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Citizens' views on climate-change adaptation

A study of the views of participants in the 2020 Climate Change Megagame

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Linköping 2021

Experiential learning– engaging with places through megagames

This report presents and analyses the use of a megagame. Games with the primary aim to educate or enhance dialogue between different actors can be valuable for the engagement with and pedagogy of places and thus an interesting method for outdoor education and learning.

The game discussed in this report has the capacity to gather between 40 and 100 participants and is thus considered to be a Megagame. The mega-format enables a roleplaying simulation of a broad range of actors and interests representing the complexity of decision making in society where it is a challenge to have control of all information and direct access to all stakeholders. Also, the sheer number of participants requires the strategies for forging alliances since there is no time to talk with everyone. Thus, the participants become an active part in a social experiment to learn about challenges and opportunities in the transformation of the region Östergötland as it seeks to reach negative carbon emission to the year 2050. The game is constructed to encourage discussion concerning what strategies to follow, e.g., high tech solutions or lifestyle changes. Participants also must negotiate how to prioritise the use of limited resources between different needs and interest. To increase the feeling of realism the participants simultaneously must consider the uncertainties and adapt to ongoing climate change and changes in global trade and politics.

Hence, especially when considering education for sustainable development, serious megagames provide an important contribution to outdoor learning in the way that they draw attention to the complexity of slow natural and social processes and actors' interests that continuously shape the places we visit or utilise to support lifestyles elsewhere. The megagame format also provides a venue where social actors jointly explore alternative futures to make different perspectives and values visible. The simplification of reality meeting the participants provides half of the value of a shared experience. Equally important is the debriefing that follows. Here the players step out of their roles and discuss the experience, connect it to the even more complex situation in reality, and the desirability of different strategies.

Beyond the educational value the serious megagame can also be an important method for gathering empirical data about different groups' knowledge and perspectives about issues covered by the game. The debriefing of this particular megagame focused on climate change adaptation, was recorded and used to increase knowledge about public understanding of the topic. However, besides the debriefing, data can be collected in many different ways during the game, e.g., in conversations between participants, or opinion polls (surveys) during the game. As such a megagame event holds the potential to educate as well as raise the awareness of the participants, enhance dialogue between social actors, and as shown in this report, contribute to more general knowledge related to sustainability and social transformation.

Future development of the format to increase the understanding of places and landscapes in the context of sustainable development would benefit from involving stakeholders not only in playing but also in the design of the game itself. Placing this work in the actual environments to be simulated would both increase the authenticity of the discussions. Looking even further ahead, moving the megagame event into outdoor environments could make the place itself an important component in the experiential learning. Perhaps by giving visibility, voice and agency to our companion species.

Linköping in March 2021

Per Andersson
Professor, Forum för utomhuspedagogik
Linköping University

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- The debriefing and analysis of participants understanding of climate change adaptation was commissioned and funded by the Swedish National Expert Council for Climate Adaptation and planned together with the council's secretariat at SMHI.
- The project also received financial support from Visit Linköping to host the event digitally from Konsert & Kongress.

Content

Introduction

One of the most significant attributes of the human race is its ability to adapt to changes in the climate. Over millennia, this has enabled humans to settle almost anywhere on the planet. Due to increasing concentrations of greenhouse gases in the atmosphere, however, we now need to adapt our advanced societies to a changed climate over the course of mere decades. Knowledge regarding climate change and adaptation is now well developed and assessed, as is public understanding of climate change and how to mitigate further greenhouse-gas emissions. Less, however, is known about public understanding of climate-change adaptation. This report is based on the Climate Change Megagame (CCM), which was developed in order to improve knowledge of the social transformations related to climate change and create a dialogue between different actors in society. The game was designed for up to 100 participants and with the intention of achieving maximal heterogeneity. Hence, the game event provided an opportunity to present the challenges and solutions involved in climate-change adaptation and mitigation, and use the debriefing to explore the participants' thoughts on climate-change adaptation.

An overview of public understanding of climate-change adaptation collated by the Swedish Environmental Research Institute, IVL, (2020) shows that very few studies have focused specifically on the topic, and that content related to this theme has to be found within broader studies focusing more on climate-change mitigation. In short, the overview shows that young people are worried about climate change, but that they believe that its effects will primarily cause problems in distant places. Sweden, as a rich country that is expected to experience moderate climate-change effects, will be able to handle the anticipated extreme weather events. More concern is directed towards biodiversity and the survival of ecosystems in the future. At the same time, the overview points to the concept of future cities wherein nature and green infrastructure are valued more highly and paved roads for cars are expected to be less significant features of the cityscape. Many of those interviewed felt that technology will be able to remedy most of the negative effects of climate change. To conclude, the public appears to be concerned with mitigation rather than adaptation; the latter is found nested, often implicitly, within broader visions regarding sustainability and the future.

In addition to the overview, this report presents the qualitative results of eight focus group discussions on climate-change adaptation involving 42 people who had just participated in the CCM, held on November 21, 2020. The analysis of the discussions had agreement with the results of earlier studies concerning the general public's views and understanding. This was particularly the case with regard to acknowledging the homogeneity of views regarding the effects of climate change – as something that primarily affects places far away – and heterogeneity of views regarding how to reach the goal of having become a sustainable and climate-change-adapted society by 2050.

However, the results of this small study also point to a critical perspective on the hegemony of a profit-orientated economic system, and endorse a belief in the use of ecosystem services to facilitate climate-change adaptation and biodiversity simultaneously. A combination of ecosystem services and technological solutions will be needed to achieve this, however.

In the discussions, the participants tended to distribute the responsibility for changing lifestyles (mitigation) quite evenly between the general population, producers, and politicians. In contrast, the responsibility for adaptation measures tended to be placed in the hands of politicians, with the role of the general population being to support this when needed.

The megagame was a pilot test of the potential of using a serious game involving a large and heterogenous group of participants to enhance discussions regarding the wicked problems of sustainable transformation. The conclusion of this test was that it is a challenging format, but has a great deal of promise in terms of helping people to experience the complexity of different futures and train soft democratic skills such as listening and negotiating in order to find ways forwards.

The next section of this report presents the CCM in brief in order to contextualise the study. The method used for the focus group study is then presented, and this is followed by a discussion of the results; this is divided into four sections, focusing on perspectives on the problems, solutions, responsibility, and visions for a sustainable, climate-change-adapted society in 2050. Finally, a brief discussion contextualises the results in relation to the overview. It also points to potential avenues for future research of the general population's views on climate-change adaptation.

The Climate Change Megagame

This study is intimately connected to the CCM, and so a short description of the latter is essential to understanding the context of the results of the former. The CCM is a pedagogical development project run by Linköping University that was initially intended to explore new ways of bringing climate change into education. However, soon after its inception it adopted a broader scope of raising awareness of climate change in general, and as a result began to attract volunteers. Initial plans were created in Spring 2019, and the project was formally launched in Autumn 2019. The goal was to hold the game as a live event in early May 2020; this was disrupted by Covid-19, and so the project was altered such that a hybrid version was initially trialled, followed by a fully digital version on 21 November, 2020.

Realism, playability, and learning

In short, the CCM has roots in serious games, boardgames, and roleplaying games, including megagames. Serious games are games wherein learning and exploring are prioritised over entertainment, even if the latter is preferred (Asplund et al., 2019; Neset et al., 2020). This kind of game has a long history, extending back to far before the digital era (Wilkinson, 2016).

In megagames, large numbers participants with different roles visualise expected and unexpected phenomena, and the heterogeneity of interests is used to explore a given situation. The CCM was designed to explore paths of transformation that can lead to a sustainable and climate-change-adapted society by 2050. Hence, as is commonplace in this type of game, the CCM needed to provide a structure that forced participants to make sometimes-difficult choices and be dependent on the other participants. At the same time, the CCM (and megagames in general) had to be flexible enough to allow for unexpected events that could occur due to the

creativity of players. In that sense, a serious megagame must be a metamorphic hybrid that is created at the same time as it is played.

Designing a serious game must always balance a realistic account of the topic and playability, both with regard to the amount of information participants can handle during the game and the knowledge and preparations of the participants. The briefings provided to the players before the game was based on scientific reports from the Swedish Metrological and Hydrological Institute (SMHI), which included data used to make predictions regarding future climate change and related problems in the region, as well as possible climate-adaptation measures. Information on possible scenarios for social transformation/transition was gathered primarily from two reports: *Beyond GDP Growth* by Hagbert et al. (2019) and *Scenarios for sustainable lifestyles 2050* by Leppänen et al. (2012). The first has a Swedish focus and the latter a European, and both were published by the EU-financed project Social Platform identifying Research and Policy needs for Sustainable Lifestyles. A wide range of research papers and reports from administrative authorities focusing on the environment, agriculture, energy, forestry, and civil contingencies was used to provide rough estimates of the effects of different activities available to the players. Representing the full complexity proved to be far beyond the scope of a playable megagame. More extensive digital simulation support would have supported greater complexity, but this would have been added at the cost of clarity of gameplay.

Alternative pathways – technology and/or lifestyle

The basic design principle was that each team of players could make two basic strategic choices: between a more globalised or localised region, and between market-oriented solutions (competition) or strategies involving political administration and cooperation. Following efforts to increase playability, these considerations were visualised for the players as four categories (food, transportation, goods, and housing), allowing them to aim for solutions relating to technological innovation to reduce carbon emissions through clean production, or changes to lifestyles in order to reduce consumption and thus emissions. The energy sector was deliberately included in each of the four categories, instead of being a category of its own.

In the final version of the megagame, the choices available to the players were visualised as shown in Figure 1. The yellow and blue squares represent solutions that rely on technological solutions or changes to lifestyles, respectively.

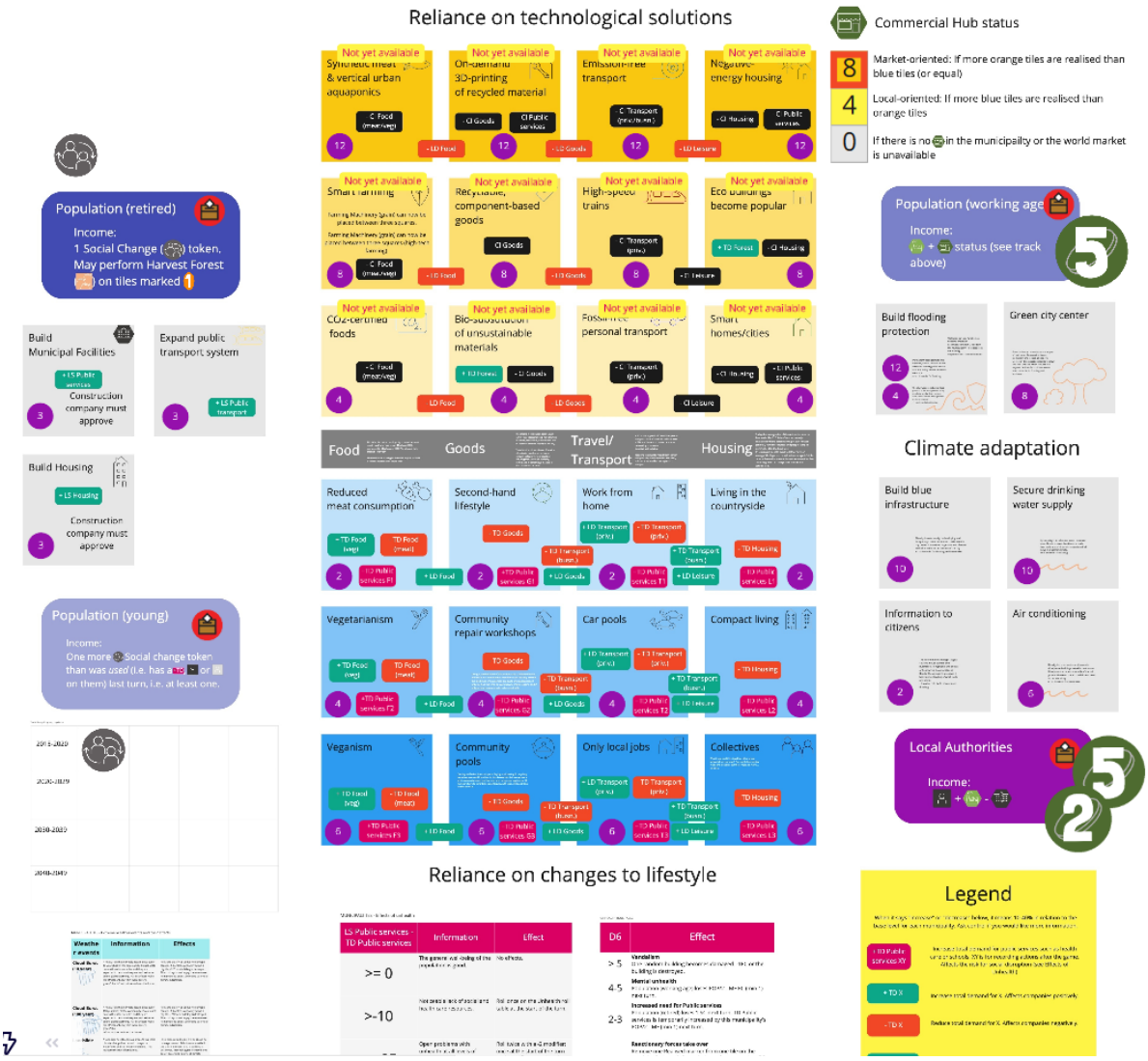

Figure 1: The game board for a municipality, showing the different available actions.

In addition to the mitigation strategies for reaching negative carbon emissions by 2050, the players also had to consider different kinds of climate-change adaptations for remedying the effects of the extreme weather events that are expected to happen. In addition, each municipality was played by a team of four players, each member of which had a different role and access to different resources in order to include a variety interests in the in-game transitions and transformations.

Geography – simulating a region

The geographical scale of the game was also important. Most existing climate megagames, such as *Climate Crisis*, designed by Darren Green (Cambridge, UK), focus on negotiations on an international scale. The CCM, however, focus on the Östergötland region of Sweden, which is home to approximately 450,000 inhabitants and lies 200 km south-west of Stockholm. The regional scope was chosen in order to provide a setting that was familiar and relatable to the players, while at the same time being diverse enough to include different kinds of physical

landscape and municipality, including the nearby cities of Norrköping and Linköping, which are almost equal in size but have very different histories.

Figure 2 shows the main game board; a closer examination (than image resolution allows) shows the different roles in the game. There are five municipalities, as well as corporations, researchers, and politicians. There is also a land-use map (upper-left corner), showing agriculture, forestry, and urban and protected areas wherein dilemmas are created with regard to e.g. turning productive forests into wetlands to promote biodiversity and ecosystem-based climate-change adaptation.

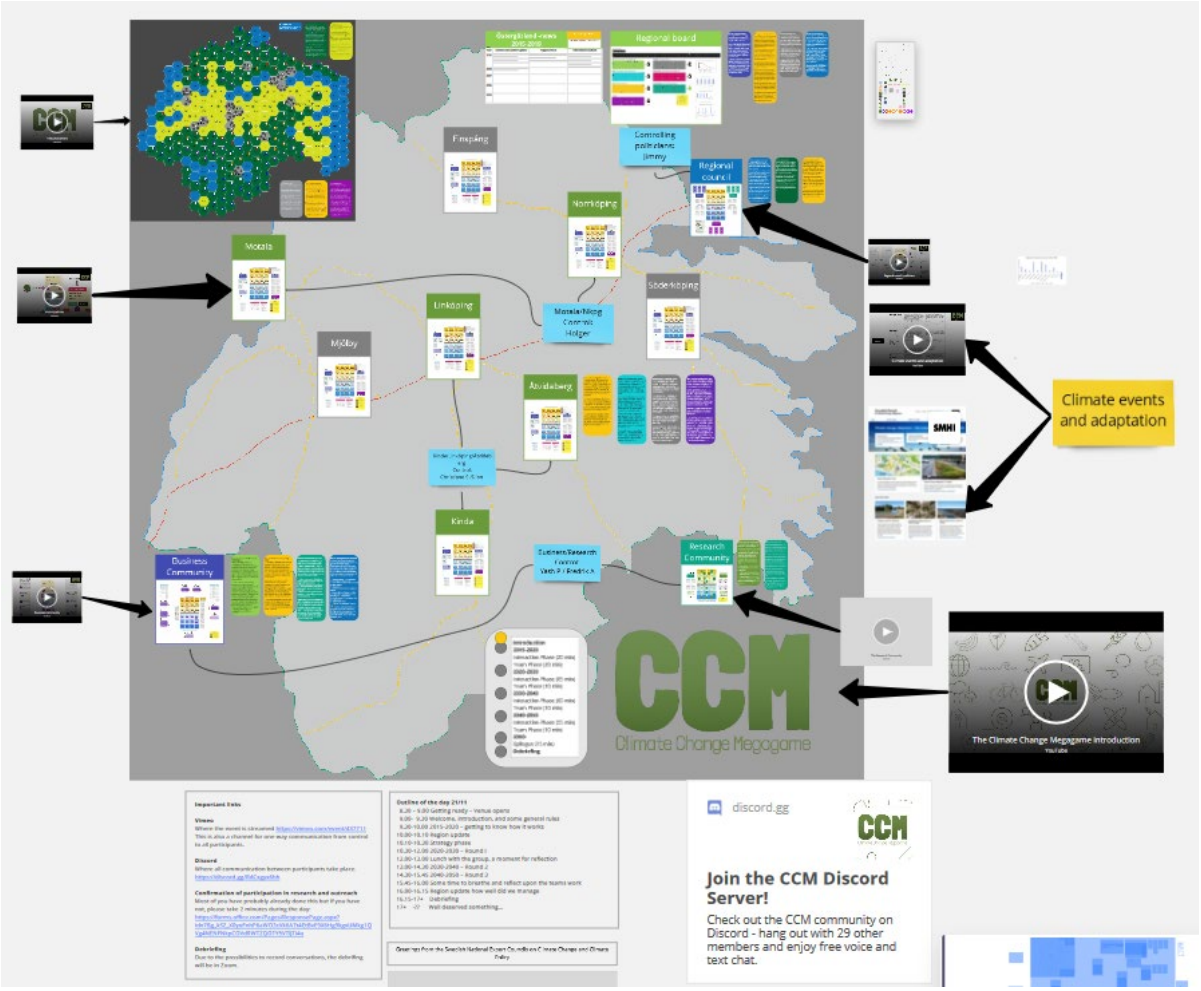

Figure 2: The main game board.

Making climate-change adaptation visible

Based on the fact that climate-change adaptation tends to be forgotten about within public understanding of the challenge of climate change, a special effort was made to make adaptation more visible. Therefore, the region experienced extreme weather events during every round of the game, the effects of which – heatwaves, cloud bursts, and droughts – were felt by all of the teams. These events were based on predictions from the RCP4.5 climate scenario, and adjusted for playability. In order to place extra focus on these events, the players rolled dice to determine the exact magnitude of the effects, which included flooding, forest fires, bark beetles, landslides, and issues relating to heat and drought. The players were able to put in place

measures to protect against these, although – in order to show that adaptation measures make a difference but seldom provide full protection in reality – these did not nullify the effects of the dice rolls that determined the effects of extreme weather events, but ameliorated them to an extent.

Climate-change adaptation was also highlighted through the participation of two climate-change adaptation experts from the Swedish National Knowledge Centre for Climate Change Adaptation at SMHI. These two people functioned as an advisory board in the game, providing real-world knowledge regarding climate-change adaptation. They were also able to support participants financially at times.

In the real world there are many relatively slow-changing conditions for the socio-ecological systems built into the megagame. In this first version of the game, effects such as shrinking ground water and an increasingly warmer climate were not included, partially as they are not expected to affect the region before 2050, and partially because they could not be implemented as worthwhile features within the framework of the megagame.

Methods

This study is based on semi-structured focus-group interviews with eight groups, held immediately after the participants had experienced being a part of the megagame, which simulated possible paths towards a sustainable climate-change-adapted society in 2050. In all, 42 people participated, and approximately 6.5 hours of interview material was gathered.

Recruitment and participants

The recruitment process for the megagame and hence the focus-group interviews was intended to obtain as broad a range of participants as possible. The aim was to have a balanced group of participants representing businesspeople, administrative staff, researchers, politicians, and laypeople. Thus, the invitation was open to everyone, with a suggested minimum age of 15. It was part of the programme of the week-long public event Globala Linköping ('Global Linköping'), and was also advertised on the Linköping University website, in the author's and volunteers' personal networks, and via local media.

Around 80 people from a variety of backgrounds signed up for the event. Given the voluntary participation and playing time of seven hours on a Saturday, a bias towards those already interested in the topic of climate change is assumed. Of the 80 people, 42 attended on the morning of 21 November. Roughly half of the participants were students from Linköping University and other European universities, presumably between age of 20-30 (=young). There were also participants from Canada and Hong Kong. Among the non-students, researchers, local politicians, regional administration, and business were represented. In terms of gender, near-equal participation is assumed based on names, as information regarding gender was not collected.

Focus-group interviews

Focus groups were used to gather data on the participants' views regarding the challenges and opportunities expected on the path to a sustainable and climate-change-adapted 2050. This data-collection method was chosen as it allowed the participants to share their views immediately after the megagame was concluded. Focus-group interviews were also valuable as they provided time for deliberation on the different views on the topic, adding a layer of information that is difficult to obtain through individual interviews (Wibeck et al., 2017).

The semi-structured interviews were organised around three main themes, and follow-up questions were prepared. These questions were designed to place the focus on climate-change adaptation. The themes were:

- The challenges and possibilities that you encountered on the journey towards a sustainable, climate-change-adapted 2050.
- Your vision of a climate-change-adapted, fossil-fuel-free society with good life quality. How do you imagine such a society in 2050?
- What did you feel was missing from the game? What should have been included? What would adding this change, and how is that important?

The special circumstances of the megagame must be considered here. The concept of the megagame was to create a shared experience of a possible path by simulating societal transformation. This was intended to be thought-provoking in terms of making both abstract relationships and trajectories tangible and unexpected problems visible. Taking part in the megagame involved encounters with other participants and their specific roles, interests, and perspectives. Players brought in new knowledge, and in negotiations this was utilised and became visible. The game experience had methodological implications and both strengths and weaknesses.

At the beginning of the focus-group interview, it was expected that the participants would be biased by the game experience, partially as a result of the game design and partially due to encounters with other participants. On the problematic side of this, the discussions that took place were influenced by decisions made during the design of the game. As is discussed above, translating scientific accounts of the real world, in terms of both the present and the future, into a playable game requires a great deal of simplification. However, this experience is also a strength of the design of a study like this. The participants had a shared experience of the possibilities and obstacles ahead. Therefore, the moderators of the focus-group interview constantly reminded the interviewees that the questions related to real-world situations, and invited them to scrutinise the real-world consequences of the choices made in the design of the game.

Another consideration is that actively participating in the game for seven hours prior to the focus-group interview meant that the participants may have been tired and unable to engage in the discussions. However, gathering the material immediately after the experience meant that all of the participants were gathered together and still embedded in the simulation, in a sense. Hence, the experience being ‘fresh’ and practical aspects motivated the choice of approach.

Thematic content analysis

The gathered material was analysed through a basic inductive thematic analysis, undertaken in order to establish how the participants talked about climate-change adaptation in the larger context of climate change, mitigation, and societal transformation.

The qualitative approach taken in this study did not allow for analysis regarding how commonly held various views were. Instead, the method contributed an understanding of how different positions are motivated and can be understood. This can be valuable for directing the design of future surveys in order to obtain a broad picture or undertake further qualitative analysis of similar topics.

Research ethics

Research ethics were considered, and were in line with guidelines from both GDPR and the Swedish Research Council. In short, the participants of the study gave informed consent to participation, data was stored on secure hard drives, the results were impossible to trace to individuals, and the participants are free to withdraw their consent at any time. In addition, no personal or sensitive data was gathered or used in the study.

Results

The CCM was designed to allow the participants to engage in an experience of the decades to come. In this study, this experience provided a common ground for reflection on climate change in general and climate-change adaptation in particular. Hence, the results were gathered using guided debriefings following the game experience.

When the interview data obtained from the eight focus groups had been analysed, the following themes stood out with regard to the participants' perceptions of climate-change issues:

- The extreme effects of climate change will primarily be felt in far-away places, and the main problem faced by Sweden and Europe will be the social and economic consequences of these effects.
- There is a near-non-existent distinction between adaptation and mitigation. Almost everything was considered to constitute adaptation to the needs of securing a stable climate.
- The participants framed 'climate-change adaptation' as a personal rather than a municipal or communal issue, closely connected to what individuals can or have to do.
- Large scale adaptation was, however, primarily seen as the responsibility of politicians and public administration. This contrasts with mitigation issues, where responsibility was much more evenly distributed.
- Adaptation as a mix of technology and/or ecosystem services. Most of the participants preferred ecosystem-based solutions, but there was a fascination with new technology.

The problem – experience and anticipation of climate effects

The participants' ideas regarding the problems of experienced and anticipated effects of climate change can be used to introduce the results. During the CCM, all of the teams had to deal with the effects of extreme weather events such as cloud bursts and heat waves. In order to place extra attention on these events, the participants rolled dice to establish the social and economic effects of the extreme weather events. The intention was to position extreme weather events as recurring phenomena – a 'new normal' in the decades to come.

One of the themes that recurred during the interviews was 'normal weather'. It was expected that the interviewees would bring long- as well as short-term climate effects into the discussion, but long-term effects were only mentioned once, and then only in relation to our understanding of the changes ahead. Instead, extreme weather events were the examples that were discussed. This could of, course, be an effect of an imbalance in the game, in that extreme weather events were far more visible than long-term changes such as shrinking levels of ground water or invasive species.

One of the eight groups explicitly discussed nature, including weather, with regard to whether it is good or bad. The saying "*there is no bad weather, just bad clothing*" was linked to a Swedish mentality wherein nature is a good thing to which humans can and must adapt. Contrastingly, a North-American participant argued that "*basically, nature for us is something to be conquered or utilised*"; something that humans must struggle against, an enemy. These perspectives exemplify the romantic view of nature vs. frontier mentality dichotomy (e.g.

Worster, 1994). The empirical material in this study unfortunately did not allow for further interpretation of this difference, but it would be very interesting to explore how these different ideas relate to the value of technological or ecosystem-based solutions in relation to climate-change adaptation.

A theme that recurred in the material was mitigation through technical lifestyle solutions being more interesting than climate-change adaptation. One group argued that they fully understood the various extreme weather effects that they "*couldn't get rid of*" in the game, and that there were things to do to protect the population "*but it seemed that we'd already caused these effects to happen. So, with this aspect, you're dealing with things that have already happened*". To the group it appeared more interesting to venture into "*changing lifestyles and maybe prevent worse things from happening*". This provide an example of the idea that the climate question is primarily about not making matters worse.

Many of the groups framed extreme weather events as things that primarily happen elsewhere, and that problems arising there might spread to other places through migration and disrupted resource flows. In general, it was noted that Sweden and other European countries are privileged, and that the primary adaptation work should really be done in other parts of the world with support from rich, industrialised countries. This international perspective will be explored further in this section, on the basis that it connects two approaches to thinking about adaptation.

Many of the groups reflected on the connection between real-life experiences of extreme weather events and action to implement adaptations to climate change. It was noted that at the start of the game little interest was paid to the adaptation options in the game. However, as extreme weather began to affect communities and economic activities, climate-change adaptation in the sense of protecting against these effects was given a significantly higher priority. The participants argued that this was a good representation of real conditions, and that our society is not likely to exhibit more profound interest in adaptation until extreme weather is experienced on a scale that is seen as abnormal.

This is an interesting reflection for two key reasons: Firstly, Sweden, and Europe in general, has experienced a range of extreme weather in recent years – the hot and dry summer of 2018 being the most conspicuous example, involving forest fires, bark beetle outbursts, and drought. Secondly, the participants framed extreme weather events in contexts that make them seem to be 'normal', or constituting tolerable variations from the norm. This seems to include both natural variability but also manageable changes in climate conditions. The anticipated solutions to this will be discussed in relation to information and education below.

Human nature and anticipation of climate change

During the interviews, interest in climate-change adaptation was related to the expected effects of climate change. Most of the participants expressed anxiety regarding the possible harshness of the future with regard to the climate: rising temperatures, increasing polarisation of international and national politics, and loss of biodiversity were the main causes for concern. In other parts of the interviews, disruptions in global food-supply were a recurring theme in the discussions.

Looking slightly past the explicit reasoning, it should be noted that the participants attributed their assessments to either scientists "*looking at the data*" or personal dispositions, e.g. "*I'm a born pessimist*", and sometimes the two in combination. Others, primarily the younger participants, had more optimistic perspectives. These were not motivated by scientific data but rather by one of the participants "*being an optimist*", the idea that climate issues are getting more attention, and that technologies such as batteries are developing faster than expected. Overall, the material suggests that the participants leaned more towards the pessimistic view than the optimistic one.

The CCM was designed to visualise the challenges that still existed despite the assumption that everyone wanted to fulfil the climate and sustainability goals set in the game, but at the same time look after their individual interests. This triggered discussions about human nature that could be relevant to discussions on climate-change adaptation and mitigation.

There was some consensus regarding the existence of large groups of people who are not interested in supporting or taking action to enact either adaptation or mitigation. Two variations around this theme were identified: the first relates to the idea that humans are short-sighted and egotistical, and prioritise short-term wellbeing over long-term and vague common goods. This relates to the idea that commercial actors are generally focused on profit.

The second concerns the lack of human cognitive capacity to truly engage with the complex matter of social transformation in general, including climate-change adaptation. Here, humans are seen to fall short in understanding the complex nature of climate change and social change due to slow physical processes becoming visible only through abstract data, and in tangible form as sudden weather events. However, the latter are difficult to clearly attribute to climate change or the lack of climate-change adaptation due to the involved complexities, as well as natural variation and management practices.

As shown by environmental historians for a long time (Cronon, 1992) narratives of complex interrelations are commonly organized along well-known story lines. Perhaps our well-rooted stories about the modern society, consumerism, and wellbeing assuming a stable environment do not enable us to envision ourselves as agents of change in relation to the social transformations needed to combat climate change. Very few comments were positive in relation to human nature. In addition, the absence of historical perspectives is worth noting: no references were made to earlier rapid social transformation such as the abolition of slavery or the shift from horses to automobiles in cities, as discussed by Linnér and Wibeck (2019). Perhaps we need a broader historical awareness in order to find paths forwards in adapting to climate change.

The solutions – no silver bullet

Technical and ecosystem services

As is discussed above, there were two main strategies for the megagame participants to follow with regard to climate-change adaptation. One was based on technical systems, and the other was based on ecosystem services. Most of the groups agreed that climate-change adaptation had to rely on both, and that local conditions were essential when choosing between them.

Wetlands were used as an example of flood protection; where this is not possible, more technically advanced solutions have to be used. In general, ecosystem-based adaptation seems to have been preferred where possible, but was not seen as sufficient to cope with expected extreme weather events, now and in the future.

In the studied material, ecosystem based solutions were contextualised differently. Firstly, they were understood to be more regional, promoting stability in the whole region. Secondly, they were commonly connected to additional positive effects. Wetlands and diversified forests were connected to biodiversity and improved opportunities for recreation and human wellbeing.

While the dual approach was expected, the motivation behind it was important when understanding different views on strategies for climate-change adaptation. Technological solutions were framed as innovative. This directed attention towards exciting technical innovations and away from ordinary technological solutions, such as air-conditioning, reducing the priority afforded to the latter. A question that arises from this is: do technological solutions have to be invented, rather than simply adapting or utilising already-existing technologies, within a mindset that focuses on technological developments? One reflection on this is that the technological approach could be understood more in relation to the innovation of new solutions, i.e. the excitement factor, than the use of technology per se. If so, the innovative dimension could perhaps be used as a way to promote ecosystem-based solutions.

Adaptation/mitigation – adaptation through changing lifestyles

A striking theme in the material is the connection between adaptation and mitigation. Despite the focus of the interview questions on adaptation and the repeated attempts of the moderators to steer the discussion towards adaptation issues, there was a strong tendency to return to discussions regarding mitigation. This resonated with the experience that mitigation is far more commonly focused on than adaptation in climate-change discussions (see the Swedish Environmental Research Institute, IVL, 2020). In showing that this pattern also occurs in this material, the qualitative interpretation allowed for reflection on the patterns that steered discussions from adaptation to mitigation.

The first reflection is organised around the finding that the terms ‘adaptation’ and ‘mitigation’ constitute an artificial distinction that is alien to non-experts. Thus, the material from the focus-group interviews show that the respondents understood the need to *adapt* our lifestyles to the conditions necessary for a society to have low or no impact on the climate.

There were many examples of group discussions returning to the topic of the need to change lifestyles when asked about adaptation. In following up on a question regarding the kinds of adaptation to be prioritised in relation to extreme weather events, one respondent argued for the importance of supply and demand with regard to lifestyle and infrastructure, using the example of personal transportation by train. Without both supply and demand, nothing will happen to the environmental footprint of transportation. This reasoning is an example of how lifestyle changes intended to reduce climate impact are framed as a kind of adaptation – adaptation to a carbon-free society – rather than to remedy the effects of existing instances of extreme weather.

The discussions also suggested that the participants felt that a wide-spread belief in technological solutions among the general population could reduce impetus for making lifestyle

changes. An example provided was that the potential of carbon capture and storage undermines a shift away from fossil fuels.

Migration is also seen as a mode of climate-change adaptation closely related to lifestyle changes. People are expected to adapt by moving away from the risks expected in coastal areas, on islands, and near rivers. During the discussions, parallels were drawn to reactions to the coronavirus pandemic, wherein people who were able to moved away from urban areas. This seems to resonate with the framing of the concept of adaptation as a personal rather than communal issue. From the perspective of the individual, it seems easier to move away from a risk than to engage in communal planning to prevent its occurrence. This distinction might be important when understanding the general public's relationship with climate-change adaptation.

Adaptation as regional self-sufficiency – an international perspective

One theme that ran through all of the group discussions was seeing Sweden and Europe as positive forces in terms of having both willingness to and resources for dealing with climate change in terms of both adaptation and mitigation. In contrast, it was felt that situations in the rest of the world will create problems that will eventually spread to this rich part of the world.

The direct threats envisioned are mass migration of climate refugees and escalating rivalries due to scarcity of resources. The roots of the problems envisioned are poverty, industrial aspirations, extreme weather events, and authoritarian nationalist politicians.

These issues, combined with globally shrinking resources/capital, will, it was felt, lead to more competition among states and economies that might disrupt resource flows through either legal or armed conflict. These issues seemed to concern the participants far more than adapting to local weather events, which were generally felt to be manageable. The immediate risk envisioned was that countries that are highly dependent on other regions will be at risk of hostile intervention through threats of cutting off resource supplies. Here it was pointed out that this is a fundamental part of the geo-political landscape, but that climate change will bring new challenges.

The solution to this problem that was most commonly proposed by the groups was increased regional or national self-sufficiency. One subtheme was that self-sufficiency will reduce the ability of foreign powers to put pressure on the region, and the participants felt strongly that we cannot rely on the abilities of other regions to sustain resource flows, even if they wish to do so. A third subtheme was related to environmental justice and our need to reduce our environmental impact in other regions; only when we have the ability to sustainably produce more than a region needs should exporting take place. Combining the two first subthemes and the third to an extent, we come to the inability of the participants to envision solutions created in collaboration with other countries and regions. This relates to the individual/communal division underpinning the discussions regarding adaptation as mitigation described above.

Adaptation as being prepared for the unexpected

In the material, little was said about common adaptation measures, but there was a substantial focus on the importance of being prepared for the unexpected. This was addressed in two different ways.

First, efficient crisis organisations were seen as an important factor in ameliorating the effects of sudden and extreme climate change. Examples drawn from the coronavirus pandemic suggest the importance of a centralised organisation with sufficient resources. Second, adaptation through regionalisation was also a common theme. The main idea put forward was that regions, as entities existing in an increasingly unpredictable political and natural world, need to be able to sustain themselves. The discussions were not particularly precise about the definition of regions and the concept was used from the local to national level. Regardless of exact definition, regionalisation stands against a continuous globalisation of trade with strategic resources, such as food and energy.

Following on from the discussions of technological solutions, it is possible that these two themes resonated because they are more engaging, perhaps even exciting, than preparing for already-understood problems. Working with problems that we already experience in our everyday lives, such as cloud bursts and poverty, falls into a more mundane category than climate-change adaptation. However, ascertaining whether this was the case would require a much broader range of empirical material than was available in this study.

Positive effects of climate-change adaptation

The focus groups also discussed the question of whether there might be any positive effects of climate-change adaptation, aside from reducing risks. Greener city centres were discussed in connection to their positive effects on people's health and happiness, as well as improved biodiversity.

Climate-change adaptation was also thought to have geopolitical benefits. National security was highlighted in relation to reducing or even eliminating dependency on foreign energy sources. The same is true for a stable electrical grid and food self-sufficiency, even if these positive side effects are more closely related to mitigation efforts.

The discussions also focused on the effects of climate-change mitigation. Technological innovations in solar, wind, and wave power were felt to reduce CO_2 emissions and create job opportunities, shifting the workforce from sectors that are causing the problem to "*sectors that are a part of the solution*". This in turn would help to shift the focus from economic growth to social justice. At the same time, a moderate approach was felt to be important: focusing only on the environment and ignoring economic opportunities risks setbacks in the form of revolts and demonstrations, as a population needs time to adapt to economic and social changes. The French yellow vests were brought up as an example of a part of the population that felt that the move towards sustainability was unfair.

Increased knowledge

As is discussed above, particularly in relation to human nature, improved knowledge of the risks and effects of different strategies was raised as an essential component of both adaptation and mitigation. As the actions of politicians are seen as driven by voters and those of companies by profit, the general public is thought to need better decision-making support in making the right choices concerning both consumption and political action. It appears that the public needs to take the initiative to push businesses and politics through voting and consumption.

Unfortunately, the improved knowledge envisioned appears to be too complex for most people to understand. This ties back to ideas regarding 'normal' weather variability discussed above. In addition, climate-change adaptation itself is argued to be very complicated, building on interactions between the climate, ecosystems, social dimensions, economies, and politics. Variability and slow feedback between the different components of the system are seen to add to the problem of understanding both the causes and effects of different strategies.

Little in the empirical material relates to tangible solutions to this problem. When mentioned, scientists and experts were seen to be important as providers of decision-making support for politicians and businesses, as well as in producing easily comprehensible explanations for the general population. On a more technical or practical note, there was also an expressed need for more research, especially with regard to technical solutions for reducing environmental impact. Considering the above-described interest in ecosystem services, it is notable that these were not pointed out as part of the improved knowledge in the same way as technological solutions.

Improving awareness throughout society is challenging. A very concrete climate-related crisis was seen as a means of encouraging broader engagement in learning about climate change and adaptation. However, considering the challenges described above with regard to identifying the effects of interrelated factors such as climate change, forest management, and tourist behaviour on a global scale, a more systems-oriented approach is perhaps needed to increase knowledge in a way that encourages agency. The discussion did not mention the role of formal education systems, which was surprising as these are generally considered to have a key role in sustainability transformations (Leicht et al. 2018).

Interaction and cooperation

A concern among the participants was how to "*achieve sustainability if we all have different needs and priorities*". An important aspect when talking about solutions was the need for more cooperation between actors and sectors in society. The participants felt that there was a twofold problem; considering priorities other than one's own at the same time as trying "*to find common interests*".

This need to and challenge of establishing alliances and cooperation across sectors was said to be an important aspect of the game: "*This is one of the nice things, learning about these things through experiencing them in a game system. To an extent I was aware of that in the rules at some point, but it really struck home during the game that we needed to balance these things*".

More directly related to the real world, the participants noted the need for improved cooperation between different agents engaged in climate-change issues – an area in which it is almost impossible to distinguish between adaptation and mitigation. However, this call for interaction

was particularly discussed in relation to research. More outreach to communicate scientific knowledge with stakeholders as well as the public was felt to be very important.

Responsibility

The question of responsibility is central to discussions of climate-change adaptation, as well as mitigation. In this material, the discussion revolved around three commonly discussed topics: individuals, politicians, and corporations. There was not often consensus among the participants, but the attribution of responsibility was slightly different in matters of mitigation and adaptation.

When the discussions concerned issues usually considered to relate to adaptation, such as protection from flooding and heatwaves, or resource management, such as securing water during droughts, the responsibility was felt to be that of politicians and administrations. In contrast, when the discussions concerned issues more related to mitigation, the participants attributed the responsibility to a wide variety of groups.

In both adaptation and mitigation, the attribution of responsibility followed similar lines of reasoning. Corporations were generally felt to primarily be interested in maximising their profits, and were not expected to take initiative with regard to sustainability. Individuals were felt to be more complex: on the one hand they were expected to be responsible for sustainable consumption, but on the other it was felt that they are not always able to do so – partly due to lack of knowledge – and, in general, cannot be expected to have the necessary motivation on an individual level needed to ensure a transition to a sustainable society. This latter issue is motivated by laziness and short-sightedness, which are discussed in the section on participants descriptions of human nature.

This leaves politicians with the main part of the responsibility for the transition to a sustainable, climate-change-adapted society with a high quality of life. In the more optimistic accounts, politicians were felt to be in possession of the resources necessary to force industry to mitigate their emissions and the administrative resources to adapt infrastructure to a changed climate, including extreme weather events. In more pessimistic accounts, politicians were assumed not to have these resources nor the knowledge needed to achieve this.

At the same time, politicians were felt to need support from citizens as well as researchers in making the necessary decisions. Hence, the question was brought back to a well-informed and -educated public. Authoritarian regimes are sometimes argued to be the most likely to achieve sustainability, with China often being used as an example. Here, democracy was presented as an obstacle to sustainability, in that voters are sometimes more interested in material wellbeing than sustainability. This argument was generally followed by a caveat that the interviewee would not want to abandon democracy in reality, however.

Thus, the interviews showed that understanding agency in relation to climate-change adaptation and mitigation is problematic in that it was consistently felt to be an intricate system of interdependent relationships. Assuming this perspective is accurate, it can be concluded that work on climate-change adaptation and mitigation should be cooperative in nature, or one sector should take on a clear and acknowledged leading role.

Adaptation and (climate) justice

A theme in many of the discussions was the ethical dimension of climate-change adaptation and mitigation. This is here interpreted as falling under the umbrella of responsibility, as it engages with the topic from a slightly different angle than those presented above. The discussions in the material concerned two related topics; the economic situation within countries, and between countries.

When discussing the inequal risks of climate change within countries, the yellow vests exemplify how lowering taxes on the richest segments of society while increasing them for everyday goods such as fossil fuels create tensions in society which can even be expressed violently. As an unjust burden on disadvantaged groups in society, the subject raises the question of who should share the burdens of risk, mitigation, and adaptation. The suggested solution was twofold: the rich need to share more of their resources, which are expected to be more than enough to cover the costs of adaptation, and taxes on e.g. fossil fuels must be leveraged in such a way as to show how the extra costs are somehow coming back and benefitting disadvantaged groups in order to enjoy broad support. This would have the potential to help the group change its behaviour while simultaneously benefiting from lower taxation.

The second issue of justice relates to the relationships between countries, in that the privileged parts of the world – the Global North – were attributed the responsibility of assisting less developed regions, and particularly islands threatened by rising sea levels. The reason given for this was the historical emissions that both created materialistic lifestyles and caused climate change.

Visions of 2050

Visions of sustainable futures are important for imagining trajectories and obstacles to these, and enabling transformative leaps forwards (Vergragt & Quist, 2011). Therefore, this study enquired into the participants' views on the situation in 2050, assuming a fossil-fuel-free, climate-change-adapted, and sustainable society with a high quality of life. As expected, this was a tough question that most participants had not thought about. One of the participants also felt that a lack of vision was part of the problem. However, as the discussion unfolded, different approaches to the topic emerged.

One clear theme in the discussion was the shift towards a more regionalised society which will adapt to climate change by increasing local resilience through self-sufficiency. This is commonly connected to production that fulfils our needs, but does not contribute to economic growth.

The anticipated more local lifestyle was tied to an improved connection with nature as "*we understand the value of connecting to and protecting our natural environments*". At the intersection of functioning democracy, anxiety regarding social-media bubbles was discussed, as was the "*need to connect with people who are really different, as that's how we'll build local communities, which we need to do*". Again, connection to local nature, challenges, and people was seen as a method of moving towards engagement with sustainability.

A question of governing related to climate-change adaptation was connected to radical societal transformations; these were felt to be either imposed by an authoritarian regime, as in China,

or based on local leadership wherein citizens feel involved on a personal level. None of the participants favoured the authoritarian approach, and transitional movement provided one example of a citizen-driven alternative within a local democracy. This may connect to young Swedes who are interested in engaging in politics, but do not know how (Molander & Olsson, 2019). These lines of reasoning suggest a distrust in the current political system with regard to dealing with the problem of climate change. In relation to the idea that Sweden and Europe are thought to be quite well-equipped for dealing with localised climate change, this criticism of the system should perhaps be understood in relation to more fundamental changes needed, primarily in terms of climate-change mitigation.

With a few exceptions, such as a return to seasonal migration, the vision for 2050 was similar to the society of the present, consisting essentially of things we are already familiar with. Working less and more frequently from home was suggested, as the trend of urbanisation will create a better balance between urban and rural areas and there will be fewer cars in the cities. Otherwise the picture was relatively familiar, except for the abandoning of fossil fuels and a more unruly weather caused by climate change.

Transition and conflict

The path to the preferred society of 2050 was a central part of the understanding of the views on adaptation and mitigation. In the studied material, that transition was usually described as non-linear and based on holistic thinking: there was no "*one thing that will solve everything*". The path was also constituted by a range of small steps, the significance of which is not obvious with regard to the chains of effects that even small things can trigger.

However, this incremental view contrasted with the scope of the problem from a more radical systems perspective, pointing to the need for radical transformation. One example was the transformation of the global economy, "*where it is actually more economical to have shrimp peeled in Morocco*". In the envisioned new economy other values than profit dominated, including wellbeing, care, and happiness.

The participants expected conflicts to be part of the transition: between urban areas and the countryside in particular, due to environmental issues. Returning to the international perspective discussed above, a great deal of conflict, or at least tensions due to scarcity of food and other natural resources, was expected.

Concluding reflections

Some reflections have already been presented alongside the results. The following discussion reflects on three key themes that recur through the sections presented above.

The first theme concerns the use of the word ‘adaptation’ and what it says about how the participants related to climate-change adaptation. The clear tendency to use the terms ‘adaptation’ and ‘mitigation’ interchangeably is central to this. From an individual perspective it seems reasonable to think of climate-change adaptation as ‘how I adapt’, which primarily means mitigation. From that perspective it is easy to think that adaptation can involve moving to an area that is more secure from flooding rather than securing the home one already lives in, perhaps in cooperation with one’s neighbours. As is shown throughout the empirical material, responsibility for what is usually considered to be climate-change adaptation is placed in the hands of the political sphere.

This leads onto the second theme; thinking about climate change seems to mean thinking big, and exploring the question of how interest is directed when climate-change adaptation is considered. The material showed a clear pattern of interest in spectacular weather events connected to climate change, while not focusing on more everyday changes and challenges. In a similar manner, new technological methods for dealing with problems gained the most attention. At the same time, most of the groups preferred ecosystem-based solutions for adaptation strategies. However, these low-tech methods were not discussed with the same enthusiasm as the more advanced technological strategies. Relatively mundane technologies such as air-conditioning attracted similar amounts of attention as non-technological solutions, strengthening the argument that innovative technological solutions appear to have been more interesting.

The third theme that seems to have underpinned the discussions is that the events that will be most significant in terms of the warming of the climate will happen far away, whereas Sweden and Europe in general are expected to encounter generally manageable effects. These countries are also seen as well-equipped to deal with locally occurring effects, but in need of preparation for the spill-over effects from other regions.

It may be that this approach of ‘thinking big’ with regard to the anticipated effects of climate change obscures the the more moderate problems that will arise – and which we have already begun to experience – as a result of climate change, such as droughts, as each of these alone may not be considered extreme enough to warrant action, when in fact the effects of such events recurring and being combined with other kinds of events may make them much more significant. This everyday perspective seemed to be missing in the discussions, which likely affected the thinking regarding adapting to everyday events.

Including public views on climate-change adaptation challenges and opportunities in scenarios

The results of this study could inform further development of the serious game concept, and suggest how areas of public concern can be included in other scenario designs.

The first two challenges relate to major, perhaps sudden, disruptive events:

1. Adaptation to an increasingly insecure global economic system in the sense that the region must be able to withstand a sudden isolation from global markets, while also expecting cooperation within an equally isolated nation.
2. Adaptation to mass migration. In the interviews, mass migration was seen as one of the major effects of climate change. Preparing a region to accept (or reject) a 10–20% population increase constituted of climate refugees could be an important part of new scenarios for climate-change adaptation.

Three additional challenges relate to the present situation, without a spectacular crisis:

3. Adaptation to climate change based on placing equal value on all of the varying interests of citizens, rather than focusing exclusively on the threat that climate change poses to public health and economic values. This could be an interesting way of including segregation in work on climate-change adaptation.
4. Adaptation to securing current materialistic lifestyles based on the short-term perspective considered to characterise the general public. Adaptation should be in place for security and comfort, but not disrupt ongoing activities or aesthetics.
5. Adaptation based on ecosystem services could be interesting to explore as many participants preferred that. A challenge could be to develop a scenario in which this kind of adaptation is used insofar as possible.

It would also be valuable to include challenges that deal with knowledge and cooperation, but these were difficult to formulate. However, preparing citizens and decision-makers for dealing with the unexpected is important, based on the results of this study.

A short reflection on the method

The discussions in the groups were engaged, particularly considering they followed seven hours of intense interaction during the game. However, the very broad topics for discussion proved to be a problem when looking for patterns across the different groups. The discussions took so many different paths that it was difficult to compare the concrete content. Given the focus-group format, it would perhaps have been more fruitful to discuss an additional concrete issue, such as the establishment of a specific wetland for flood protection, to provide sufficient depth and variety of views.

As was anticipated during the design of the study, there was a trade-off between the interviews taking place immediately after seven hours of game but being fresh from the game experience, as compared to organising an interview later. Many of the participants mentioned being tired. However, this approach was probably optimal in order to collect the material we wanted. Developing this method of using a game experience as a basis for gathering data could benefit from the interviews being shorter and spread throughout the event, rather than having a long one at the end.

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Appendix - Focus group guide

So, then we have reached the final and as you heard maybe the most important part of the 2020 Climate Change Megagame. (Short presentation of yourself if you wish.) As you know we use this debriefing to study the understandings of climate adaptation, eg. how we adapt our society to the climate change impacts that are already here and that will multiply in the future, in the bigger context of climate change. So, any questions about that before we start? … Then I turn on the recorder. **(START RECORDER, in zoom!).** As you know you will be anonymous in the material and can withdraw from participation at any time and without any explanation if you would want to.

You have probably already talked to each other but before we start our discussion, I suggest we take a quick round and just say our names and what role we played in the game.

THEME 1 The first theme for discussion starts in the challenges and possibilities that you encountered on the way towards 2050. Based on these and your previous experience, what do you think will be most important in the real-world journey towards a sustainable society.

Since it is very easy to forget the questions of climate adaptation, I suggest we start there. So, how should we think about adapting to the changes in climate that we have already caused, and will continue to cause before reaching zero emissions?

1. Drought, Forest fires, beetles, flooding, heat waves, climate related international events,
2. Can the work with climate adaptation bring positive side effects, not just reducing risks? If yes, could you think of examples?
3. How do you think about the balance between technical and ecological solutions? One example could be choosing between the building of flood protection walls in the cities or create wetlands upstream from the city. In order to prevent floods
4. The region is closely connected to international events. Will we need to prepare for sudden changes there, and if so how. Some examples could be interrupted trade flows of food and goods, climate migration, armed conflicts. How can we do that?

Let's move on to the other related issues. How do you think about technological solutions and changes to lifestyle when it comes to reducing carbon emissions?

1. How do you view the balance of responsibility between the individual and for example politicians and corporations?
2. How do you think about the risk for major conflicts on the way? Between whom? About what?

THEME 2 Challenges and possibilities are usually on the way towards something. The second theme concern your vision of a climate adapted, fossil free society with good life quality. How do you imagine the good society in 2050?

1. What are the most significant things that have changed?
2. Will it be more local/global?
3. Will we live more in cities or in the countryside?
4. Other…

THEME 3 Games are always simplifications of reality. The point with serious gaming is that it can help us to identify things that we had not thought about before but that should really be a part of the simulation. So, the third theme concerns what you missed in the game, things that should have been there. What did you miss and if you have an idea, how would you like to include it in the game? What would it change and why is that important?

1. Just as an example. One thing that is obviously missing in our game is a gender perspective and little is said about different socio-economic groups in society and how they are affected by climate change.
2. other