Working Paper Series

Can games help people manage the climate risks they face?

The participatory design of educational games

People in a Nicaraguan village play the educational game 'Upstream/Downstream' to learn how climate change adaptation, ecosystem management and disaster risk reduction can fit together. (Photo: Maya Schaerer/NLRC)

by Carina Bachofen, Pablo Suarez, Margot Steenbergen and Natasha Grist

RED CROSS/RED CRESCENT CLIMATE CENTRE
International Federation of Red Cross and Red Crescent Societies
The Netherlands Red Cross
CDKN Climate & Development Knowledge Network
JICA

Key messages

Games with an underlying serious purpose can speed up learning, dialogue and action on climate risks, engaging people's minds and emotions, in sharp contrast to unidirectional learning through traditional lectures and PowerPoint presentations.

Asking policy-makers to engage in the design of games helps create a constructive learning dialogue about climate risk management.

Guidelines about how to design rules-based games that represent complex systems exist; they can help designers and decision-makers develop games that lead to compelling, memorable and fun learning experiences.

Whilst popular and in great demand, some people may consider climate risk game play to be frivolous. We don't yet know enough about how serious game play on climate risk leads to changed or improved policy decisions, so we need better monitoring and evaluation, baseline studies, and after-action reviews on game play effectiveness.

A key challenge is the availability of experienced game facilitators and a willing set of participants to engage in game play. The design process faces an additional challenge of availability of skilled game designers to make the most of a cooperative process. The Red Cross/Red Crescent Climate Centre (the "Climate Centre") is testing methods for training game facilitators and engaging decision-makers in the game co-design process with a view to scaling-up game play and building capacity for further game development.

1. Introduction

The humanitarian consequences of climate-related events, particularly for the world's most vulnerable people, are alarmingly evident. The recent IPCC Special Report on Extremes (SREX), projects an increase in several hydrometeorological hazards into the future as a result of climate change, as well as, in many areas, rising uncertainties. Rising exposure and vulnerability, especially in developing countries, result in rising human and economic disaster impacts, magnifying the shortcomings of the prevailing "wait and see and respond" approach. Humanitarian organizations are adapting to new climate risk patterns and increasing their capacity to make decisions based on scientific climate information. In doing so, it will not be enough to simply train existing staff, or expand the staff and volunteer base: humanitarian organizations need to modify the way they function – evolving towards being knowledge-based entities that can rapidly absorb and act upon the increasingly reliable information about changing risks will be fundamental for generating better outcomes in an increasingly uncertain climate. We need smart, forecast-based decisions as well as simple, decision-based forecasts (Suarez 2009). This requires a change in policy and new thinking on how to confront issues in humanitarian policy.

Given this situation, policy work on climate risk management needs to innovate and spur uptake at an unprecedented level. Anticipatory, inclusive, and participatory approaches for designing and implementing disaster risk management operations are one method that can try to transform traditional thinking across all scales. Participatory games and simulations are tools that can approximate the complexity of real life.

In this working paper, we find that games as well as the process of the participatory design of games offer an innovative approach that can accelerate learning, dialogue and action on how to address climate risks.

Funded by the Climate and Development Knowledge Network (CDKN), the Climate Centre and its partners have since 2011 successfully designed, tested and used games for learning and dialogue processes to address topics as diverse as:

- forecast-based decision-making
- strategies to prevent dengue fever
- optimizing supply-chain dynamics for humanitarian response
- urban infrastructure
- gender inequity
- diversifying smallholder cropping systems.

Notably, the ability to scale-up these games as learning tools has resulted in more than 80 game events in four continents with stakeholders ranging from national finance ministry staff involved in an Africa-wide regional insurance pool, to subsistence farmers developing village-level flood contingency plans. All of them have been able to explore and discuss a variety of policy options through the use of games. Stakeholders engaged as players in a simulated reality, were able to participate in constructive dialogue and learning on practice and policy for climate risk management. Importantly, these games always created a fruitful atmosphere of collaboration and mutual understanding. In addition, the Climate Centre has also taken a further step, engaging practitioners and policy-makers in game *design*: users disaggregate the elements of the design process with a view to developing games that may better reflect complex systems and promote the lessons they seek to convey.

This working paper will discuss how the ability of games to reflect complex systems can promote learning and dialogue on climate risk management among a range of stakeholders. The paper also discusses how engaging humanitarian and development professionals in a participatory game design process may help to elicit deeper insights among key stakeholders and interactions deemed helpful for promoting climate risk management.

2. Linking games and learning about climate risk management

To understand how games might help in climate risk management decisions, we first need to investigate what, precisely, games are. In essence, games consist of well-defined rules, processes and emotional responses. In any game, these three elements are causally linked. A game designer will seek to develop rules that shape the process of game play. A game's rules can be designed in a way that integrates data sets and analytical research and allows a player to get a feel for how variables interact – an attractive alternative to engaging in strenuous quantitative activities that often feature complex graphs and charts (Macklin et al 2009).

The extent to which a player can learn through a game is based on the process by which he or she, on the one hand, creates knowledge by experiencing real or simulated events in a *tangible* way, and on the other is able to engage in *abstract* conceptualization through game play. By carefully crafting game-enabled processes that inspire opposing ways of dealing with climate issues, learning will emerge naturally from the resolution of these conflicts.

Thus game rules and the game process, taken together, trigger a desired emotional response in players that can make a game a compelling, memorable and fun learning experience. The emotional triggers that do this can be rooted in one or more of the following elements (Hunicke et al 2004):

- Challenge: game as obstacle course – how to overcome the hurdles that make it hard to get from where we are to where we want to be?
- Discovery: game as uncharted territory – what does our "space of possibility" look like?
- Fellowship: game as social framework – who is around us and how can we better relate to them?
- Narrative: game as drama – how to tell a story, including its logic, tensions and resolution?
- Expression: game as self-discovery – how to reveal and make known our thoughts and feelings?
- Fantasy: game as make-believe – how to imagine a reality that doesn't exist here and now?

Understanding the interplay between the rules, process and emotional response of a game can help us grasp how and why games can be valuable tools for achieving learning objectives in a way that can be scaled up. For example, the Climate Centre's game Paying for Predictions can, with relatively simple rules, drive players to grapple with changing chances of disasters as they decide whether or not to invest in forecast-based flood preparedness. Through consecutive turns, players discuss options and strategies among peers, observing the decisions and consequences of fellow players. Each participant can develop a deep understanding of the long-term value of seasonal forecasts for humanitarian work, as well as their short-term limitations. Importantly, data from more than ten sessions on four continents shows that game play itself can accelerate learning about common errors; this can help people link early warnings with early action in the real world. In terms of emotional triggers, there is a strong element of self-discovery as individuals must express their risk preferences and make their ideas and feelings known to fellow team members, while discussing how much to invest in bidding for the forecast – one of the richest learning and dialogue moments in the game (Mendler de Suarez et al 2012).

In addition to using games to promote learning and dialogue, engaging decision-makers in a participatory game design process may also intensify learning. Using the method for participatory game design described in the following section, decision-makers can themselves devise game rules to mimic plausible decisions and their consequences based on information available for a given context. The added value of engaging decision-makers in a participatory game design process is threefold:

(1) a better game can be created as those most familiar with the context as they become the game designers, (2) greater ownership and enthusiasm about the game can emerge, and perhaps most excitingly, (3) better insights can be generated amongst the participants regarding the systems dynamics that the game mimics. This in turn can contribute more deeply than game play alone would to the higher objective of learning about climate risk management. The Climate Centre is currently testing the effectiveness of this participatory game design method for learning and policy impact, and analysing the challenges and opportunities for taking the process onto a bigger scale.

3. Participatory game design for learning and dialogue

Understanding the value of games as learning tools and having reviewed the basics of game design, how might the process of participatory game design be used productively towards disaster risk management? Based on a wealth of experience, it has been found that games can harness individual and collective ideas on how disaster risk management measures could be conceived and implemented, when crafted as truly participatory design tools. As explained in section 2, this is done by creating rules that simulate plausible decisions and related consequences based on available information, and allowing stakeholders to explore the space of possibility and the most effective arrangements for achieving desirable results.

Game design: six simple steps

Practically speaking, how can one design a game to support learning about forecast-based risk management? The following six steps guide a participatory game design process.

1. Define the communication challenge

What conversation should game play elicit? What types of decision-making strategies should emerge during game play? What is the A-HA! moment players should experience?

2. Define key elements that will be used to construct the rules, process and emotional triggers of the game. What needs to be represented in the game?

Who can make decisions: women and girls, farmers, Red Cross Red Crescent staff and volunteers, donors, meteorological service authorities, local government officials?

What are possible actions: invest, trade, collaborate, move, store, sell?

What are the thresholds, feedbacks and trade-offs players should face during game play: get richer by deforestation, paying scare resources for privileged information, taking a risk in context of uncertainty?

3. Define the emotional triggers of the game narrative. What feelings should the game process elicit: anxiety, tension, triumph?

Develop a narrative that highlights the game's key elements (step 2) and reflects how *information* may lead to different *decisions* that have one or more emotional *consequences*. The game dynamics will emerge from this process. In the narrative, decisions may be individual or collective, planned or random. Tensions will arise regardless during game play as both expected and unexpected consequences present themselves. To finalize the narrative, participants may present their scenarios theatrically, injecting drama, suspense and surprise for the rest of the group partaking in the participatory game design process to experience.

4. Refine the game's dynamics

Strip away all superfluous elements of the story to boil the narrative down to its essential elements related to decisions, actions and consequences.

5. Develop rules

Reflect on existing games to craft the rules (action, behaviour, control), bearing in mind what is the

most appropriate type of dynamic for the game as well as how to make the learning elicited through game play engaging and memorable. At this stage it is necessary to engage design professionals. The game rules need to create a complex system based on simple rules and there is substantial expertise in methods to capture complex dynamic systems in games. (For more information on this aspect of the game design process, see Mendler de Suarez et al 2012).

6. Play!

Tweak game dynamics, rules and emotional triggers. Discuss with participants the consequences of different actions, and how to improve the game prototype.

4. Case study: participatory game design for upstream-downstream problems with climate, disasters and ecosystems

Using the previous six steps to devise a game's rules, process and desired emotional responses, we now put this method into practice. The impacts of disasters, climate change and ecosystem degradation have rarely been jointly tackled. In 2011, five Netherlands-based humanitarian, development and environment organizations,[1] with support from the Dutch Ministry of Foreign Affairs, formed an alliance called "Partners for Resilience" (PfR), to reduce the impact of hazards on vulnerable communities in nine countries around the world and generate lessons on best practice for strengthening community resilience.

In February 2012, the Nicaraguan and Guatemalan PfR country teams co-designed a game to engage communities in discussion about appropriate local policy for disaster risk, climate change and sound ecosystem management for locations facing drought and flood risk. The six simple steps for participatory game design were applied, as described below.

1. Define the communications challenge

PfR workshop participants (the designers) agreed the game should stimulate dialogue about the role of climate-related information in decision-making at the community level, and how neighbouring upstream and downstream communities could work together to manage consequences related to flood and drought risk, and deforestation. What are the local policies that will achieve this objective?

2. Define the key elements

In this game, all players represent subsistence farmers living in upstream or downstream communities. All farmers can take three possible actions: 1) plant crops, 2) cut down and sell trees for more money, and 3) buy and plant trees on their land for added protection against flooding. Each action has a potential benefit and consequence. All farmers face drought and flood risk. Both hydrometeorological events may destroy any crops while favourable weather conditions can result in increased yields.

3. Define the emotional triggers of narrative

To add tension to the dynamic, during game play upstream farmers can deforest their land, but after a certain point this causes increased likelihood of flooding for downstream farmers with potentially major crop losses for them. In addition, after each round of game play, each farmer must pay for food. Farmers who cannot afford to must migrate to a city in search of work and consequently are out; they lose. After ten rounds, the farmer and community with the most resources are the winners. The game is designed to stimulate dialogue between players representing upstream and downstream farmers on ways they may be able to work together to avoid crop losses from drought or flood. Among other discussion points, this draws out dialogue on *payment for ecosystem services*, which is an

1 The Netherlands Red Cross, the Red Cross Red Crescent Climate Centre, CARE Netherlands, Cordaid and Wetlands International.

innovative policy with the potential to greatly mitigate future disasters in this location.

4. Refine game dynamics or process

Farmers living downstream have access to more fertile land, but it's prone to flooding. Upstream farmers have less fertile land but access to more trees they may cut down in exchange for resources. Farmers may buy and plant young trees to protect themselves from floods but young trees cannot survive drought and only can only be cut down and sold after two rounds; a delayed benefit. After several rounds of the game, the facilitator introduces climate change into the narrative, which changes the probabilities of floods and droughts and potentially increases the consequences of actions farmers decide to take.

5. Develop rules

The game is played with a six-sided dice representing regional rainfall where a score of 1 represents drought and 2 to 6 represents favourable rainfall. Upstream farmers each have their own dice, and after the regional rainfall dice is thrown upstream farmers throw their own. If the sum of regional and local dice is 10 or more, upstream river basins flood, and if two or more farmers upstream experience floods, this causes flooding in plots of the most fertile land downstream. If upstream farmers have deforested their land, then flood are caused when the sum of regional and local dice is 9 or more. An eight-sided dice is subsequently introduced to represent climate change – increasing the probability of upstream flooding. The facilitator may also assign one person to the role of donor, who has 20 seeds that he or she can choose to grant farmers. While this factor may boost farmers' chances of survival, it will also affect individual and collective decision-making strategies. When the donor's beans run out, the possibility of outside assistance is over.

6. Play!

Enjoy the game play experience and ask players questions such as: What information determined the decisions you made? Did the introduction of the eight-sided dice change your decision-making process? How could this game be improved to better reflect reality? How would you be interested in changing your decisions based on this game?

This game was designed and piloted during the regional PfR workshop and then played in several communities in Nicaragua. The ability to scale-up was a key added value of the game as a learning tool. Local participants from the upstream community El Chichicaste and the downstream community of Moropoto remarked on the importance of sharing risk management strategies with each other and in some cases acting collectively rather than pursuing individual decisions. Collective action during game play also boosted the confidence of players, which in turn was reflected in increased confidence to a dialogue about ways to take action in reality.

For PfR technical staff, the participatory game design process offered distinct added value: as the Upstream/Downstream game reflected the reality faced by particular communities in Nicaragua, PfR staff's interest and sense of ownership boosted their commitment to continuing to improve and scale-up the game in a way that met their objective of promoting dialogue and learning about managing changing risks in the Nicaraguan context.

In the post-game debriefing session, players reflected how their decision-making approaches changed based on changing probabilities – playing with a six-sided dice versus an eight-sided dice where likelihood of flood was higher, for example. In addition, the ensuing discussion during which players reflected on ways the game's emotional triggers, rules and dynamic could be improved fostered a sense of local ownership of the game and validated its narrative. Participants all agreed the learning experience was memorable, challenging and fun!

Moving forward, this learning experience is now being used to develop programming in these PfR communities. Harnessing the emotional energy of the players to discuss policy implications in their communities has helped shape ground-up programming that simultaneously addresses disaster risk reduction, climate change adaptation, and ecosystem management.

5. Applying games to policy change

Given that the humanitarian world vastly underutilizes the tools and resources developed by climate scientists to help predict disaster, games may help spur innovation and development of new policies and practices that incorporate use of science that seems incomprehensible at first glance. The game described above is part of an expanding body of tried and tested games aimed at improving community-level disaster risk management by conveying complex climate science in a simple manner.

Based on experience with designing and facilitating numerous game sessions on climate risk management, the Climate Centre has generated limited anecdotal evidence of games' ability to strengthen learning and dialogue processes so that they impact policy and practice.

For example, in 2009 a four-day workshop in Senegal gathered 40 people who would not normally talk with each other:

- Scientists who produce forecasts on different timescales
- Red Cross Red Crescent workers who try to understand, communicate and use forecasts
- Vulnerable people who may suffer or die if an early warning doesn't lead to early action.

In order to create common ground for future, long-term collaboration, several tailor-made games were co-designed by the Parsons School and the Climate Centre to create a safe and playful space where participants could explore new avenues for collaboration and joint approaches for improved decision-making.

In another pioneering use of games for learning, the World Bank partnered with game designers to design a game to help teach farmers about the Tanzanian Social Action Fund (TASAF) and its benefits for rural farmers and communities. The initial game pilot was so successful that the Tanzanian government asked for a simpler version in Swahili to scale-up learning about the TASAF across 13 districts. The game design process has been collaborative and participatory, involving game designers, climate adaptation experts and TASAF leadership and personnel (Mendler de Suarez et al 2012).

Understanding the potential of games and the participatory game design approach for strengthening learning and dialogue on climate risk, the Africa Climate Change Resilience Alliance (ACCRA) project recently initiated collaboration with the Climate Centre to co-design a game for district-level policy makers in Ethiopia, Mozambique and Uganda. ACCRA hopes to harness the potential of games to encourage flexible and forward-looking decision-making in a climate-constrained context, and generate evidence on the impact of a specially designed game to drive this learning process.

To fully understand the capacity of games to spur improved decisions on climate risk management, there are numerous areas where further research is needed. For example, generating a stronger evidence base of games as vehicles to impact positive policy change, rigorous assessment of how games may improve risk management decisions better than other methods, and the trade-offs of using games as opposed to alternative tools for learning and dialogue is needed.

6. Challenges and limitations of games and participatory game design as learning tools

Games as learning tools and the participatory game design process are limited in their impact on people's understanding of, and decision-making on, development issues.

Firstly, skilled *facilitators* are needed for ensuring that any game play experience is rooted in reality. A genuinely collaborative process where underlying power structures – for example, gender relations and formal hierarchies – can be appropriately addressed

will help ensure an unforgettable and fun learning experience based on an engaging, animated and thoughtful dialogue. A skilled facilitator will be able to encourage cognitive and emotional engagement as well as critical thinking to achieve the learning objectives. It can be dangerous to assume that the game itself is the only knowledge vehicle and is self-contained. Learning and dialogue are enhanced through a variety of facilitation techniques – setting the stage, explaining rules, relinquishing control of interactions, sharing power, and guiding debriefing when participants generate knowledge and act on new understanding (Mendler de Suarez et al 2012). The participatory game design process will need not only skilled facilitators but also knowledgeable *designers* who will know how to ground their work in reality.

Secondly, working with a *willing* group in game play is not a foregone conclusion. Time is valuable and not everyone will be immediately willing to experiment with this innovative approach. Questions will be raised concerning the justification for allocating human and financial resources and time to games. Some may equate what are, in fact, serious purposive games with children's play and be reluctant to carve out time in busy schedules, or even see the initial suggestion that games be played as patronizing. But senior people do need to experience games for themselves to discover their value as a serious approach to learning for all ages.

Similarly, as the game design process is deeply participatory, time is required for this somewhat unconventional approach to learning and dialogue. Initial scepticism is common among professionals who may be asked to design a game. In addition, there must room to make mistakes, to engage in an iterative process and, most importantly, to discuss limitations of the approach. It is important for someone wanting to develop a game – particularly with expert audiences where resistance to the concept might be greatest – to acknowledge diversity of preferred learning styles and not assume that one kind of learning approach is best in every instance (Mendler de Suarez et al 2012).

Thirdly, it is vital to note that a game will never reflect the countless complexities present in the real world. As a *simplified version of reality*, a game model will be imperfect and sometimes wrong. Participants in the game design process will need to decide which elements or relationships between decisions and consequences they wish to emphasize while recognizing that not all aspects of reality will be reflected in the game. Again, time for reflection on the limitations of a game and how to improve the model is a crucial element of the learning process.

Finally, while scaling-up the use of games with a skilled facilitator and willing audience can be relatively simple and straightforward, scaling-up the participatory game design process is much more complex, and a broader evidence base is needed to determine how best this may be achieved.

7. Conclusions

Can games help us learn to make good decisions? Anecdotal evidence from case studies is showing us already that people learn well in a serious game situation, and even better when they are invited to participate in the rules and process creation of game design, learning to think through the system components and the desired outcomes of learning. The Upstream/Downstream game on climate, disaster and ecosystems demonstrates that the help of game designers has refined humanitarian and climate risk simulations impressively from clumsy first attempts at teaching and influence through gaming. What we don't know is how these interventions themselves affect decision-making processes in real life and in people's professional work.

Whilst they remain one-off interventions rather than being programmed into an institution's way of working and behaving, serious games may remain simply an interesting and enlightening interlude from existing work patterns and decision-making. A robust analysis of the impact of these climate risk simulations on decision-making is challenging methodologically, because it deals with a multi-headed hydra of causal links. How can we say that result *x* is due to intervention *y* when there are so many other related factors? But this research is necessary, on a case-study basis initially. It is imperative in order to assess whether investment in simulations is really a good use of precious time and financial resources.

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