Final report: CDKN Action Lab Innovation Grant

Using games to experience climate risk

Empowering Africa's decision-makers

The ACCRA resilience game being played by district officers in Kotido, Uganda. (Photo: Thomas White/ACCRA)

CDKN Climate & Development Knowledge Network

ISDR International Strategy for Disaster Reduction Africa

START

RED CROSS/RED CRESCENT CLIMATE CENTRE

International Federation of Red Cross and Red Crescent Societies

The Netherlands Red Cross

Synthesis information

This is a final donor report on the contribution of the *Forecast-based humanitarian decisions* project to the global climate risk management sector. After a summary and introduction, section 2 presents the analytical framework developed as part of the research that guided subsequent work. Section 3 outlines student-led research carried out in Africa through travel grants funded by the project. Section 4 provides an overview of participatory processes for learning and dialogue resulting from this work. Section 5 describes the dissemination of activities and outputs. The new opportunities that emerged thanks to this project are discussed in section 6, and the report ends with conclusions and next steps.

Appendix 1 is an overview of the students who have been engaged in the project; Appendix 2 is a list of about 100 agencies which collaborated in designing games, hosting or running participatory sessions, and writing publications and proposals on games; Appendix 3 is a list of 33 participatory games designed for, researched by or resulting from this project.

Supporting documentation, including files for or links to project deliverables, are provided as attachments in a separate .zip file, but for convenience are itemized below.

Attachments to this report

1. 15 publications produced by the project team
2. 26 student-led outputs
3. 130 game sessions
4. 33 games designed for, researched by, or resulting from this project
5. 74 media-coverage references
6. 100 Partnerships made possible by the CDKN Action Lab Innovation Grant.

Project title:	Forecast-based humanitarian decisions: Designing tools and processes to link knowledge with action
Reporting period:	November 2011 (confirmation of grant) to May 2013
Funder:	Climate and Development Knowledge Network (CDKN)
Recipient:	Red Cross Red Crescent Climate Centre in collaboration with International START Secretariat and UNISDR-Africa
Principal Investigator:	Pablo Suarez, Climate Centre Associate Director for Research and Innovation
Total project value:	GBP 220,000 (120k from CDKN, the rest counterpart funding from the American Red Cross)

Authors' note: all publications and videos directly funded by this project include the disclaimer requested by CDKN. Some other products delivered here, like videos and game materials, were funded by other agencies and hence do not carry the CDKN disclaimer; in most cases, CDKN is acknowledged.

-- Pablo Suarez, Carina Bachofen (Red Cross Red Crescent Climate Centre)

Summary and project lessons

‘Inhabitable games’

This research project, *Forecast-based humanitarian decisions: Designing tools to link knowledge with action*, which has been experienced by more than 4,000 stakeholders, has been aimed at embedding science into humanitarian work. By understanding and designing participatory tools that enable smart, forecast-based decisions, this work promotes better climate risk management for development and adaptation in Africa.

The CDKN Action Lab Innovation Grant made it possible for three partners, the Red Cross Red Crescent Climate Centre, the International START Secretariat and UNISDR Africa, to engage in action-oriented, collaborative research, delineate both the potential and the limitations of games-based approaches for accelerated learning, foster dialogue and improve decision-making in humanitarian and development work involving climate risk management. People from more than 40 countries took part.

To achieve its objectives, the project team developed an innovative, analytical framework to link knowledge and action, combining games-based learning and dialogue with climate risk management approaches. The team refined and tested this framework with student-led fieldwork in Africa; they applied the framework in a range of participatory processes around the world; and they disseminated outcomes through a book, journal articles, handbooks for practitioners, guidelines for facilitators, video tools, and web-based platforms – as well as through facilitating coverage by the mainstream media.

Stakeholders have experienced how games can help people inhabit the complexity of climate risk management decisions, and explore then test a range of plausible futures. Participants have ranged from subsistence farmers and poor people in cities in sub-Saharan Africa to authorities from meteorological services, elected decision-makers, humanitarian donors, and senior staff from multilateral development organizations. The project team has collaborated with close to 100 partners to make these events possible and document them.

The Red Cross Red Crescent Climate Centre (“the Climate Centre”) and its partners have designed some 30 new games about a very wide range of issues encompassing food security, road safety, supply chain logistics in humanitarian relief, interpreting and acting on climate information, improved cooking stoves for better health, climate-resilient coastal development, urban waste management, disaster preparedness and response and more. Each game reveals how complexity manifests itself across various sectors, timescales and spatial scales of decision-making, and simulates changing realities, plausible decisions, and related outcomes. Most of the games are freely available online, including rules, facilitation guidelines, training videos, printable materials or data collection surveys.

Games for a new climate: Netherlands. The dice are rolled for climate game in Scheveningen one evening after a 2012 Climate Centre team meeting.
(Photo: Alex Wynter/Climate Centre)

The project team's progress and achievements were covered in many mainstream media outlets, including Reuters (carried by many Reuters subscribers worldwide), US National Public Radio, Internews, *La Nación* (Argentina's second largest newspaper), the Qatar Gulf Times, and others.

The body of research and practice supported by CDKN has generated new evidence about what we have called *inhabitable games*: dynamic models that can meaningfully engage people in experiencing complex systems to better understand their current or potential role in transforming them, in a way that is both serious and fun.

Key lessons

Games are uniquely well suited to help understand and address *humanitarian and development work in a new climate*. Like climate change adaptation, well-designed games involve decisions with consequences. Games enable us to think about global environmental and social change, and to explore in a rational yet sensory and creative way the sometimes surprising or counter-intuitive outcomes of our individual and collective decisions. This can include consequences for ourselves, our community, other close or distant stakeholders (now or in the remote future), or even for the structure of the system itself.

Games can support design and implementation of *forecast-based risk management initiatives*, grounded in a holistic comprehension of our vulnerabilities, as well as emerging opportunities for climate-compatible development. Towards this goal, we have identified three process drivers of climate risk management that games can uniquely integrate through immersive, experiential learning:

- *Acceleration*. Participatory games can help in accomplishing what is aimed for, faster or more efficiently than other approaches.
- *Consolidation*. Desired learning and dialogue outcomes can be deeper, more robust and durable with game-enabled participatory processes.
- *Innovation*. Games can cultivate motivated and inspired, out-of-the-box, creative thinking.

Games can encourage *peer-to-peer learning among diverse stakeholders* by enabling players to collectively 'inhabit' a complex system and share the "Huh?" (confusion) and "AHA!" (revelation) moments. This group learning experience generates a collective intelligence that can set the stage for deep discussion and truly participatory dialogue. Debriefing afterwards is an important evaluative step which provides a means to not only share and consolidate insights gained through the common game experience but also to engage players in relating the game to their own reality.

Purposefully designed games can help humanity tackle a changing climate where complexities, volatilities and uncertainties may be the hallmarks of *a new normal*. Climate manifests as an enabler of human endeavour as well as a hazard to our assets and livelihoods. It can exacerbate and amplify other natural or man-made sources of stress, and is dauntingly complicated – especially when considering the relatively unknowable forces and additional complexities that will shape the range of plausible futures. Those futures become "inhabitable", as we put it, when the system that can lead to it is distilled into a game.

Participatory games can offer *numerous advantages over more linear, traditional forms of teaching* and learning. Many unidirectional learning platforms leave decision-makers and stakeholders with little recourse other than passive engagement at best. All players develop and share new knowledge within the risk management framework: the game system creates new ways to inhabit an iterative process of defining problem and context, and addressing risks, options, choices, decisions, actions, and evaluations. Through gameplay, participants find themselves witnessing the emergence of complex concepts in an emotional and engaging yet rigorous and effective way. Such participatory activities can transform passive consumers of information into active players who absorb and retain new information more readily.

Important considerations when preparing to use games for participatory sessions must be *safety and sensitivity*. Whilst game-enabled initiatives are popular and in great demand, we don't yet know enough about the many things that can go wrong when using games for climate issues. While the insights and experience derived from this project have been overwhelmingly positive, several instances have highlighted the risks – from inadequate facilitation causing cultural misunderstandings to an adult participant playing so intensely as to actually break an ankle during a game about mosquito-borne diseases, forcing a visit to the emergency room. We also now need more evidence about whether serious gameplay on climate risk leads to improved thinking, actions and outcomes – from household risk management to policy decisions. Better monitoring and evaluation, baseline studies, and after-action reviews on game play effectiveness are needed.

> "*It looked funny, it looked like a waste of time. But when we practically started using the cards, using investment points, using the time, using the group things, it actually opened up my mind, to begin to say, 'Wow!' This is the best way one can plan, and can integrate issues of environment into the development plan.*"
>
> – **Christine Lokiru**, Forestry Officer, Kotido District Government, Uganda

Sustaining momentum

The CDKN Action Lab Innovation Grant has established the Climate Centre and its partners as global leaders in the use of games-enabled approaches for climate risk management. Demand for more game design to address partners' specific work areas is growing rapidly, as is demand for more facilitation of games-based initiatives. To build local capacity to use our games, the Climate Centre and partners have conducted several trainings of game facilitators as part of this grant; expressions of interest to lead more workshops (including trainings of facilitator trainers) are frequent. Once people have experienced our games and seen the rich discussions that can follow gameplay, they are keen to replicate this learning experience independently and in their own contexts.

Given this surge of interest in game-enabled approaches, the need for a rigorous methodology for conducting impact research and monitoring and evaluation of medium and long-term outcomes of these approaches is increasingly evident. The project team has identified many additional opportunities for collaboration and partnership to exploit the full potential of games for accelerating learning, dialogue and action about disaster risk management and climate-compatible development. More capacity building, game design and research on impact of game-enabled learning are clear areas where the use of games can be further explored and more broadly developed.

As a start, the project team has secured funded partnerships to design and facilitate more game-based initiatives after the completion of this CDKN grant. Partner organizations include:

- The Red Cross in Uganda and Togo: forecast-based funding for disaster preparedness work.
- American Red Cross: games for community-based disaster risk reduction
- USAID: games for communicating the opportunities and challenges of index-based insurance instruments for climate risk management
- The World Bank Office of the Chief Economist for Sustainable Development: games for raising awareness about the concept of *deep uncertainty* and promoting robust decision-making.

Importantly, three initiatives supported by the project team are using games to scale up their work:

- Africa Climate Change Resilience Alliance (ACCRA): dozens of trained facilitators in Ethiopia, Mozambique and Uganda are using a participatory game to help local government officials embrace flexible and forward looking decision-making in ther planning efforts. (See video.)

- African Union – Africa Risk Capacity (ARC): a participatory game is being used to explain the potential for regional insurance pools to help manage climate-related shocks across the continent.

- Tanzania Social Action Fund (TASAF): over 100 government staff have been trained as facilitators and are using a participatory game designed to help farmers understand the complexities of a new productive safety-net programme that will target about one third of the Tanzanian population. (See video.)

The outcomes of this research project are helping to accelerate the growth of games for a new climate. A key challenge for sustaining the momentum over the long term will be to nurture a new generation of scholars and practitioners.

Youngsters take on the role of district government officials playing the ACCRA game at a workshop in Maputo. "The game taught me that we must plan for the future", said one. (Photo: Frederick Womakuyu)

Finally, a number of academic institutions, including Harvard, MIT, Yale, Oxford and the University of Cape Town are utilizing our participatory games and, whenever possible, will invite the project team to facilitate the sessions. Additionally, the principal investigator of this research project, will guest edit a special issue of a peer-reviewed humanitarian journal focusing on games, while remaining a humanitarian worker, will also continue this work by teaching graduate-level courses on innovations in climate risk management at:

- Hanken School of Economics, Finland: PhD course on climate and disasters

- Parsons the New School for Design, US: master's course on systems and games

- University College London: training and research programmes on science and public policy

- University of Lugano, Switzerland: master's course in humanitarian logistics.

> "*We consistently strive to infuse our work with the latest scientific thinking and evidence, and seek to innovate to teach new methodologies to our operational colleagues and country counterparts. Developing games with the Red Cross Red Crescent Climate Centre offered us a great opportunity to experiment, and we have learned a great deal from the game design process itself.*"
>
> – **Marianne Fay**, Chief Economist for Sustainable Development, World Bank

1. Introduction

People often suffer and die because of natural hazards even when the hazard is *predictable*. The remarkable progress in science and technology over recent decades allows us to anticipate future conditions, communicate early warnings and take early action to avoid losses. Yet many recent disasters are evidence of a yawning gap between science and the humanitarian sector. Forecasters and risk managers must build common ground, designing smart forecast-based decisions as well as simple decision-based forecasts.

To do so, the humanitarian sector needs to restructure its relationship with predictable climate-related threats, particularly given climate change. When it comes to health, shelter, water, food security, conflict and other areas of humanitarian work, many future decisions and their outcomes will be affected by events that, in many cases, can be forecast with reasonable levels of skill. Three key questions emerge:

- Will humanitarian staff, volunteers and people at risk be able to access, understand and trust forecasts about impending hazards?
- Will individuals, communities, NGOs, government agencies and the private sector know what the risks are and what can be done before, during and after a predicted event in order to reduce losses?
- Will human, institutional and financial resources be mobilized in a timely, appropriate and effective manner to avert predictable and potentially catastrophic outcomes?

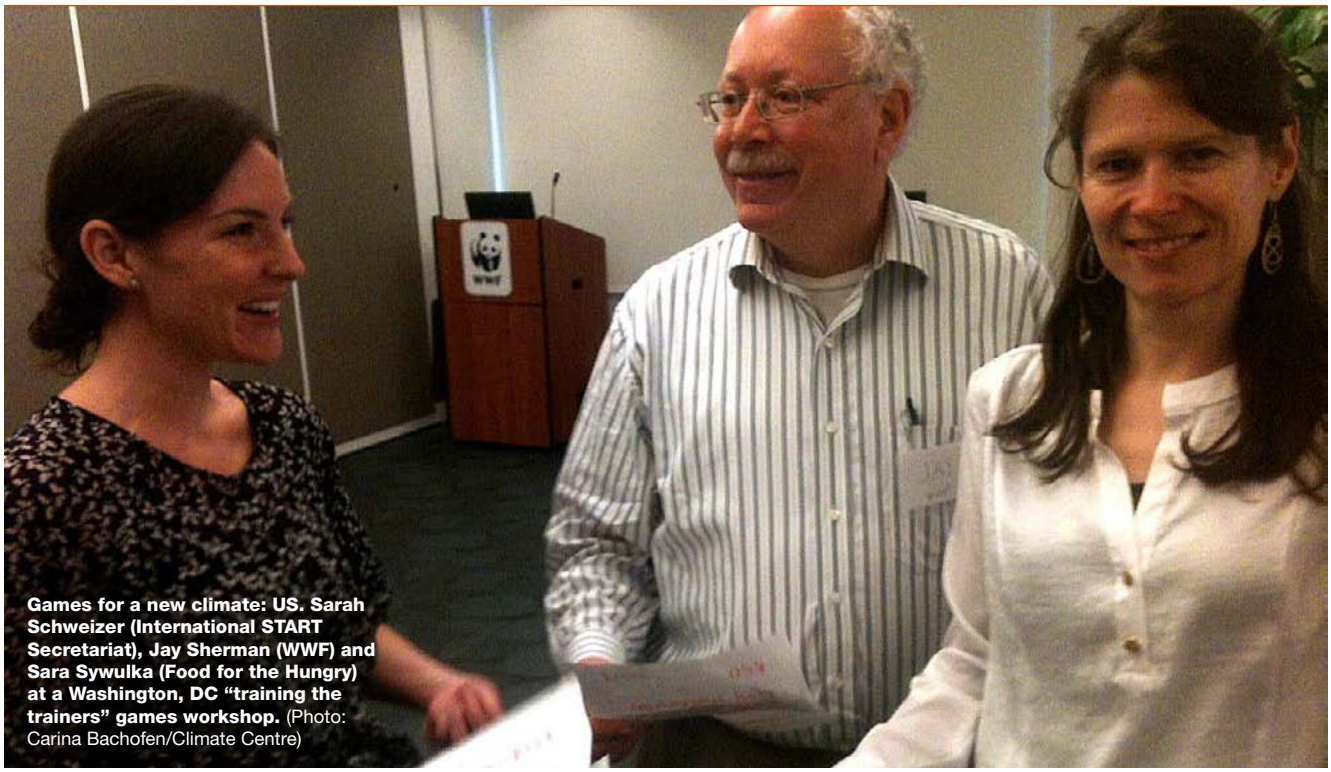
It is difficult to answer these questions with optimism given the impacts of disasters as diverse as cyclone Nargis in Myanmar, the 2005 famine in Niger, and hurricane Katrina in the US, all anticipated by science-based early warning systems. The literature identifies six key constraints limiting the use of forecasts: *credibility, legitimacy, scale, cognitive capacity, procedural and institutional barriers, choices.* It is reasonable to assume that these and other obstacles stand between science-based forecasts and humanitarian action. Crucially, humanitarian and development practitioners often lack the knowledge, resources and tools to access, understand and trust forecasts to launch “smart” early action.

Deciding whether to act ahead of a likely loss is especially complicated when natural hazards interact with non-climatic factors as diverse as structural poverty, questionable governance and uncertain livelihoods. How then might we help people from a subsistence farmer to a disaster management coordinator acquire the knowledge to act differently? What are the best entry points for the new information into decision-making? What different tools, methods and approaches are most effective for different stakeholder types?

Research demonstrates that participatory approaches to risk management improve the benefits of climate information. This requires treating the end-users of information not merely as a “target audience” but as partners in learning through processes and products that reflect their own contributions. At present, most stakeholders are not aware of the range of decisions they can make in response to plausible forecasts at different timescales. Lacking tools to evaluate options, they are not investing in plans, assets and institutional mechanisms to reduce climate risk building on the opportunities provided by science and participatory dialogue processes.

As part of its Action Lab Innovation Fund, the Climate and Development Knowledge Network (CDKN) supported an action-oriented, collaborative research proposal submitted by three partners:

- The Red Cross Red Crescent Climate Centre helps understand and address the humanitarian consequences of climate risks.
- The UNISDR-Africa ensures synergies within UN system and regional organizations.
- The International START Secretariat develops regional networks of scientists and institutions to deal with global environmental change and disaster risk.



Games for a new climate: US. Sarah Schweizer (International START Secretariat), Jay Sherman (WWF) and Sara Sywulka (Food for the Hungry) at a Washington, DC "training the trainers" games workshop. (Photo: Carina Bachofen/Climate Centre)

Objectives of the proposal include:

- Building the capacity of decision-makers from different sectors and operating at different geographic scales to link climate knowledge with humanitarian and development action.
- Helping stakeholders access, understand, trust and use science-based predictions at different timescales, turning knowledge into action.
- Promoting policy dialogues and new partnerships to manage climate risks through collaboration between research, government, civil society, international organizations and the private sector
- Nurturing a new generation of scholars and practitioners at the interface between climate science and humanitarian and development work.
- Monitoring and evaluation of the project to ensure efficient and productive outcomes.

2. Developing the analytical framework

At the heart of this research project is an analytical framework for game-based learning about climate risk management. It was developed to focus on the synergies between games and real-world decision-making about climate risks. We understand that an increasingly uncertain climate threatens to leave millions of people at a loss when faced with decisions about what to do in unfamiliar circumstances, like erratic rainfall, hurricanes, or threats to infrastructure from rising sea levels.

Through trial and error, people typically learn the best way to process information and make strategic decisions. But this process can be lengthy – enough to be fatal. The framework elucidates how games-enabled experiential learning corresponds almost seamlessly to the real-world process considering possible outcomes, making decisions based on (often incomplete) information, taking action based on the options deemed most promising, and confronting a subsequent set of choices shaped by the outputs of a complex system. Can games provide an iterative platform through which these steps can be taken in a safe, rewarding and fun way?

Figure 1 shows the well-established risk management framework used by the project team. It posits the iterative nature of risk management in six stages, and was embraced as a conceptual foundation, building on it to think systematically about the potential integration of game design thinking to support forecast-based humanitarian decisions.

Figure 1: A six-stage framework for risk management decision-making (Omenn, 2001).

Actual processes of learning and dialogue for risk management tend to differ from the ideal framework depicted in Figure 1. For example, stages are not always tightly linked, stakeholders are heterogeneous, and some stakeholders may be unaware of what takes place in other stages.

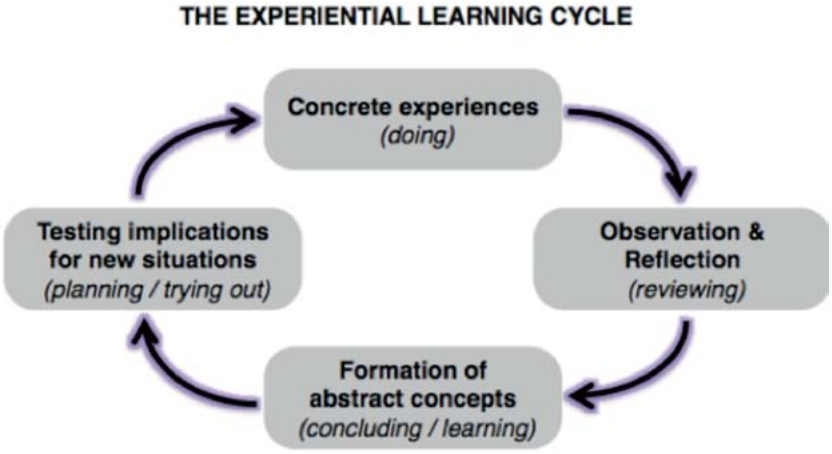


Figure 2: The experiential learning cycle that infuses and cross-fertilizes the risk management framework (Kolb, 1984).

Through literature review and discussions with practitioners in participatory methods, the project team realized that the risk management framework has strong parallels with the experiential learning cycle shown in Figure 2. Kolb (1984) defined experiential learning as “a process whereby knowledge is created through transformation of experience”. This guiding concept, in combination with the emerging experience from game design and facilitation from the project team, proved useful for illustrating how games can offer numerous opportunities for testing different strategies for risk management and engage a broader group of audiences examining possible futures. What follows is a brief description of what we call the game-infused risk management framework.

The problem in context

This stage involves identifying and characterizing existing or potential problems caused by risky situations; considering the problem in context; determining risk management goals; identifying risk managers with the authority or responsibility to take action; and implementing a process for engaging stakeholders.

> *"We have to reforest in the upper basin"; "Conserve more in the upper lands, so that the lower lands also get protected"; "Choose some of the land for reforestation, and another part for community consumption."*
>
> **– Three subsistence farmers from the Nicaraguan communities of El Chichicaste and Moropoto**, during a session of *Upstream, Downstream*

Identifying a problem is the first and perhaps most important step towards selecting the best action to take in a given context. Yet all too often a diversity of stakeholders actively engaged in problem identification processes results in conflict, as clashing opinions emerge on what exactly the problem that must be addressed is. Games offer a potentially useful avenue for cultivating a consensus on what constitutes a problem and what steps may be taken to resolve it. If care is taken to integrate diverse stakeholders early on in the design process, the parameters of the game and nature of the problem will reflect the depth and the nuances of locally-authenticated perspectives. Players with diverging perspectives can explore what exactly it is that presents them with doubt, perplexity or difficulty, and define collectively the magnitude, urgency and importance of a given problem or context.

Games for a new climate: Nicaragua. Villagers play *Upstream/Downstream* to see how climate change adaptation, ecosystem management and disaster risk reduction can fit together, as part of the Netherlands PfR project. (Photo: Maya Schaerer/PfR-NLRC)

In the game *Upstream/Downstream*, an understanding of what may constitute the problem to each player is crucial for assessing flood and drought risk and defining what options to take. The game creates the space of possibility for players to confer in a process of risk assessment that repeats in each successive round. Continuously reviewing and refining understanding of the problem context enables better risk assessment as the game proceeds.

Understanding risks

To make an effective risk management decision, stakeholders need to know the potential hazards, in particular those associated with climate and weather events, and the likelihood that they or the environment they depend upon will be harmed. The risk assessment process consists of gathering and analyzing this information.

Risk assessment can be contentious, underscoring the important roles of both information and judgment in drawing conclusions about the likelihood of experiencing a particular negative outcome. Yet risk is generally measured in terms of probabilities, which tend to be very difficult for people to meaningfully grasp. *Paying for Predictions* is a game that centres on the assessment of risk as climate conditions change and resources to deal with disaster management dwindle, i.e. estimating the probability of negative outcomes due to likely floods.

Evaluating options

Options for potential risk management actions are identified from a range of alternative paths for action based on available information. Effectiveness, feasibility, costs, benefits, unintended consequences, and cultural or social impacts should be evaluated.

Games can offer a way to better understand and leverage a diversity of perspectives and motivate players to think creatively about risk management options. This can release a latent resource in stakeholder processes for identifying and examining viable choices.

Ready! is a narrative-based game of chance where the facilitator starts off with a roughly defined problem and small teams must identify potential actions. To set the game in motion, the facilitator may announce, “We have just learned there is high likelihood of a flood striking this neighbourhood in the next two hours.” Teams have five minutes to discuss and propose as many options as possible to resolve the problem.

Games for a new climate. Namibia. Villagers in Katima Mulilo, on the Zambezi River, play Ready! The region has suffered severe annual floods in recent years. (Photo: Colleen Macklin/Parsons the New School)

Making decisions

What is the best available option? Given changing conditions, at what moment should that option be turned from potential action to real action? Who decides? A decision is the selection between possible options, including the option of taking no action. Decision-makers review information and options to select the most appropriate solution.

Games provide useful mechanics, dynamics and aesthetics to process the information associated with options in a way that leads to choosing one. In some games, decisions may reflect one player's attempt to independently optimize variables, while others involve negotiation and compromise. Some of the most interesting scenarios involve the pursuit of win-win solutions that allow stakeholders with divergent views to achieve their goals simultaneously. Decision-makers must balance the value of obtaining additional information about available choices against the need for making a decision, however uncertain, within time limits imposed by the game.

The game *Before the Storm* generates decisions as players think through the various options that may be available to them when a particular disaster strikes. Information is often imperfect and the effectiveness, benefits, and unintended consequences of any particular decision may not be immediately evident. The game creates a safe space that enables players to experience alternative futures based on identified options and afterwards reconsider whether decisions were indeed worthwhile.

Taking action

Action is motion with purpose – the intentional fact or process of doing something. It results from a decision, and is intended to achieve an aim. In any game, action is influenced by players' ability to implement their chosen options, as well as by the actions of other players operating in their own contexts during game play. Actions are the actual implementation of decisions, and their completion depends on context, including decisions of others and external events. It is important to note that in actual risk management processes, whoever is in charge of making the decision to act or not at any given time is often different from who is in charge of carrying out the action, leaving ample room for miscommunication or tensions.

The *Rockefeller Resilience Game* illustrates how there can be a disconnection between decisions and actions: Once an option is selected as the best available choice, players acting as donors may decide to have it carried out, but there is no certainty. Farmers may not have the resources, time, information or consensus to act, for example, and hence not act.

Evaluation

At this stage, decision-makers and other stakeholders reflect on what risk management actions have been implemented, and how effective they have been. Evaluation consists of the systematic comparison of actual impact against a set of criteria or standards.

As the goal in any game is to win, evaluation of plausible strategies during game play drives the learning process. All players actively consider how well they were able to define their problem, understand risks, identify available options, make decisions, and act. In the game *Living with Shocks*, teams of farmers experienced and assessed the likely conditions of their village with and without a new programme on productive safety nets – which is actually being scaled up by the Tanzanian government using this game. Evaluation of the game helps participants examine the new choices they confront in the real world.

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This analytical framework enables users to capture new risks, options and considerations that mediate between decisions and actions, and stakeholders to evaluate a range of possible outcomes that can lead to entirely different ways of understanding a problem and its context.

It also enables stakeholders to test, review and reflect on decisions, while inhabiting iterative cycles and enhancing capacity to anticipate future changes in complex systems. Each of the participatory games designed under this grant are rooted in an integrated framework of experiential learning and risk management. See Attachment 1 for our book on *Games for a New Climate: Inhabiting the Complexity of Future Risks*, in which the analytical framework is discussed in greater detail and applied to seven different games.

3. Student-led research

During the early phase of this research, the project team began to engage graduate students in both thinking and action involving climate change adaptation and disaster risk reduction. Building on the incipient analytical framework, a call for proposals was launched for the *2012 Graduate Student Research Opportunity in Climate Risk Management*. It attracted more than 50 applications from several continents; 14 were selected. The young researchers received a travel grant for fieldwork in Africa, launched at a workshop in Nairobi in May 2012, where grantees learned about the games-enabled approach to climate risks already in use by the Climate Centre and partners. The International START Secretariat supported grantees through each step of the research process and manuscript writing process.

> "*The game we tested in a village in Namibia may not contain all that's needed for disaster risk reduction, but it provides a strong shared experience on which to build future learning. Games for a new climate can help people be more resilient, empathetic and knowledgeable in the face of an uncertain future.*"
>
> – **Colleen Macklin**, professor of interactive design at Parsons School for Design, New York

Appendix 1 provides an overview of the diversity of students engaged in this process, as well as the scope of their research and university affiliation.

Many of the student grantees have created interesting professional opportunities for themselves at the interface between climate science and humanitarian and development work. For example, one student co-founded her own game design firm with a focus on humanitarian games for learning and dialogue; another became a consultant for the World Bank, supporting a games-based approach to extension services in Tanzania and is now a lecturer at a school of communications; a third grantee organized a session at the community-based adaptation conference ("CBA6") in Vietnam and co-authored a book chapter with members of the project team.

Three grantees joined the UNFCCC COP18 in Doha, Qatar, to support the Climate Centre in running Development & Climate Days 2012 ("D&C Days"), also partly funded by CDKN. See Attachment 2 for an overview of the student-led research component of this grant, as well as copies of their journal manuscripts and other outputs.

Additionally, other graduate students have decided to integrate intensely participatory approaches with their research. For example, Rose van Steijn from University of Lugano co-designed and tested a game for her research on road safety (her adviser was the principal investigator of this research project); she won the best

Games for a new climate: Vietnam. Students at the Hanoi's University of Science and Technology play *Humans versus Mosquitoes*. Five times the expected number of participants turned up at this 2012 Climate Centre games session. (Photo: Janot Mendler de Suarez/Climate Centre)

master's thesis award in humanitarian logistics. Additional graduate students addressing games in their work include Colleen Macklin (The New School, fieldwork in Namibia), and Luis Castro (University of Cape Town, fieldwork in Ethiopia).

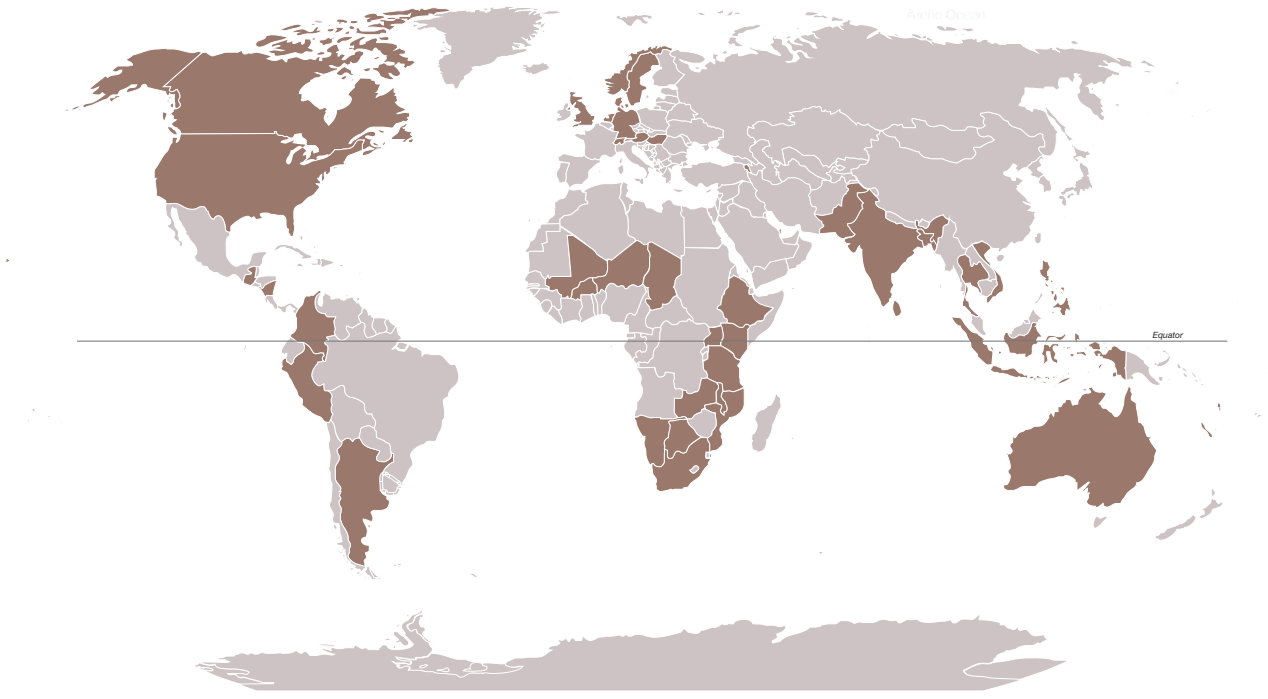
4. Applying the framework in participatory processes

The project has led to the development of or published research on over 30 participatory games since July 2011, spanning topics as diverse as food security, dengue awareness and hurricane preparedness. Almost all of these outputs are the direct product of the work of project partners and collaborators – chiefly the American Red Cross, PETLab and game-design firms.

Each game has the serious purpose of speeding up learning, dialogue and action on climate risks. Each involves making decisions with consequences, enabling players to inhabit the reality of climate risk management decisions, test a range of plausible futures in a serious, captivating and fun way. A full description of each participatory game can be found in Attachment 4.

For each newly designed game, the Climate Centre has produced written rules and facilitator guidelines and in some instances, game facilitation training videos. Attachment 4 also contains a compilation of materials, including rules and facilitation guidelines, for practitioners interested in applying a games-based approach to learning.

The game-based approach was successfully used in over 120 events in over 40 countries around the world (*see map*), including Red Cross Red Crescent workshops in Ethiopia, Kenya, Mali and Uganda (as part of the Netherlands Partners for Resilience programme), Red Cross Red Crescent training sessions and conferences, UNISDR risk management policy dialogues, and events organized or attended by International START Secretariat. The Climate Centre received an invitation to showcase its games-based approach to learning at the White House in Washington, DC, where about 70 participants had to avoid being hit by a flying Frisbee in a game about hurricane preparedness!



Games world. Since July 2011, the games-based climate risk management framework has been applied in over 120 participatory sessions in at least 43 countries worldwide (shaded in the world map above). Sessions were held in highly diverse settings, from the informal settlements of the Kenyan capital, Nairobi, to the White House.

African countries:

1. Botswana
2. Burkina Faso
3. Chad
4. Ethiopia
5. Ghana
6. Kenya
7. Malawi
8. Mali
9. Mozambique
10. Namibia
11. Niger
12. South Africa
13. Tanzania
14. Uganda
15. Zambia

Non-African countries:

16. Argentina
17. Armenia
18. Australia
19. Austria
20. Bangladesh
21. Canada
22. Denmark
23. Finland
24. Germany
25. Guatemala
26. Hungary
27. India
28. Indonesia
29. Netherlands
30. New Caledonia
31. Nicaragua
32. Norway
33. Pakistan
34. Peru
35. Philippines
36. Qatar
37. Sri Lanka
38. Switzerland
39. Thailand
40. United Kingdom
41. United States
42. Vanuatu
43. Vietnam

Approximately 4,000 participants have experienced our games since the beginning of this CDKN research grant. The diversity of the social, political, economic and cultural backgrounds represented by the participants is remarkable. Across five continents, subsistence farmers, multilateral development bank staff, schoolchildren, officials from meteorological service agencies, graduate students, high-ranking government officials, climate policy negotiators, slum dwellers, Red Cross Red Crescent volunteers, and donors (amongst many others) experienced the power of games-based learning; the level of knowledge and experience and perspectives that each person brought forth during game play and post-game play debrief sessions led to extraordinarily rich, fruitful, engaging and surprising discussions and learning moments.

Engaging this cross-section of participants was possible largely due to some 100 partner entities that helped to organize these events, write proposals and publish papers and reports – including universities in Europe, Africa and North and South America, private sector organizations, and Red Cross Red Crescent National Societies. We have compiled a complete list of games-based sessions and the countries in which they have taken place, as well as a list of our partner organizations in Attachment 3.

Games for a New Climate: US. Pablo Suarez plays *Dodging the Storm* at the White House in Washington, DC. (Photo: American Red Cross)

The versatility of our games and their ability to connect and engage with different stakeholders is further exemplified by the specific locations of our various game sessions. Games have been played under trees in rural villages in sub-Saharan Africa while others captivated decision-makers at COP 18, where the Climate Centre was provided with an important opportunity to host Development & Climate Days and link policy, knowledge, and practice, injecting innovative participatory learning approaches into the two-day event. Most if not all 200 negotiators, policy-makers, scientists, funding agencies and development practitioners experienced our games-based approach to learning and dialogue.

One D&C Days session featured the participatory game *Paying for Predictions*, where over 100 participants were challenged to take on the roles of provincial governors faced with limited information as well as a limited budget for investing in disaster preparedness, or not. To simulate the complex relationships between donors and recipients of climate and development funds, some players took on the role of a funder with a limited budget that could provide development support as well as disaster relief in times of crises. A quick bidding process added richness by offering players the option of early-warning systems and disaster risk reduction (DRR). Increased probability of extreme weather in a changing climate was represented when normal six-sided dice were replaced with eight-sided dice. There were winners and losers and prizes. Additional participatory games played a central role in D&C Days Film Festival, with in-depth discussions in smaller groups.

As a result of D&C Days and many other participatory games-based events, the Climate Centre has received numerous expressions of interest and requests for games-based approaches to promote different pieces of other organizations' work plans, highlighting the value of this approach.

5. Dissemination of activities and outputs

As games sessions in different countries aroused the interest of different stakeholders in our approach to learning, media coverage of our events expanded. In just under two years, over 63 media outlets around the world covered our events both in print and broadcast, and in many languages. The coverage offered various benefits to the project such as increased public awareness about the ability for games to spur learning and dialogue about climate risk management; encouragement for different communities of practice to consider and embrace our game-enabled approach to learning; posit the possibility of increased resource allocation new, innovative, effective and efficient approaches to learning; and dissemination of lessons learned and key messages emerging from growing experience applying this framework for learning on climate risk management.

The project team's progress and achievements were covered in many mainstream media outlets, including Reuters (carried by many Reuters subscribers worldwide), US National Public Radio, Internews, *La Nación* (Argentina's second largest newspaper), the Qatar Gulf Times, and others. Specialized media also reported on our games, from the Environmental Negotiations Bulletin (ENB) to the Inter American Development Bank television channel, IADB TV. (Attachment 5 contains an overview of all sources of media coverage with hyperlinks.)

The Climate Centre and partners also actively pursued various avenues for publishing the project's progress and results in peer-reviewed journals, working papers, policy briefs, research reports, a book chapter, videos – many of which are briefly discussed in this section, and on its own website. The project team collaborated with the Boston University Frederick S. Pardee Center for the Study of the Longer-Range Future to form a Task Force to explore the potential of participatory, game-based processes for accelerating learning, fostering dialogue and promoting action with an emphasis on humanitarian and development work. The Task Force report was published as a book, *Games for a New Climate: Inhabiting the Complexity of Future Risks*.

The Task Force comprised experts from academic institutions, humanitarian organizations, NGOs and game-design firms with backgrounds ranging from climate modelling and anthropology to community-level disaster

management and national and global policy-making as well as game design. They met in March 2012 at Boston University in an all-day session that combined presentations, plenary discussions, small group sessions, and intensely interactive participatory activities (including games, of course) that captured many of the key ideas presented in this report.

Members of the project team have also co-authored two articles for peer-reviewed journals articles as well as a book chapter – all currently in print:

- Suarez, P., Bachofen, C., Van Aalst, M., Huq, S., Dupar, M., and Juichiro, S (in print). Development and Climate Days at COP 18 Meeting Report. In print at *Climate and Development*.

- Juhola, S., Driscoll, P., Mendler de Suarez, J. and Suarez, P. (in print). Social strategy games in communicating trade-offs between mitigation and adaptation in cities. In print at *Urban Climate*.

- Suarez, P., Mendler de Suarez, J., Koelle, B. and Boykoff, M. (in print). Serious Fun: Scaling Up Community Based Adaptation through experiential learning. In: Ayers, J., Schipper, L., Reid, H., Huq, S., and Rahman, A. (eds.) Scaling up Community-based adaptation. London, Earthscan.

As the first paper of its working paper series, the Climate Centre produced a policy brief presenting a methodology for participatory design of games, and the potential of this process to influence climate and development policy. The brief, entitled "*Can games help people manage the climate risks they face? The participatory design of educational games*", has proven particularly effective for communicating how the Climate Centre and partners design a new game in a collaborative, innovative and seriously fun way tailored to partners' needs. It doubles as a case study on the application of this methodology in Central America, where the Climate Centre co-designed a participatory game on climate, disasters and payment for ecosystem services in the context of the Partners for Resilience program. The brief was particularly useful when the UK Overseas Development Institute approached the Climate Centre on ACCRA's behalf to explore the potential for developing a game for conveying key messages on flexible and forward looking decision-making (FFDM) with district level decision-makers. Since then, the Climate Centre has designed a game that has been a primary vehicle for promoting learning on FFDM in Ethiopia, Mozambique and Uganda.

Games for a new climate: Nairobi, Kenya. Participants at a workshop on urban climate risk used games to frame decision-making and develop recommendations for adaptation activities. (Photo: Erin Coughlan/Climate Centre)

As a result of partnering with ACCRA, a project team member co-authored a key research report, *New approaches to promoting Flexible and Forward-looking Decision Making: insights from complexity science, climate change adaptation and 'serious gaming'* – contributing to the chapter devoted to the use of serious games for learning.

Two case studies were produced on the value of participatory approaches for enchancing disaster preparedness at the community level in rural and urban areas. The first, *Innovative Approaches to Engaging Communities in Participatory Dialogues that Enhance Community Disaster Preparedness*, was published by the American Red Cross and co-authored by one of the student grantees from Zimbabwe. It discusses the pursuit of more efficient ways to engage communities in the Caprivi region of northeastern Namibia in a focused dialogue that leads to action on disaster preparedness and risk reduction. The second, "*Urban Risk Reduction Climate Assessment*", discusses the role of games to help to evaluate the climate risks in Nairobi and develop

recommendations for climate change adaptation activities so they could be incorporated into a larger urban risk reduction project.

The Climate Centre regularly published blogs on various game sessions taking place around the world and tweets events in real time as well. At least five blogs have been published on the Climate Centre website with a few of them (like Young Mozambicans practise 'forward-looking decision-making', 11 April 2013) being republished by partners like ACCRA on their own websites.

As part of developing and testing innovative participatory processes for promoting dialogue and action, the project team has sought to extensively harness the power of film to communicate the transformative potential of such approaches in the humanitarian and development fields. "*Beyond the Film: Innovations in participatory use of film for climate conferences*" is a working paper which critically examines how film as a medium can be used in conferences, workshop venues and as part of participatory activities to incite emotions, evoke changes in attitudes, behavior and elicit improved understanding of some of the toughest problems faced when dealing with climate risk management.

Video shorts were produced to showcase how participatory games look and flow in different contexts. A complete list of the 15 publications for practitioners and the videos produced as part of this grant can be found in attachment 4.

Games video highlights...

Games for a New Climate

ACCRA

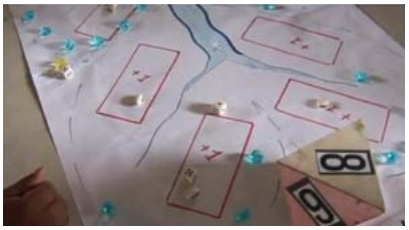
TASAF

Gender and Climate (intro)

Gender and Climate

Paying for Predictions

Upstream Downstream (intro)



Upstream Downstream (training)

Memory Strings

As an innovative way of using web-based platforms for promoting games for learning and disseminating results, the Climate Centre organized two competitions. The first was an international competition for the creation of miniatures of sound art related to the climate change effects and the global environmental crisis. For this contest, sound art miniatures were understood to be creations of sound art/music involving the use of new technologies, whose products can fit into what is known as soundscapes and sonifications. The end products can have multiple uses such as providing background for participatory workshops, educational videos and collaborative learning games, or create evocative atmospheres at conferences, workshops and symposiums. About 30 miniatures soundscapes have been selected by an international jury and will be announced during this year's Balance-Unbalance 2013 international conference at Queensland Central University, Australia.

The Climate Centre also organized an online strategy competition for the game Paying for Predictions. Given limited resources (ten beans) and some information about the risk of floods (determined by the roll of two dice), each player indicated how much they would invest in a bidding process to get an early-warning system (which allows you to see one of the dice before the potential flood), and proposed a standard operating procedure for when to take early action. Should you spend a bean for flood preparedness, risking wasting resources if no flood? Or is it better to wait and see, risking having to spend four beans for disaster response later? We received 71 submissions from people from 16 countries. There was a wide range of strategies, from extremely risk-averse to remarkably risky. A key innovation was a crowdsourced submission: an MIT researcher built a digital platform to simulate the competition itself, helping any user to test and refine possible strategies. Such crowdsourcing approaches could be used to help humanitarian decisions by mobilizing the brainpower of humanity.

6. New partnerships

The support provided by CDKN to the project team has nurtured the growth of, and given visibility to, our games-based work – prompting rapid growth of demand both for partnerships with the Climate Centre. The CDKN Action Lab Innovation Grant has established the Climate Centre and partners as global leaders in participatory approaches for climate risk management. Demand for more game design to address partners' specialisms is growing rapidly, as is demand for more facilitation of games-based initiatives.

To build local capacity to use our games, the Climate Centre and partners have conducted several trainings of game facilitators as part of this grant; but expressions of interest to lead more workshops (including trainings of facilitator trainers) are frequent. Once people have experienced our games and seen the rich discussions that can follow gameplay, they are keen to replicate this learning experience independently and in their own contexts.

Given the surge of interest in games-enabled approaches, the need for a rigorous methodology for conducting impact research and monitoring and evaluation of medium and long-term outcomes of these approaches is increasingly evident. The project team has identified many additional opportunities for collaboration and partnership to exploit the full potential of games for accelerating learning, dialogue and action about disaster risk management and climate-compatible development. More capacity building, game design and research on impact of game-enabled learning are clear areas where the use of games can be further explored and more broadly developed.

As a start, the project team has secured funded partnerships to design and facilitate more game-based initiatives after the completion of this CDKN grant. Partner organizations include:

- The Red Cross in Uganda and Togo: forecast-based funding for disaster preparedness work.
- American Red Cross: games for community-based disaster risk reduction.
- USAID: games for communicating the opportunities and challenges of index-based insurance instruments for climate risk management.

- The World Bank Office of the Chief Economist for Sustainable Development: games for raising awareness about the concept of deep uncertainty and promoting robust decision making.

Importantly, either through Climate Centre or other work, three initiatives supported by the project team are using games to scale-up activities:

- Africa Climate Change Resilience Alliance (ACCRA): dozens of trained facilitators in Ethiopia, Mozambique and Uganda are using a participatory game to help local government officials embrace flexible and forward looking decision making in their planning efforts.

- African Union – Africa Risk Capacity (ARC): A participatory game is being used to explain the potential for regional insurance pools to help manage climate-related shocks across the continent.

- Tanzania Social Action Fund (TASAF): Over 100 government staff have been trained as facilitators and are using a participatory game designed to help farmers understand the complexities of a new productive safety nets program that will target about one third of the Tanzanian population

Games for a new climate: Qatar. Left to right at "D&C Days", Mary Robinson (Mary Robinson Foundation-Climate Justice), Jason Blackstock (Oxford University), and Colleen Macklin (Parsons the New School for Design). (Photo: IISD)

The principal investigator of this project has also been invited to guest-edit a special issue for the Journal of Humanitarian Logistics and Supply Chain Management. Entitled *Games for Learning and Dialogue on Humanitarian Logistics*, it aims to promote the development, deployment, and analysis of games for humanitarian work. This constitutes perhaps the clearest sign of this project's success in helping to establish innovative methods as an analytically rigorous approach to climate risk management.

Finally, a number of academic institutions have committed to continue utilizing our participatory games and, whenever possible, invite the project team to facilitate the sessions. The list includes Boston University, Columbia University, the Harvard School of Public Health, MIT, University of Cape Town, University of Colorado at Boulder and Yale University. Additionally, the principal investigator, while continuing as a humanitarian worker, will also continue this work by teaching graduate-level courses on innovations in climate risk management at:

- Hanken School of Economics, Finland: PhD course on climate and disasters

- Parsons the New School for Design, US: master's course on systems and games

- University College London, UK: training and research programmes on science and public policy

- University of Lugano, Switzerland: master's course in humanitarian logistics.

7. Conclusions and next steps

This project set out to develop games-enabled learning and explore the main questions, insights and opportunities for putting the principles of game-based learning into practice. Through our experience designing and facilitating games for learning and dialogue, we have identified several steps to take if the full potential of inhabitable games for disaster risk management and climate-compatible development are to be exploited.

Capacity building

New kinds of partnerships need to be brokered to address our climate crisis. Participatory tools are needed for diverse partners to effectively communicate, solve problems and democratize learning outcomes. Bringing game designers into the picture can help humanitarian and development organizations create games-enabled tools for consolidating, accelerating and innovating in participatory processes.

What can be done to build capacity for games-enabled learning and dialogue?

There is a considerable gap to bridge between the humanitarian and development stakeholders on the ground, game designers, who tend to carry out their work in entirely different institutional and even geographical locations, and other stakeholders – from forecasters to global policymakers and donors to the most vulnerable and marginalized communities in the developing world.

We must reach out in new ways to tap on new capacities. If at first it may seem like a poor fit, "games for a new climate" constitutes a space worth exploring. A few very successful events and processes[1] have begun to build bridges, but much more can be done. We need to cross-pollinate, creating spaces for game designers and climate risk managers to converge, understand their complementarities, and embark on new joint ventures – including the creation of platforms for crowd-sourcing analysis to inform humanitarian decisions. Today's game design students are a particularly promising asset for climate risk management, as they bring in a rich skill-set, a creative mindset, and many care deeply about humanitarian issues; they just do not know how to contribute, who to reach out to, where to start.

> *"Games engage people in thinking what is ahead. Our plan is to use this tool to raise awareness on linking social protection, safety nets, climate change adaptation, and disaster risk reduction. I'm expecting that in communities, in places, in districts where we are going to have this game facilitated, they will continue to play it even after roll-out."*
>
> – **Amadeus Kamagenge**, Acting Manager for Systems, Research and Training, Tanzania Social Action Fund

We must be willing to take risks and try new ideas despite uncertain outcomes. Game designers embrace failure as part of their iterative process, whereas humanitarian and development practitioners, like most climate risk management stakeholders, often do all they can to avoid failure. As in forecast-based disaster preparedness, the fear of acting in vain can be paralyzing. As a simplified representation of reality, a game model will always be imperfect, but in some cases it may also present the wrong model – for example, if it proves to be useless or misleading. For that reason, the iterative game design process frequently entails abandoning a prototype and starting over with another game model altogether, without the certainty at any given stage whether it will ever get to successful completion. As a result, we should expect occasional failure. If we are to create games for a new climate that help correct the flawed mental models which so often lead to failure to act, we must create safe spaces for taking the risk of sometimes acting in vain.

[1] See for example http://www.gamesforchange.org/ and www.rhok.org for some of the most successful events of this sort, and http://petlab.parsons.edu/project/games-for-a-new-climate/ for a concrete collaboration between a humanitarian organization and a game design lab.

Games for a new climate: Uganda. The ACCRA resilience game underway in Kotido district, Uganda. (Photo: Thomas White/ACCRA)

We must document, share and study successes and failures, learning as we go. Game design for climate risk management opens up new horizons full of promise but also studded with thunderheads. Knowing how to avoid game design minefields and how to recognize goldmines is something that requires time, brainpower, bandwidth, budget, and experience. Learning from failure aligns with the idea of trial and error – an important concept in invention and innovation, and the lessons learned often prove more valuable than "best practice". Nonetheless, all too often we shy away from admitting failure because in a results-orients world driven by the need to demonstrate impact, acknowledging failure is likely to carry with it risks of loss of funding and other ramifications. We must rethink how we learn.

Research

The evidence base for games for a new climate needs to be expanded, and the question of whether games improve risk management better than other methods must be rigorously assessed. The possibility that we are exacerbating one problem while solving another must be excluded. We can begin with unpacking how effective games may be for each of the six stages of the risk management framework; how they involve diverse stakeholders meaningfully and appropriately, and help them work well both within and across each of the six stages – ultimately testing whether the games-enabled approach can adequately represent the complexity, volatility and uncertainty that characterize our changing climate.

We must adapt or create new research methods, and there are rich opportunities for developing, testing and evaluating quantitative and qualitative methods for collecting and analyzing data and insights on immersive learning games to advance climate risk management. Climate game research can contribute not only to improving ongoing and planned initiatives for using games at a much greater scale, but also help develop game-based learning and dialogue methodologies to apply games as monitoring and evaluation tools themselves.

Study is also needed to understand how best to reduce the risk of games going wrong. Like any innovation that spreads over time beyond the control of its creators, once a game exists it may take on a life of its own. Only applied research will reduce the real and serious threats that can derail any game-based approach. We must enable the generation of feedback to inform improvements in the iterative design and use of games developed, and provide donors with benchmarks to readily understand the performance of games in the context of a wider portfolio of investments. Systematized research can help establish the emerging field of serious games as a

Games for a New Climate: Matuu, Kenya. Janot Mendler de Suarez prepares to roll the dice at a climate and gender workshop for farmers organized by the Kenya Red Cross. (Photo: Pablo Suarez)

credible, useful, perhaps even necessary approach, and inform efforts to deploy them at scale.

We must adapt or create spaces for sharing knowledge and debates. At present there are a few academic journals and conferences that offer a venue for publishing and discussing game-based innovations. However, they tend not to reach the audience that most matters to climate-compatible development stakeholders – practitioners, scholars, funders and others in the humanitarian and development fields who play a role in climate risk management. As this field grows, it will be crucial to open new spaces for that growth to be visible and widely accessible.

Design

The development of games needs to be nurtured to educate, innovate, motivate, accelerate and consolidate the management of climate risk. While games for a new climate are in high demand and growing exponentially, design and development are still in their infancy.

Targeted efforts are needed to unleash the evident power of games for motivating and accelerating – we must implement more, and do it better. The word “implement” derives from the Latin implere, to fill up. Given the need for better, faster climate risk management, we need to draw from diverse areas of expertise. If natural sciences can help us learn what knowledge is best to fill with, and social sciences can teach us how people can go about “filling up”, games can not only motivate and accelerate implementation, they can change its dimensions. Games can help us explore the boundaries and pitfalls of what it’s possible to implement.

We must consolidate games-enabled processes, making them coherent and whole. There is considerable scope for furthering the role of games in climate risk management initiatives, especially when complementary to a wider suite of methods. The ground is fertile for examining ways in which inhabitable games may help support stakeholder (including donor) buy-in, engagement, decision-making and willingness to implement risk-reducing actions. It is fundamental to invest in the design, monitoring and evaluation of efforts aimed at making games integral to – and fully in harmony with – wider learning and dialogue.

Honest and critical examination of failures as well as successes in game design and implementation are a prerequisite for making genuine progress. Many things can go wrong and it takes work to ensure it all goes right. In our experience, it is decidedly worth trying.

Appendix 1

Overview of the international students who have been engaged in the projects:

	Student Name (country)	Name of Research Article	Fieldwork Site	University Affiliation
1	Gloria Cheche (Tanzania)	Strengthening the use of **seasonal climate information** in the Great Ruaha River - Managing risks, building resilience.	Tanzania	MS: Institute of Development Studies, Sussex UK Climate Change and Development
2	Erin Kitchell (USA)	Examining forms and institutions through which **forecasts are communicated among pastoralists**.	Senegal	Master's/PhD: University of Wisconsin-Madison, Dept of Geography
3	Bettina Koelle (South Africa)	Participatory development of **Learning Games for understanding heat stress** in livestock under climate variability and change	South Africa	PhD: University of Cape Town, Faculty of Science
4	Anna Law (UK)	Evaluating the financial effectiveness of forecast-based humanitarian intervention: **a cost-benefit analysis of the World Food Programme's** early warning-early action LEAP project in Ethiopia	Ethiopia	MS: University of Oxford, Environmental Change and Management
5	Lien Tran (USA)	Adaptation of TASAF interactive simulation game to enable understanding by Tanzanian farming households of a productive **Social Safety Net Program** in order to withstand climate shocks	Tanzania	MFA: Parsons the New School for Design - Design & Technology
6	Selina Maenzanise (Zimbabwe)	Local **risk perceptions** and views on NGO-led climate change adaptation and disaster risk reduction interventions	Botswana, Namibia	MA: King's College, Disasters, Adaptation and Development
7	Ernest Nnamdi Ogbozor (Nigeria)	Preparedness and Response to Changes in Climate: An exploratory study of what the IFRC can do to help **the elderly** to respond to extreme events in East Africa	Kenya, Uganda, Tanzania	MA: Brandeis University, Sustainable International Development
8	Francis E. Omondi Opiyo (Kenya)	Influence of climate variability in **vulnerability and adaptation strategies** among Turkana Pastoralists of Northwestern Kenya	Kenya	PhD: University of Nairobi, Range Management
9	Berekey Zeleke Tunkala (Ethiopia)	**Drought early warning systems** and adaptation strategies in Konso and Benatsemay Districts, South Western Ethiopia	Ethiopia	MS: Bonn University, Agricultural Science and Resource management
10	Samaila Yusuf (Nigeria)	Impacts of climate variability on **malaria transmission** and the development of an early warning system for Uganda	Uganda	MS: Asian Institute of Technology - School of Engineering Technology - Remote Sensing and Geographic Information Systems

11	Joshua Zake (Uganda)	Establishing baseline for early warning systems for climate related hazards impacting on **smallholder farming communities** in Mpigi district, Central Uganda	Uganda	PhD: University of Natural Resources and Life Sciences - Centre for Development Research, Vienna, Austria
12, 13	Lauren Graham (USA) & Mohini Dutta (India)	Developing and refining an educational and participatory game on **Climate and Health**: Humans vs. Mosquitos	Botswana, Kenya, and Malawi	Master of Environmental Management: Yale School of Forestry and Environmental Studies MFA: Parsons the New School for Design
14	Anthony Banyouko Ndah (Cameroon) & Mohamed Ajan Saheed Fofanah (Sierra Leone)	A GIS-based Assessment and Prediction of **Climate - related Health Hazards** in the Coastal Zone of Littoral Region of Cameroon: Innovative Options for Proactive and Rapid response	Cameroon	Professional Masters in Public Health: University Brunei Darussalam, Darussalam Program

Appendix 2

Entities that collaborated in designing games, hosting or running participatory sessions, and writing publications and proposals on games since the beginning of the CDKN-funded project:

1. Aalborg University (Denmark)
2. Aalto University (Finland)
3. Antidote Games (USA)
4. A Rocha Uganda
5. Artists in Context, US
6. Africa Climate Change Resilience Alliance
7. African Union, Africa Risk Capacity
8. Allianz Insurance
9. American Red Cross
10. Asian Development Bank
11. Australian Government Overseas Aid Program
12. Australian Bureau of Meteorology
13. Boston University, US
14. Buenos Aires provincial government
15. Canadian Red Cross
16. CARE Nederland
17. CGIAR Research Program on Climate Change, Agriculture and Food Security
18. Collaborative Institute on Oceans, Climate and Security, US
19. Columbia University, US
20. Concordia University, Canada
21. Consensus Building Institute, USA
22. Department for International Development, UK
23. Emerson College, US
24. Ethiopian Ministry of Women, Children and Youth Affairs
25. Ethiopian Red Cross Society
26. Escuela Nuevo Guayabo, Nicaragua
27. Finnish Meteorological Institute
28. Finnish Red Cross
29. FleetForum
30. Georgia Institute of Technology, USA
31. German Red Cross Society
32. Global Facility for Disaster Reduction and Recovery
33. Good Focus
34. Guijç District Government, Mozambique
35. Haiphong Department of Natural Resources and Environment, Vietnam
36. Hanken School of Economics, Finland
37. Harvard School of Public Health, US
38. IGAD Climate Prediction and Applications Centre
39. International Federation of Red Cross and Red Crescent Societies
40. International Institute for Environment and Development, UK
41. IIRR
42. Indigo, South Africa
43. Indonesian Red Cross
44. Inter American Development Bank
45. International Institute for Applied Systems Analysis, Austria
46. International Youth Environment Meet, Bangladesh
47. International Research Institute for Climate and Society, USA
48. Japan International Cooperation Agency
49. Journal of Humanitarian Logistics and Supply Chain Management
50. Kenyan Red Cross
51. Kotido District Government, Uganda
52. Malawi Red Cross
53. Malawi Meteorological Service
54. Massachusetts College of Art and Design, USA
55. Massachusetts Institute of Technology, US

56. Mozambique Red Cross
57. Noragric, Norway
58. Northeastern University, US
59. Organization for the Assabet, Sudbury and Concord Rivers, US
60. Overseas Development Institute, UK
61. Oxfam America
62. Oxfam Dire Dawa
63. Pacific Disaster Risk Management Platform
64. Parsons The New School for Design
65. Partners for Resilience (Netherlands)
66. Pastoralist Welfare
67. Peruvian Red Cross
68. Philippine Red Cross
69. Playmatics LLC
70. PopTech
71. Rockefeller Foundation, US
72. University of London, UK
73. Save the Children, Mozambique
74. Skoll World Forum
75. Tank Think
76. Tanzania Social Action Fund
77. Academy of Sciences for the Developing World
78. Ugandan Red Cross Society
79. United Nations Framework Convention on Climate Change
80. Universidad de Moreno, Argentina
81. University of Colorado at Boulder, US
82. University of Lugano, Switzerland)
83. University of Massachusetts at Lowell, US
84. United States Agency for International Development
85. Vanuatu Climate Change Consortium
86. Vanuatu Red Cross
87. Vietnam Administration on Seas and Islands
88. Vietnam Red Cross
89. VIVO Media
90. Wayland Public Library, US
91. World Food Programme
92. Woods Hole Oceanographic Institution, US
93. World Bank
94. World Vision, Uganda
95. World Resources Institute
96. WWF International
97. Yale University, US
98. Yatta Farmers Association (Kenya)
99. Zambezi River Basin Initiative
100. Zambia Red Cross

Appendix 3

Games designed with full or partial support from this project are:

1. *Paying for Predictions*: Evaluating the cost, value, and use of early warnings (flagship game resulting from this project.
2. *ACCRA: The Africa Climate Change Resilience Alliance Game*: Flexible and forward-looking decision-making.
3. *Conquering the Cone*: estimating probabilities given deep uncertainty.
4. *Dramatizing Difficult Concepts*: a game where players act out what they learn.
5. *Do Things Right*: a game on clogged supply chains in humanitarian relief.
6. *Dodging the Storm*: a game where players try to figure out the science of predictions.
7. *Driving Force*: a game on road safety in a changing climate.
8. *Dwelling near the Ditch*: a game on floods and urban waste management.
9. *Experiential Learning for Adaptation*: facilitation cards for adventurous practitioners.
10. *Future Fit*: Designing real standard operating procedures for forecast-based decisions.
11. *Intuiting Investments*: Cost-benefit analysis for development sectors.
12. *Living with Shocks* (the TASAF game): Safety nets and climate resilience in Tanzania.
13. *Map your Messages*: a game for making sense of different and conflicting messages.
14. *Memory Strings*: a game about profiling past events.
15. *Nyami Nyami*: a game on SMS communication of current and future river levels.
16. *Paying for Predictions II*: digital version.
17. *Seasonal Forecast Game*
18. *Upstream-Downstream*: A game on climate, disasters and ecosystems at river watershed level.
19. *Wood Walk*: Trade-offs between conventional and improved woodstoves.

Games researched or disseminated under this project (developed by others):

20. *Africa Risk Capacity - The ARC Game*: Regional insurance pooling for food security.
21. *Before the Storm*: a game on forecast-based options and decisions.
22. *Broken Cities*: a game on urban adaptation and mitigation.
23. *Climate & Gender Game*: a game about the differential impacts of disasters.
24. *Dissolving Disasters*: a resilience game where donors walk the talk.
25. *Humans versus Mosquitoes*: dengue awareness in a changing climate.
26. *Ready!*: a game on disaster preparedness.
27. *Spreading the Word*: a game about communicating complex information.
28. *VIS-À-VIS*: A game on Volatility, Inequality, and Scarcity.

Games inspired by this project's outputs or nurtured by project team:

29. *Bitten!*: a universal game about malaria in a changing climate for COP18.
30. *Climate-resilient Coastal Development*: a game on national infrastructure for resilience.
31. *Healthy Cookstoves*: a game about improved woodstoves for improved living.
32. *Inquiries on Insurance*: Exploring financial instruments for drought risk management.
33. *Story Go Round*: a game on disaster response.