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Journal Article

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Publication date:
2020-12

Permanent link:
https://doi.org/10.3929/ethz-b-000406584

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Originally published in:
International Journal of Disaster Risk Reduction 51, https://doi.org/10.1016/j.ijdrr.2020.101782

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International Journal of Disaster Risk Reduction 51 (2020) 101782

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: http://www.elsevier.com/locate/ijdrr

Assessing policy preferences amongst climate change adaptation and disaster risk reduction stakeholders using serious gaming

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A B S T R A C T

The ESPREssO Project set out to propose ways to inform more coherent national and European approaches on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA). A critical step in this process is the identification of existing barriers to effective collaboration, finding new areas of common ground, and ways to enhance co-operation with regards to CCA and DRR policymaking in Europe. This is particularly important considering the potential relationships between CCA and DRR activities at the regional, national, European and global levels.

Serious games have emerged as a valuable tool to communicate information and catalyse discussion in many policy arenas. The games have the power to inform, mainly by exposing strengths and weaknesses of a system but not necessarily create policy choices. This paper presents the development process and rationale behind creation of RAMSETE I, a serious game developed by and for the ESPREssO Project to elicit information from its stakeholders in aiming to inform synergies between CCA and DRR sectors. The results assess its application as a device to frame discussions during an international Think Tank workshop. The serious game focused on three particular aspects of CCA and DRR policy interactions: (1) separation of administrative responsibilities and the use of different terminology, (2) the ongoing competition for funding and political will as well as (3) difficulties regarding the top-down implementation of policies.

The rules and design process are presented briefly, before going in-depth into the information gleaned during its application in the workshop.

1. Introduction

Creating more coherent national and European approaches on Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) is a real challenge. It requires identifying existing barriers to effective collaboration, areas where common ground may be found, and ways to enhance co-operation in regards to CCA and DRR policymaking in Europe [1]. thoroughly explores the obstacles and ways forward for the integration of CCA and DRR in legislation, policies and institutional arrangements; and outlines the following issues:

- Horizontal and vertical coordination issues: Often, the two policy fields are managed by different ministries with little cooperation, compounded by a lack of coordination between administrative levels (municipalities and national or federal level) [2].
- Lack of capacities of local governments for the implementation of CCA and DRR strategies: municipalities and towns are identified as key actors in both policy fields, yet they often lack the necessary competencies and types of expertise needed to be proactive and are required to translate policies to the local context [3]. Together with resource limitations, this leads to poor implementation of strategies at the local level.
- Resource limitations and poor implementation of strategies: Resource limitations in both human capital (number of qualified personnel), technical means and funding affecting not just the local government level, but rather all levels of the governance chain. Limitations in funding streams are exacerbated by the inefficient allocation and the often opaque availability, as well as the lack of scrutiny on their impact.
- Unequal attention paid to CCA and DRR. As climate change has become such an important policy area in recent years, and CCA has

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https://doi.org/10.1016/j.ijdrr.2020.101782
Received 19 June 2020; Accepted 14 July 2020
Available online 27 August 2020
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been integrated with other policy domains such as urban planning, the benefit of "green adaptation" has become an attractive idea for politicians to support and promote. In many countries, political will and funding are substantially skewed towards CCA rather than to DRR or integrative approaches between CCA and DRR [4].

- A persistent gap exists between the DRR and CCA scientific expert communities and cultures, who frequently use different terminology. This leads to inadequate platforms for stakeholder communication and engagement.
- Conflicting priorities between disaster response and risk reduction: A recurring issue in disaster management across the world is that more funding and political attention is given to response and preparedness activities and mechanisms that sustain short-term, rather than long-term prevention and resilience-building plans and actions.

1.1. Definition of policy and the policy cycle

In this article, the word "policy" is used to refer to both global and EU frameworks as well as national or local laws, plans and strategies dealing with CCA and/or DRR. Three main global policy frameworks addressing CCA and DRR constituted the foundation of the policy review: (1) the Sendai Framework for Disaster Reduction 2015–30; (2) the Sustainable Development Goals; and, (3) the Paris Climate Agreement (COP21). Many national or local policies also play a role [5]. These include National strategies for Global Integrated Coastal Management for Protection of Critical Infrastructures, Municipal and National CCA plans, Risk Prevention plans, flood use regulations, and Local Government and Housing Act.

Following the "policy cycle" [6], policies build on one another following a cycle of problem-(re)definition (Agenda Setting), policy development (Formulation) and legitimation (Adoption), before being implemented and having their outcomes and consequences assessed (Evaluation), resulting in either the Termination or Support and Maintenance of the policy. The maintained policies within this framework thus become a part of the landscape that must be taken into account in the new Agenda Setting steps, thereby closing a cycle (see Fig. 1). Note that the policy cycles, such as the one depicted in Fig. 1, have been a particular focus of science-policy discussion within the European Geosciences Union[1] or the European Environmental Agency[2] [7].

1.2. Serious games as policy discussion tools

The term "serious game" is nowadays most often applied to videogames, although in one of the oldest and most cited definitions, that by Abt [8]; the term also included board games (in [9]; we also find the term "low-technology serious game"). Despite the large variety of definitions for the term "serious game", most literature reviews agree on a definition along the lines of "a game where entertainment is not the sole or even main focus" (e.g. [10]).

Djaouti et al. [11] present a good overview of the "other objectives" that serious set out to accomplish, showing that most serious games are usually designed as tools to teach the players. Similarly, most of the literature in the field has focused on this area, describing the learning approaches followed and the exercises' effectiveness as learning and teaching tools (e.g. [12,13]). However, as shown by Ampatzidou et al. [14] in their review of serious games and gamified applications for urban planning, serious games can also serve as excellent discussion catalysts, particularly when it comes to complex, politically charged and socially relevant issues.

Although crisis exercises or simulacra are a relatively common tool in for the training of DRR practitioners [15], these usually take the form of either paper-based, multimedia or even live reconstructions of crisis in near real-time (see for example [16]). It is difficult to give an exhaustive picture of existing games on the topic of DRR and CCA due to the number of games and characteristics (objectives, forms, languages and so on). In addition to the 45 DRR serious games reviewed by Solinska-Nowak et al. (see Appendix A of Solinska-Nowak et al. [17]), the website of the Program on Negotiation at Harvard Law School[3] gathers 10 more DRR/CCA serious games, such as for example, the 4 serious games developed under the New England Climate Adaptation Project (*Coastal Flooding and Climate-Related Risks in Launton*; *Flooding and Climate Change Risks in Northam*; *Flooding in Milton: Collectively Managing Climate Change Risks* and *Coastal Flooding in Shoreham Attributes*). Most of these exercises focus on preparedness and response to a crisis, and very few to the recovery phase [17]. Yet the treatment of serious questions of disaster risk management as a game allows for a layer of aesthetic distance, creating an effective space for policy discussion. However, the games have the power to inform, specifically by exposing strengths and weaknesses of a system, and quickly reveal where communication breaks down. In turn, information provided by the games may help to guide creation of policy choices if collected correctly. This comes later, at a second stage of analysis and development led by the stakeholders themselves finding routes to improved inter-sectoral cooperation proactively, prompted by the games' strongly discursive application. In that sense, they are important in generating objectivity and accountability for the actors that have the remit and the influence to change things in reality for the better.

While the RAMSETE series of games, presented below, can be used as learning tools, and this might be one of their potential uses, the games were originally conceived instead as a way to learn from the players themselves.

1.3. The RAMSETE serious games

The ESPREssO project set out to find answers to three core challenges: to propose ways to create more coherent national and European approaches on DRR and CCA; to enhance risk management capabilities by bridging the gap between science and legal/policy issues at local and national levels; and to increase efficient management of transboundary crises. To gather stakeholders' perspectives on these three challenges, the project developed three serious games referred to collectively as RAMSETE (Risk Assessment Model Simulation for Emergency Training Exercise) games [15]:

- RAMSETE I (Abad et al. developed in this paper)
- RAMSETE II [18].
- RAMSETE III [19].

The 3 RAMSETE games served as framing devices and knowledge-elicitation tools in a series of workshops, the ESPREssO Think Tanks. Thus, the games share a common philosophy: each game sets out a core policy problem, assigns a relevant role to each participant, and provides a series of rules defining the ways the participants may interact with regard to solving the problem. All three RAMSETE games revolve around allowing policy choices to take effect and develop over long stretches of time, evolving alternative images of the future of a fictional geographical region. The timescales in all three games is relatively long-term, ranging over a number of years or over several 'election cycles', in contrast with the near real-time type of exercise that most DRR practitioners are accustomed to from operational training. These long-term scenarios are contextualised within the RAMSETE series using a format resembling that of a board game [15]. The participating stakeholders are referred to as players and are provided with a set of rules that

[1] https://www.egu.eu/policy/basics/cycle/.

[2] https://www.eea.europa.eu/publications/europes-environment-aoa/chapter1.xhtml.

[3] https://www.pon.harvard.edu/store/topics/.

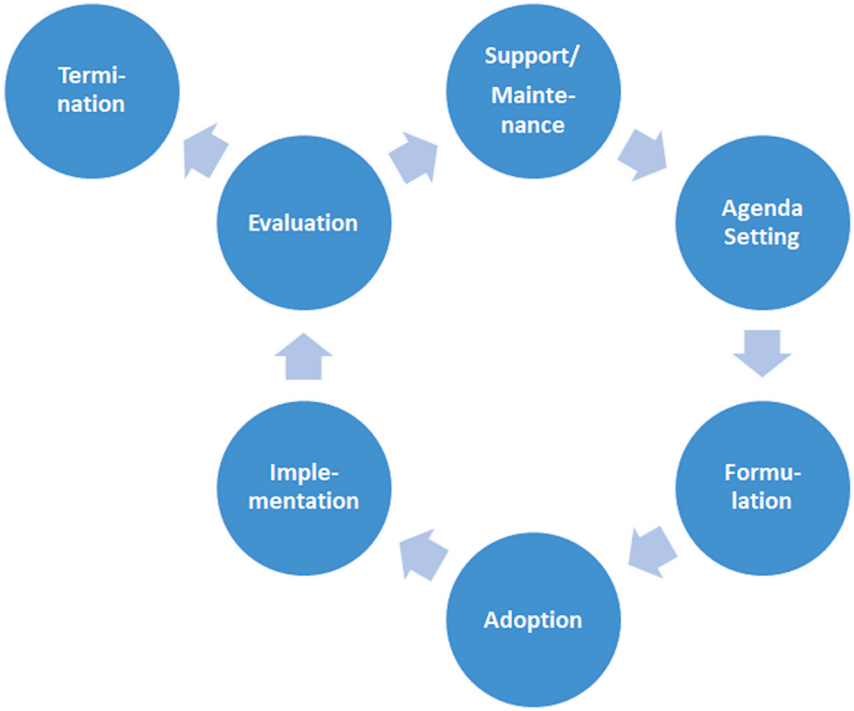

Fig. 1. The policy cycle, adapted from Jann & Wegreich [6] and EGU website.

govern the process of choosing and implementing DRR and CCA policies.

RAMSETE scenarios use a policies-first approach to policy discussion, focusing on available or proposed policy options and considering the subsequent responses and their effectiveness. It was decided early in their development that one of the key questions that participants would have to explore in each of the games would revolve around the desired policy mix to accomplish their desired goals. Participants in the Think Tanks were encouraged to discuss the arising events and situations, based on their professional experience. Note-takers recorded both in-game decisions as well as any accompanying commentary during the workshops. Finally, these insights were collated and analysed so that they could be used as input into the ESPREssO Vision Paper [20] and the Guidelines [21].

The issues under consideration during the RAMSETE series of board-games sessions were very serious and the players never lost sight of the importance of the themes being explored but during discussions with the players after the exercises, most stated how they did enjoy the exercises.

This paper presents the development process and rationale behind RAMSETE I, the first board game in the series. The core aim of RAMSETE I was to allow the participants to explore the differences and similarities between CCA and DRR policy-making and invite the participants to find avenues for synergy in order to achieve the goals of both areas, as well as to analyse possible contradictions or even competition between these fields.

2. Game design process

2.1. Design goals

The design process for the gamified scenarios outlined in the following paragraphs uses the Mechanics-Dynamics-Aesthetics (MDA) model, popularized by Hunicke et al. [22]. Like Hunicke et al. [22] recommend, the design goals started from a player-oriented point-of-view assessment of MDA (i.e., an inverted look, or ADM, meaning Aesthetics, Dynamics, and Mechanics).

Aesthetics goals: Aesthetics refers to the experience felt by the player while playing the game. The classification presented by Hunicke et al. [22] is not necessarily applicable to the RAMSETE exercises, since the different Aesthetics presented all relate to ensuring "enjoyment" of a game. Instead, the main aesthetic goals of the game were nurturing an environment in order for the stakeholders to provide useful feedback during the workshops. This meant maintaining their attention for the duration of the exercise, engaging them intellectually with the issues at hand through a sufficiently nuanced presentation, and creating a social space that would allow avenues for discussion to be developed.

Dynamics goals: Dynamics are emerging behaviours among the players that arise from following the rules of the game, leading to the aesthetic experience. An important step at this point was the summarizing of the issues presented in Section 1 into the following three points, which each became a "dynamics goal" over the course of game design process:

1. Separation: the game should reflect the persisting trends in terms of different terminologies, separate institutions and scientific communities affecting the ability to create discussion spaces in which to find synergies between CCA and DRR policies.
2. Competition: the game should instil a sense of competing for funding and political will, creating the impression that synergies are difficult to develop.
3. Top-down scaling: the players should be faced with difficulties regarding the top-down implementation of policies.

Mechanics goals: The mechanics are the rules of the game. The mechanics' goal in the case of a game intended for play in a workshop setting was to ensure the exercises was sufficiently simple so that the rules could be easily understood within a short time, but not too simple in order that the dynamics goals are not sacrificed.

2.2. Player roles

The issue of separation (Dynamics Goal 1) is enforced in RAMSETE I through the definition of roles for the players. Four of the five player roles follow a symmetrical structure, with two players representing policy-making bodies, one each for CCA and DRR, referred to as

"Ministries" (Ministry of the Environment for CCA policy, and Ministry of the Interior for DRR policy), and a further two players representing the separate scientific communities (silos) revolving around these topics. The role of the scientific players was to advise the government players as to what policies were the most useful or effective within the context of their sphere of interest.

A fifth role is that of the "Local Government", a generic administrative body tasked with implementing both sets of policies, in spite of limited funding and possible contradictions.

2.3. Game mechanics

The rules of the gamified elements of the scenario are the key to framing constructive policy discussions. The previously presented policy cycle (Fig. 1) served as the basis for the RAMSETE I ruleset: the scenarios would unfold cyclically, giving players the choice to uphold or reject previous policies, while dealing with the consequences of previous policy choices.

2.3.1. Time-step and turn structure

The chosen time-step for these cycles is five years. The precise stretch of time is not important per se, however, the necessity to have a multi-year time-step was threefold:

- It allows the players to break away from a "crisis-management" mind-set. Within the gamified scenarios, players receive updates on the outcomes of disasters (i.e., cumulative losses) at the end of every five-year time-step. This allows them to see the systemic consequences of policies, rather than the micro-level impacts of a crisis-centric approach.
- It allows climate change-related hazards to progress at a perceptible pace. Climate change is an incremental process, and many of its effects will materialize over the following decades. Within the gamified scenarios, CCA is closely linked to economic development, where failure to adapt to climate change in the medium- and long-term leads to negative economic consequences, without needing to address the numerous different impacts separately.
- The period broadly corresponds to electoral mandates in Europe. Policy instruments exist at a mid-point between politics and administration, with the former often having a substantial impact on the policy cycle [23].

For the players, each five-year iteration is divided into phases based on the policy-cycle paradigm:

1) First, the players receive a forecast for the upcoming year, in term of expected climate change progress as well as foreseeable disasters, and receive a budget, which they can spend on policies. This step corresponds to the Agenda-Setting part of the policy cycle, with new aspects of disaster risk or climate change being highlighted in the forecast, while the imposed budget constrains how many actions can be taken, potentially changing the players' priorities.
2) Next, there is a discussion time, during which the "policy-maker" roles and their advisors review the available options and commit to a policy program. In the first iteration, this phase maps cleanly to the Formulation and Adoption steps of the policy-cycle model. However, in following iterations, this step also includes the Termination/Maintenance decision for previously introduced policies.
3) The Implementation phase takes place when the players allocate their budget to the policies they wish to activate or maintain, since the maintenance costs for policies come from the same pool of resources. This step begins the end of a round.
4) Finally, the consequences of the policies are revealed and the players are invited to discuss the results among themselves (Evaluation).

2.3.2. Game engine

One of the biggest challenges for game design was creating rules that would provide an abstraction of real processes. The level of abstraction needs to be high enough to result in simple rules that are accessible to most players, as well as to ensure a rapid resolution of player actions so that the game progresses at an adequate pace. On the other hand, too much abstraction can entail a sacrifice in the verisimilitude of the game and the desired dynamics and aesthetics may not arise. As an example, the game is set in a fictional nation; so that, the participants would not need to have any specific knowledge, important since they came from across and outside of the European Union. It also allows the exercise developers to tailor the situation towards the exploration of specific concerns.

The game engine relies on two core mechanics to represent the issues at hand: resource-management and deck-building:

1. Resource-management: Simple numerical "scores" were implemented as a way to measure how well the players are dealing with complex issues. The stated goal of the game was to maximize these scores. Trackers on the board (Fig. 2) represent disaster preparedness (symbolized by shield symbols), climate change adaptation (symbolized by tree-leaves), and social well-being (symbolized by handshakes). Players invest in these resources by playing policy cards, which are associated with a cost. Since the player's budget is limited, investing in one of these three trackers often requires compromising on the other two, introducing the idea of funding imbalances between CCA and DRR that were one of the issues of interest in this workshop. During the design process it was decided that discussions on the actual costs of different policies could be distracting and were undesirable. Instead, players should be encouraged to discuss the *relative* costs of different policy options. Thus, a fantasy currency was introduced and used to engage discussion without letting the players get caught in the specifics.
2. Deck-building: Players have "policy cards" to represent policy choices (Fig. 3). Instead of letting the stakeholders propose policies freely, players were presented with a list of options from which to choose from. An effort was made by the design team to ensure the list of options was broad enough to cover a wide range of policy options in the fields of DRR and CCA, greatly inspired by the detailed inventory of adaptation options presented by De Bruin et al. [24]. These policies had pre-determined effects on the above-mentioned trackers, both positive and negative. The cards include a "cost" in fantasy currency, what they provide in terms of impact, and a narrative description of the actual real-world policy. In some cases, the action card may require more than one player to agree to its use, the intention here being to encourage a cross-sector discussion. Players also have the option of investing in scientific research to gain more effective policy cards, introducing a deck-building aspect of the game (players ultimately build a "deck" of policy cards, not all of which can be played in the same turn due to budget constraints). This is a knowingly simplistic view of the role of scientific research in policy development: Since science-policy interactions were understood to be the focal point of a future workshop (RAMSETE III), it was decided to keep the "scientific research" dimension very simple, removing the uncertainty of scientific investment from the equation. The "Scientific Advisor" players were each given a fully transparent list of improved "policy cards" that they could deploy if they managed to convince the "policy-maker" players of their importance.

2.3.3. Barriers

Rounding out the core mechanical engine, several extra rules were introduced in order to ensure the emergence of the necessary dynamics. These were referred to as "barriers" during the development process. Barriers are limitations that are in place at the start of the game, representing real-life problems issued from literature review. All barriers could eventually be lifted if the players took specific actions during the

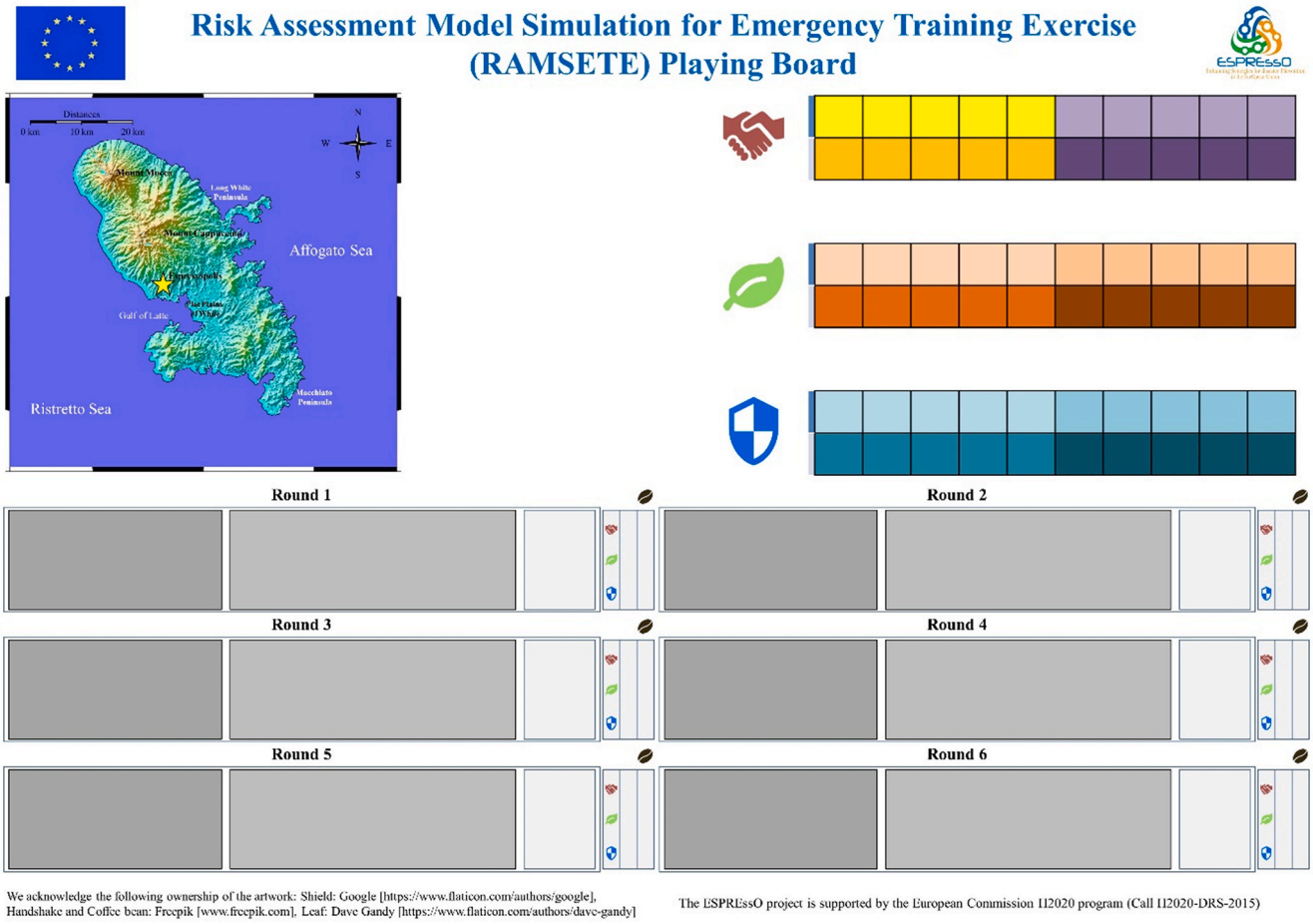

Fig. 2. RAMSETE I playing board.

game. The barriers were as follows:

1. In order to showcase the existing lack of scientific collaboration, some policies had hidden consequences, making them counterproductive.
2. Similarly, in order to showcase the lack of institutional collaboration, the total budget is split and no sharing can happen unless the players specifically change this policy.
3. Lack of bottom-up governance disadvantages the Local Government player, who actually holds effective policy cards, but could rarely play them since they must be played under the restrictions imposed by the other policy-makers.

3. Insights from ESPREssO's international think tank

In October 2017, the 1st ESPREssO Think Tank (TT1) was held in Berlin. The topic of interest for this meeting was the 1st ESPREssO Challenge 'Improved integration of DRR and CCA policies'. While the links between CCA and DRR may seem obvious, given the expected (and experienced) increase in extreme-weather-related disasters, there are still significant gaps between them at the conceptual, institutional and research activities levels. The intention of this meeting was therefore to gather stakeholders from both communities in an information-elicitation exercise with RAMSETE I as a key framing tool for discussions. A total of 30 stakeholders and ESPREssO partners attended. At the start of the workshop, introductory presentations outlining the aims of the workshop, as well as the basic game rules were given, so that the participants first knew what was expected of them, and also how the actual exercises was to be carried out.

During the games several members of the ESPREssO consortium acted as 'stewards' and 'recorders'. Their roles included further explaining the game rules, facilitating gameplay, and recording the interactions between the players. It was important that these persons themselves did not influence the exercise in terms of what decisions were made, although it was also important to allow some freedom whereby the players could discuss amongst themselves topics that, while perhaps not directly related to the exercise itself, still allowed insights into the overall issues under investigation to be gained.

Overall, the serious game proved to be a successful framing tool, with discussions during and after the rounds very open and energetic. While there were some suggestions and criticisms made about the game's rules (which were welcomed by the ESPREssO RAMSETE design team), the game was generally positively received, even by some participants who were not themselves 'game players'. It should also be added that every participating stakeholder played their role well, with most participants stating that they enjoyed their participation, which could also be said to involve an element of theatre.

One of the more interesting features that arose from the exercises involved the recognition during the first round that there needed to be greater collaboration between all parties, particularly between CCA and DRR scientists and between the ministries. Overall, the participants enjoyed the interactions, with a great deal of bargaining between players (especially the local government, who frequently needed the ministries to support their actions) taking place. While some limitations and over-simplifications in the game design were pointed out, in general, the participants believed it to be a reasonable representation of the issues at hand.

One feature of the exercise that was especially fruitful was that after

Fig. 3. Sequence of action cards chosen to be played by a team in Think Tank 1 (photograph courtesy of L. Booth, 2017).

the cards had been played, the participants were called upon to discuss their decisions and to justify them, then to consider how they might or should have played differently. The discussions were continued during the afternoon session of the think tank and were conducted in an open and positive manner. The experience of Think Tank 1 set the scene well for the format for the subsequent think tanks that dealt with the other challenges and are the subject of additional papers in preparation.

From the organizational side of the experience, the density of feedback and commentary that the game sessions generated was foreseen and a reporting template was developed to maintain consistency. Outcomes from each round were noted before progression to the next, as part of a review (or de-briefing) session which was integral to the game evolution. This allowed objectivity not just for recorders but the game-players themselves to see what was working well, and what required improvement in future rounds. Useful insights will be presented in the following section.

4. Synthesis of feedback and outcomes

In this section, some of the discussion points brought up by the stakeholders during the Think Tank in relation to playing the RAMSETE I exercises are presented. The following paragraphs were synthesized from the analysis of recorded exchanges.

4.1. Synergies between climate change adaptation (CCA) and Disaster Risk Reduction (DRR)

This topic was the main goal of the game, since it pitted both policy spheres against each other. Stakeholders who played the game proposed expressed the following views:

- It is important to make the most of the areas where both subjects intersect thematically. When dealing with, e.g., changing precipitation patterns, have as a consequence more severe storms, floods, and droughts. One strategy is therefore to connect the extreme events to climate change. Thus, in the wake of events, there might be opportunities to have the two communities exchange information with each other. There was a perception among DRR stakeholders that the CCA community does not concern itself enough with the effects of climate change in terms of natural disasters, effectively leaving them to the DRR community. However, it was also pointed out that the effects of climate change can manifest in many ways beyond damage due to extreme events, such as in terms of changing lives and economies, as well as cultural values that communities generate.
- Climate change policy touches many different governmental portfolios (water, health, etc.), thus creating a complexity in terms of who is involved and what areas are affected by global environmental change. Therefore, transversal, horizontal collaboration needs to be fostered.
- Stakeholders stressed the fact that political, social and cultural issues need to be considered to understand the complexity of synergising CCA and DRR and to assess the context in which this process is evolving, particularly when looking at the global picture (consumption behaviour, migration, etc.). This is frequently connected to local political issues and the cultures of the area or country in question.
- Stakeholders agreed that they did not perceive international frameworks to be helpful for synthesizing DRR and CCA – statements in the Sendai Framework were singled out as being too vague in their proposals. However, relatively new policy goals, such as Building Back Better, are understood as important concepts. A more integrated approach remains necessary, such as the pre- (retrofitting) and post-event (reconstruction) actions that make up part of the "Building Back Better" scheme, since these are two key elements are common to both DRR and CCA.

- Silos (in science and policy) create issues in defining which actions to take. Barriers to integration include the lack of information exchange, insufficient funding and conflicting regulation. Great emphasis currently on CCA is attracting the DRR community to be involved in the climate change domain, although some stakeholders said that in some cases, this is merely a cynical "strategy" to secure funding, such as by nominally involving a climate institute in a DRR-oriented research project.
- Competition between the two communities is visible in both the policy and science domains. Stakeholders generally agreed that central governance is needed for integration instead of departments working independently. Furthermore, continuous dialogue and collaboration would help to reduce the competitive element that frequently arises, especially with regards to securing resources.
- Some stakeholders pointed out the paradoxes that arise within the climate change science community. For example, while climate change issues dominate the current discourse, there is also 'too much knowledge' and no clear consensus or way to navigate all the information that exists on climate change. At the same time, the experience with climate change impacts is not very long, totalling around 1-2 decades of research.
- Financing problems were a central discussion point. On the CCA side, the implementation of CCA strategies is very costly and action plans are generally underfunded. Yet, since CCA is such a cross-cutting issue, it can often be a question that the funding is there, but allocated inefficiently. An example was provided regarding the water management sector, which is heavily subsidized, but not particularly active in CCA. They suggested that a better translation of climate change information from scientists into the context of water management could help with the implementation of necessary CCA measures.
- A balance between "soft" (e.g., awareness) and "hard" (e.g., engineered) DRR and CCA measures is important. Soft (non-structural) measures, focusing on society, are economically preferable, since engineered disaster prevention methods are very expensive, while at the same time still suffering from an element of uncertainty as to whether the actual action being undertaken is the more effective use of resources.

4.2. General stakeholder considerations from specific national perspectives

The focus on a fictional country in the game led several stakeholders to provide examples pertaining to their countries of origin. Many of these issues align with the national analysis made within the scope of [5]:

- In Germany, there is competition between the ministry of research (climate services) and the ministry of infrastructure (weather services) and both have a good relationship with the World Meteorological Organization (WMO), which has resulted in a duplication of structures. There is competition also, in who has the competence and the knowledge to provide advice to the local/regional levels and governmental bodies in charge of addressing research and implementing the actions. In Germany, this is split into two different bodies. The understanding in Germany is that CCA is a horizontal action, to be dealt with as a crosscutting policy rather that a new policy issue. The German perspective is very much concerned with governance between the different political levels. In contrast, there is no national risk assessment procedure, and there are few links between the governmental levels, scientists and emergency response agencies. German stakeholders put the Swiss model, which offer highly decentralized measures and structures, forward as a good example.
- The climate service centre in Austria's national risk assessment was showcased as a positive example of integration. In recent years, there has been a shift from flood protection plans to heat wave plans (an emerging hazard related to climate change) as they were already well prepared against flooding. The Austrian perspective is the same as the European perspective, where CCA is seen as a coordination effort by the Ministry of Environment. Moreover, CCA is seen as a horizontal issue because the required funds are not from within the Ministry of Environment, as the topic is being mainstreamed into different sectoral policies, such as, e.g., health or water management, although this risks creating an unbalanced approach to stakeholder engagement. Besides the horizontal coordination, depending on the governance of the country, a vertical coordination from national level down to local level is still required. At the local level, a strategy can be developed to fit with the respective needs according to the framing action plan.
- In Italy, integration of both policy spheres remains difficult. Despite the efforts represented by the National Adaptation Strategy and Plan, an organisation that can spearhead CCA is still missing (the role of bodies such as "Italia Sicura" is still not clear, for example). In contrast, there is a structured and well-organized relationship with universities and public research dealing with natural hazards. For example, the new national adaptation plan has been a collaboration between the government and the scientific community, jointly preparing the document and assessing the impacts of climate change in the four different Italian regions. The DRR scientific community has a certain role in the governance system, but there are only certain areas where they can actively contribute, and the climate change domain needs to be integrated into such a system.
- In France, stakeholders relate that political priorities change very quickly in the wake of disasters. There is a problem with big decisions made because of the pressure that would arise from such events, which stands in tension with the actual need of thinking long-term for Building Back Better, prevention, protection and adaptation. Questions arise regarding the priorities of government and their subsequent ranking. France now has a Ministry for Social and Ecological transition, dealing with both CCA and DRR issues, and for the first time, there is the opportunity to address these issues from a policy perspective. A crosscutting concern about social and natural sustainability is emerging, pushing for a governance approach that needs to deal with many areas: health, pollution, agriculture, etc. In terms of the science and policy interface, it is mandatory to work with the most up-to-date data on any issue related to climate change. For example, the energy regulations for buildings are becoming centrally planned, while there is a great deal of CCA work going on at the level of cities and local territories, but less at the national and regional levels.
- The action plan of the African Union has a regionalized approach to implementing the Sendai Framework and recognizes the importance of integrating sustainable development and the Sendai Framework.

4.3. Feedback on specific topics addressed in the game

4.3.1. Role of science

The game included several policy options that were only accessible through scientific collaboration. When interrogated on this topic, several stakeholders agreed that this requires scientists to break down silos and challenge the frequently entrenched 'engineering mind-set', which is a strong bias in many organisations dealing with both CCA and DRR. Two specific areas of collaboration were brought up:

- Stakeholders said that climate change science needs to provide statistical information on hazards and risks in terms of probability and quantity for improved risk and hazards assessments.
- Furthermore, both fields should focus on reducing the associated uncertainties, but more importantly learn to communicate these uncertainties in a manner that would benefit risk governance. Given that all prevention interventions are very expensive, uncertainties

may create barriers to investments. Uncertainty also needs to be tackled as part of the wider population's perception of how the climate, and the associated disaster risk, is changing, for example, the increased number and intensity of hurricanes in the US. This effectively is the issue of the communication of (un)certainties versus the perception of risk.

4.3.2. Role of politics

When invited to discuss the concept of the five-year "turn", stakeholders complained that, for political actors, the timeframes associated with policy and decision-making are anchored to political terms. Thus, there is a low probability or incentive for politicians to invest in longer-term issues, although there are an increasing number of cases of politicians finding political capital and support for longer-term CCA decisions. There is political will to create synergies between CCA and DRR, but the problem exists of competing agendas between ministries, departments, agencies, individuals in the background with their own economic interests. In addition, political decisions are made by experts and public officials in combination, and this frames the decisions that politicians can or cannot decide on.

4.3.3. Role of communities

The game tries to address the situation of local governments, which are tasked with implementing policies they often have little say in the development of. When asked to discuss this topic, stakeholders brought up a series of new insights.

Stakeholders stressed that the geographical diversity at the regional level makes it hard to maintain a national framework/agenda. Therefore, at the regional level, any national framework/agenda needs to be adapted to the needs of the local entities, since activities only have longevity if the local government promotes them. Prioritising funds is a central issue, especially assessing differences between national and local levels, and especially how scientific communities impact upon the decision-making.

Community-level knowledge (i.e. local knowledge from local response services and local communities) should not be neglected and should be able to integrate into risk assessment (ideally allowing both a bottom-up and top-down integration). Local government investments in society and education are important, as at the policy level, there can exist bureaucratic hurdles that fail to facilitate the type of action that can, if adequately supported, take place faster "on the ground". This revolves around finding mutual perspectives however, which links back to the importance of the games as a tool for broadening objectivity.

Education allows communities to make their own decisions, and makes them aware of the dangers (e.g., during evacuations, people often choose not to leave, but *targeted* education would help to build the knowledge of the community on why evacuation is important). Communities should be engaged by using existing community structures (e.g., the UK Environment Agency delivers community flood awareness efforts via church halls as they form an ideal hub for exchange at local level).

The privatisation of utilities and critical infrastructure often creates new problems. Where infrastructure is old and starting to fail, there is often no money to repair or replace them, while such a situation is exacerbated through climate change. When utilities are privatised, official reports are replaced by consultants' reports, meaning knowledge long held within the municipalities can be lost. In the event of such disappearing knowledge bases, investment is recommended to re-establish and preserve availability of existing information and data in order to avoid having to repeating collection in the future.

There are also problems associated with devolution. One of the most critical is the coordination function versus technical expertise in municipalities, where there can be false assumptions that "if we are a critical infrastructure, then the government needs to support us". Wherever possible, a broader view must be taken in order that systems remain sustainable and adaptive to the best of their capacity.

5. Discussion

At this point, the question of integrating Disaster Risk Reduction and Climate Change Adaptation has been under discussion for over a decade, dating back to the 2009 IPCC special report "Managing the risks of extreme events and disasters to advance climate change adaptation" [25], as well as the seminal paper on the issue by Birkmann and von Teichman [26]. The discussion points raised by stakeholders show that many of the problems persist, but there is now more knowledge available to address them. Salient points in particular are disappointment with global policy platforms, such as the Sendai Framework, and the role of the private sector, particularly critical infrastructure providers. At national levels, both spheres continue to be managed in an uncoordinated fashion, both in terms on policy-making and funding, and at local level, communities are not receiving the support and resources they need to be champions for change. Capitalizing on the wealth of accumulated knowledge over the last decade, and in particular of the increased granularity that is now possible, appears to be the way forward: policies need to be more focused (locally and regionally) and more evidence-based (impact assessments), turning the accumulated experience into best practices.

A detailed analysis of stakeholder feedback from the Think Tanks and how they line up to the policies presented in the European Commission Staff Working Document "Action Plan on the Sendai Framework for Disaster Risk Reduction 2015–2030" is also carried out in the [27].

6. Conclusion

RAMSETE I constituted a successful application of gamified scenarios as a way to generate rich and frank discussions between different stakeholders. The codifying of the policy cycle model into a gameplay ruleset successfully created a climate for open discussion of issues regarding the integration of CCA and DRR perspectives, helping to keep discussions well-focused and animated. The relatively informal nature of these exercises within the context of international Think Tank workshops, as well as the scenarios themselves being sufficiently inclusive so as not to rely on all participants having expert knowledge about real-life geographical locations or particular policy frameworks, allowed a much more open discussion than could be possible under more realistic situations. The games have thus the power to inform mainly through providing a greater degree of objectivity. Furthermore, exercises and meetings such as the ones discussed in this work bring together individuals who might otherwise rarely interact during the course of their professional activities generating new ideas and progressive policy recommendations for finding new avenues for cooperation between CCA and DRR sectors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The work presented in this paper was undertaken as part of the ESPREssO project (Grant agreement 700342) supported by the European Union's Horizon 2020 research and innovation programme under the topic DRS-10-2015: Disaster Resilience and Climate Change topic 2: Natural Hazards: Towards risk reduction science and innovation plans at national and European level. ESPREssO partners would like to thank all stakeholders for their input to the project.

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