Designing Disaster Diplomacy in the Context of a Climate Change Water Game

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Abstract. In this paper, we explore how a climate change game can be designed to enhance trans-boundary water partnerships between governments and provide a window of opportunity to challenge the status quo, leading to change. The primary focus of the paper is to discuss a theoretical framework that utilizes "Disaster Diplomacy" as a pre-disaster capacity development tool for policymakers. The Nile Basin by 2050 scenarios, guided us in the design of the theoretical framework. The framework established a foundation for the design of the climate change game known as Nile WeShareIt. This game was played in October 2014, with policymakers from the Ministry of Water and Irrigation, in Nairobi, Kenya. Findings indicate that climate change games may challenge the current perceptions of normality and possibly lead to increased situation awareness, trust, and collaboration. Future work will entail redesigning the game, based on the initial outcomes and its application in the river Nzoia catchment, in West-Kenya.

Keywords: Climate change games · Disaster · Disaster diplomacy
Cooperation · Collaboration · Trust
Situation awareness and water resources management

1 Introduction

Disasters are a double-edged sword: they are catastrophic, but they can also lead to positive outcomes. A natural disaster causes extensive loss of human, environmental, economic and material resources. As a consequence of the severe loss, the affected community cannot survive under the circumstances and with the remaining resources [1, p. 17]. Examples of past natural disasters that have led to significant loss of life include the 2010 Haiti Earthquake (100,000 to 316,000 deaths), 2013 Typhoon Haiyan (6,343 deaths) and the 2004 Indian Ocean earthquake and tsunami (280,000 deaths). Some of the most expensive disasters in recent history include the 2011 Japanese earthquake and tsunami ($309 billion); the 2017 Hurricane Harvey ($125 billion) [2]; and the 2005 Hurricane Katrina ($81 billion) [3]. Despite the negative impacts of any disaster, a disaster could provide an opportunity for change. Since 2000, there has been an emerging area of research focusing on "disaster diplomacy" or disasters as "opportunities for change" [4–12]. Therefore, this paper seeks to contribute to this emerging area of research, with a focus on water management.

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The paper's scope is limited to "disaster diplomacy" in the area of future slow onset disasters. The paper relies on Kelman's definition of disaster diplomacy as a study that seeks to answer the question "Do natural disasters induce international cooperation amongst … states that are not normally prone to cooperation? [13, p. 215]" The term disasters, in this paper, refers to future slow onset disasters. We define future disasters as the traditional disasters that may occur at a later date or "new distinctive class disasters and crises, not seen before [14, p. 16]." Slow onset disasters are disasters that cannot be easily detected because they slowly creep into the system, thus taking months, years or even decades, for the effects to be catastrophic. Though there are numerous studies on droughts and other slow-onset disasters, there is little research on assessing the impact of inaction due to the silent and deceptive nature of slow-onset disasters [15, p. 198]. Also, very few researchers have focused on the contribution of slow-onset disaster diplomacy in fostering water cooperation [8, 14]. Since disaster diplomacy is an emerging concept, there is a need for more in-depth action-based assessments, to examine its applicability, in water resources management.

To test whether the concept of "disaster diplomacy" can be applied to river basin management, we facilitated a participatory process of developing the Nile Basin by 2050 scenarios [11, 12, 16]. Scenarios are defined by Saritas as "narratives of alternative futures [17]." Scenario construction can be traced back to the works by Herman Kahn with his colleagues at the RAND and the Hudson Institute in the 1960s [17]. These scenarios were developed in Jinja, Uganda in February 2014 by a multi-disciplinary group of actors from the 11 Nile Basin riparian states and other international actors. The participants developed four scenarios, two under high climate variability and two under low climate variability [12], and their impacts on the Nile Basin, were assessed.

Based on an assessment of the four scenarios, the two scenarios (Miskeen – an Arabic word for poor, and Umoja – Swahili word for unity) developed under low climate variability led to future negative impacts and conversely, the two scenarios (EjoHeza and Kazuri) developed under high climate variability led to positive outcomes. In Miskeen (meaning poor), the countries managed the water resources unilaterally, and by 2050, depleted the water resources, and there was no water for any of the countries. Kazuri is a Swahili word that represents the phrase "small is beautiful." EjoHeza is a Kinyarwanda word for "a bright tomorrow." In Kazuri and EjoHeza, climate change induced disasters led to immense losses that challenged the status quo and triggered community (Kazuri) and inter-state (Ejo-Heza) collaboration, leading to positive outcomes [11, 12, 16]. Based on the scenario outcomes, we realized that absence of disasters might sustain the status quo leading to adverse outcomes and disasters may lead to positive change [12, 18]. Disasters may create a window of opportunity to challenge the status quo thus trigger positive changes. Hence, the need to investigate how this window of opportunity, created by disasters, can be utilized.

Undoubtedly, findings from some disaster diplomacy studies indicate that disasters, "do not create cooperation [13, p. 215]" but have the potential to catalyze a diplomacy process that may lead to collaboration [5, 7–9, 13]. A critical factor that led to positive change in the Kazuri and EjoHeza scenarios was the robust collaborative processes that led to the joint decision-making, planning and management. For example, in EjoHeza a basin commission was established to facilitate the process of jointly managing the

scarce water resources and addressing the problems that had been caused by high climate variability. On the other hand, Kazuri established a citizen-led platform that connected all the basin citizens to facilitate the joint management of the water resources, by the citizens [11, 12, 16]. Therefore, in the two scenarios, disasters did not create cooperation but initiated a collaborative process that led to cooperation.

Similarly, recent research shows that disaster losses do not arise mainly from the extreme events but as a result of the complex interaction between the physical, social and built environments [19, p. 3]. Past research has heavily focused on how to make the physical and built environment more disaster resilient. However, little focus has been on the social environment and how it interacts with the physical and built environment to minimize or escalate disaster losses [20]. The social environment is responsible for steering the disrupted system toward the desired state. Hence, the social environment primarily determines whether the window of opportunity will be utilized efficiently [21].

Moreover, there are some pre-requisites that a social environment should have to enhance the collaborative process and eventually minimize losses during a particular disaster. They include increased situation awareness [22] and trust [23] (please refer to Fig. 1 for the definition of these terms). The evidence we derived from the Nile Basin by 2050 scenarios supports the argument that trust and situation awareness are essential social environment pre-requisites [12].

To assess whether a change in the social environment may steer the policy makers towards the desired state, we decided to design a game. Gaming simulates a pre, in and post-disaster situation [24]. It provides actors with an opportunity to test actions that they may take and their impacts [25]; increases their situation awareness [26]; increases their trust in other actors and institutions [27]; and helps them to agree on a collaborative process [28]. Also, gaming provides a safe learning environment [29] to prepare for future disasters [30].

We designed a game as a pre-disaster capacity development tool under the context of disaster diplomacy, incorporating the social environment pre-requisites (Fig. 1). In

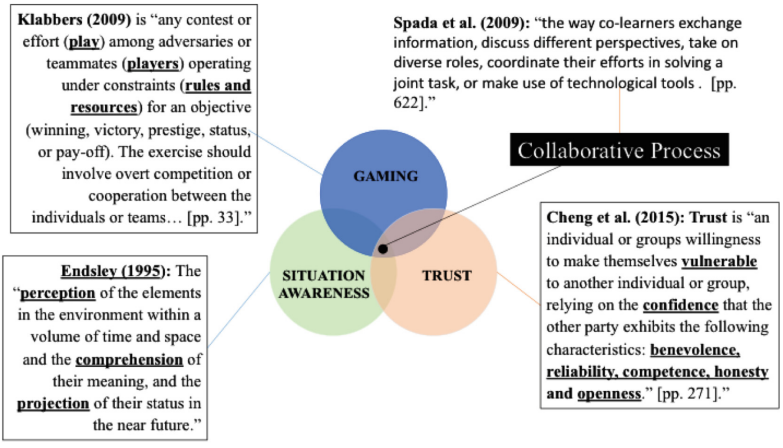

Fig. 1. Definition of the principal terms used in this paper: trust [31]; situation awareness [32]; gaming [33]; and collaborative process [34]

particular, we designed a climate change game known as Nile WeShareIt, to enhance the pre-disaster adaptive capacity of Nile Basin policymakers. We seek to answer the question: how can a climate change game be designed to enhance trans-boundary water partnerships between governments and provide a window of opportunity, through disaster diplomacy, to challenge the status quo, leading to change.

The paper outline is as follows. Section two explains the Nile by 2050 scenarios and discusses the main findings. Section three discusses the theoretical and methodological framework for the Nile WeShareIt game. Section four contains an assessment of existing games and an introduction to the Nile WeShareIt climate change game. The explanation of the initial findings is in Sect. 5, and our conclusion and further research are in Sect. 6.

2 Nile Basin by 2050 Climate Change Scenarios

As the supply of the Nile water resources declines, demand is steeply increasing, putting a strain on the shared resources. The Nile river traverses eleven countries in Africa. It is the source of life for 257 million people. The basin's aquifers, tributaries, lakes, rivers, and streams provide water for the environment, domestic use, energy production (hydro-electric power) and irrigation. High population growth, rapid urbanization, overexploitation and poor land practices pose a threat to the future of the Nile water resource [35]. Moreover, the Nile Basin is a highly complex basin with many uncertainties that compound decision-making [12, 36, 37]. Hence sound decision-making under deep uncertainty when there is no "clear print [37]" of what cause of action to take requires long-term thinking [36, 37]. The use of decision support tools like scenarios can support decision-making in complex basins such as the Nile, which face many challenges and profound uncertainty [11, 12].

A participatory scenario building exercise was held in Jinja Uganda in February 2014 [11, 12, 16]. We used the RAND methodology to develop four scenarios [16]. Figure 2 illustrates the three-step scenario development process and outcomes. At the foundation of every driving force[1] are contextual factors. We derived three key contextual factors from the 38 clusters that were identified by the participants during the scenario development workshop [11, 12, 16]. Notably, trust, situation awareness, and collaboration seemed to be critical factors that may shape the Nile Basin futures. Moreover, climate change was selected as a fundamental driving force and was a vital component of the scenario logic. After that, the scenarios were presented to stakeholders, to elicit views.

We explained the four scenarios to the eleven Ministers of water and over 400 participants during the 4th Nile Basin Development Forum (a bi-annual conference for the basin) on the 6th of October 2014 [16]. The Ministers of Water stated that they would like a future depicted in Ejo-Heza or Kazuri but fear Miskeen and Umoja [12].

[1] We define driving forces as the external factors that impact of the social, physical and built environments.

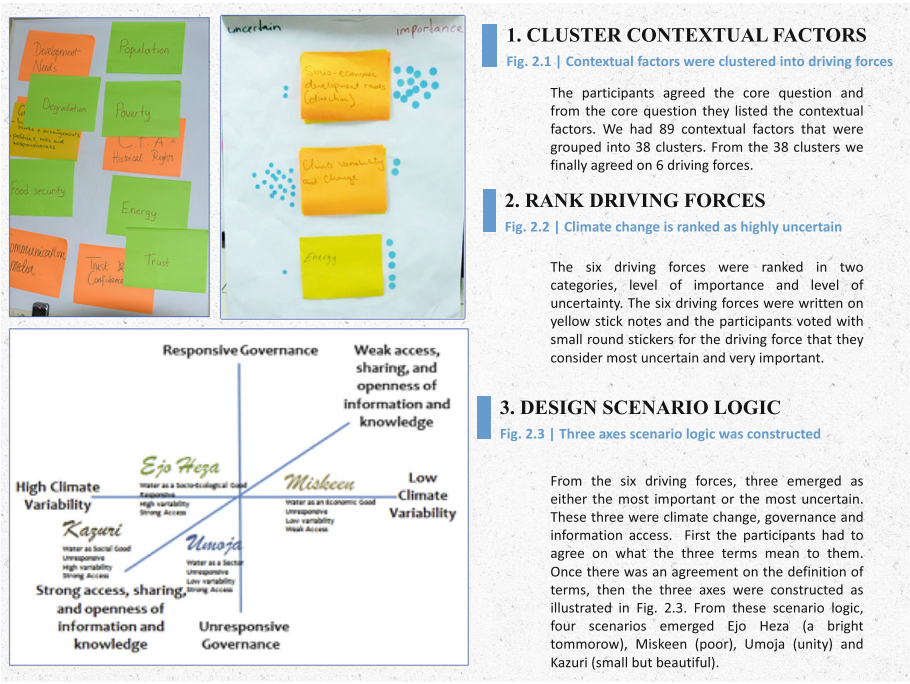

Fig. 2. In Fig. 2, we illustrate the Nile Basin scenario construction process. It emerged that climate change is a highly uncertain driving force that may shape the future of the Nile Basin. Figure 2.1: From the 89 contextual factors, we identified trust, collaboration and situation awareness as three factors that are relevant to this paper. In Fig. 2.1: Trust and Confidence are in green and yellow stick notes. Above the trust-sticky-note are many sticky notes that relate to situation awareness (degradation, population, food security and development needs). These sticky notes indicate that there is pressure on the resources but the system is not adjusting to these pressures. Finally, there are two sticky notes relating to cooperation: communication and CFA. Figure 2.2: The participants ranked climate change as one of the highly uncertain driving forces because it is highly uncertain. Figure 2.3: The scenario logic with three axes: climate change, governance, and access to information. Only the scenarios faced with high climate variability had positive outcomes. (CFA stands for Cooperative Framework Agreement. It is a draft legal framework to facilitate the joint management of the Basin.)

Surprisingly, the preferred scenarios were situated in a context of high climate variability, indicating a positive correlation between high climate variability and positive futures/scenarios.

As noted earlier, the stakeholders selected trust, situation awareness, and collaboration as crucial contextual factors and later confirmed their position, in the subsequent workshop held in Nairobi, Kenya. Furthermore, most of the Nile basin discussions confirm that these are the critical factors. For instance, after presenting the four scenarios, the Ministers of Water made a joint press statement, and the three contextual factors emerged, as illustrated in the press statement excerpt:

"Nile Basin States have got no choice (situation awareness) but to cooperate (collaborative process). Through cooperation (collaborative process), the Basin States are able to harness the synergies (trust and collaborative process), taking cognizance of the comparative advantages (situation awareness) presented by the different development approaches (situation awareness) and growing the pie for each individual Basin State (trust and collaborative process) [38, p. 2]."

To support the implementation of the Nile Basin States vision as expressed in the press statement, in collaboration with local actors, we initiated a process of developing a game known as Nile WeShareIt [36]. The game aims to increase situation awareness, trust and enhance the collaborative process. Situation awareness may increase understanding of the benefits of joint management of the shared river and the dangers of unilateral actions. Increased trust may be through the use of the benefit-sharing concept (trade in food, energy, and wood fuel). Improved collaboration process may be through identifying and utilizing the comparative advantage of each riparian state and new approaches for "growing the pie" together.

3 The Theoretical Framework

The objective of the theoretical framework (Fig. 3) is to provide a structure that describes the significant variables, elements, and constructs that will be used to design, apply and assess the learning outcomes of the climate change game.

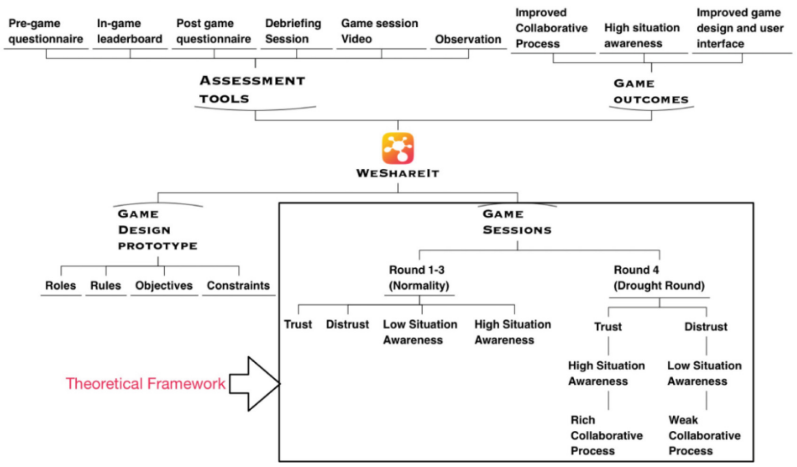

Fig. 3. Theoretical and Methodological Framework for the design of a Climate Change Game for Trans-boundary water resources management that utilizes disasters as an "opportunity for change." The rectangle is a visual representation of the theoretical framework within the context of game sessions. It is a representation of how the three theories (Gaming, trust and situation awareness) are conceptualized and used to design game sessions to improve the Collaborative Process. For the theoretical framework, we adjusted the Schul et al. [39] and Lowry et al. [40] theory of trust and distrust to a water resources management context and added situation awareness and the YUTPA model of trust [41–43].

Apart from assessing the changes in trust and distrust we also intend to assess the effect of climate-induced disasters on situation awareness. When climate change-induced disasters replace normality, there is disruption of perceptions of a safe and predictable system and situation awareness increases. Recent studies show that increased situation awareness may reduce disaster losses by half [44]. Normality encourages 'business as usual' thinking. Therefore, if "business as usual" is poor collaboration, it is difficult to change from non-collaboration to collaboration, while normality exists. Especially when past non- non-collaborative actions have not led to adverse outcomes or the consequences are not immediate, and the connections are not clear. Thus, positive or non-significant results reinforce trusting beliefs that the system is safe and predictable and there is little need for investigating the system further.

On the other hand, climate change induced disasters disrupt normality, and the previous trusting beliefs regarding the safety and predictability of the system are brought to question. Lowry et al. [40] carried out a research that established that with low levels of normality, the distrust of the system increased, which led to high awareness levels. With the distrusting beliefs, individuals are compelled to investigate the system, and they discover that it is not safe nor predictable. What we were not confident of is what happens after they come to this discovery. Before Lowry et al. researchers regarded distrust as a negative attribute, which led to no prior empirical assessments on the contribution of distrust to situation awareness and collaboration [40]. Surprisingly, early research in the 1950s until 1970s highlighted the positive aspects of distrust [45]. Then there was a wave of research mainly focusing on the positive aspects of trust [45, 46] and a few studies on the contribution of dissent [47, 48], without efficiently addressing distrust. Therefore, the contribution of distrust to collaborative actions is also a new research focus has begun to be re-assessed.

We made four adjustments to the Schul et al. [39] and Lowry et al. [40] theory. First, we included climate change-induced disasters as the factor that disrupts normality to increase system distrust and enhance situation awareness. The initial model did not include climate-change induced disasters. Second, we extended the theory from individuals to teams. While playing the WeShareIt game, some people play in teams. We assumed that team rationality is a total of the individuals in that team [39]. Third, we incorporated the assumption that increases in trust/distrust within the various WeShareIt teams will significantly affect collaboration, which will then affect the quality of the decisions made. Fourth, in the game design and assessment, there is a distinction between distrust of the system and distrust of other individuals (i.e., other players in the game). Consequently, we grouped parameters to measure distrust of the system under situation awareness and distrust of individuals and teams under trust and distrust.

Subsequently, we developed research instruments to assess increases in trust, situation awareness, and collaborative actions. The research instruments were inbuilt in the game itself, and external assessment tools. The external assessment tools consist of pre-game, in-game & post-game questionnaires, video recordings, observations and a debriefing session. Research measurements were developed to measure situation awareness, trust, and collaborative process. To assess situation awareness, we adopted the ten-question Situation Awareness Rating Technique (SART) [49] approach. The players were requested to subjectively rate their level of awareness based on a 7-point

Likert scale, before the start of the game and at the end of the game. We incorporated the situation awareness assessment questions in the pregame and postgame online questionnaires.

Furthermore, we assessed trust by some frameworks that were incorporated in the pregame, in-game (leaderboard) and postgame questionnaires. We developed a 16 question (in Swahili) rating scale, using the YUTPA conceptual framework [50] and its four dimensions (time, place, action, relation), for the leaderboard. Additionally, we used two techniques to assess trust, the first to assess the personality and the second; for self-assessment of one's level of trust at the beginning of the game and the end of the game. The personality inventory in the pregame questionnaire was developed using questions from the North-western University personality project website[2]. This website uses the Synthetic Aperture Personality Assessment (SAPA) method to assess the data and classifies personalities in the Big Five categories[3]. In addition to the personality test, the participants assessed their level of trust at the start and end of the game using 18 questions filtered from the IPIP Scale measuring constructs for trust[4]. We designed a research approach to assess collaborative actions using the in-game data, observation reports, debriefing notes and the recorded videotapes. Detailed descriptions and assessments of the various components of the theoretical framework are not within the scope of this paper. Therefore, each theory will be assessed separately, and discussed in detail, in subsequent papers.

4 Nile WeShareIt Climate Change Game

Before designing the WeShareIt climate change game, we assessed whether there are existing games that match the WeShareIt game specifications. In the assessment, we came across over fifty sophisticated climate change games [51]. Conversely, the focus of these games was mainly on the climate change negotiations at the global scale (for example, WORLD CLIMATE [52]) and decision support to reduce green gas emissions (for example, PLANET GREEN GAME, 2007 [53]). There are a few that focused on disaster risk reduction (for example, BEFORE THE STORM [54]/EARLY WARNING, EARLY ACTION, 2009 [55]). Alternatively, there are more recent climate change games that focus on water management and skills development (for example, AQUA-PLANNING [56] and FLOODED [57]).

From our assessment, we could not find a single game that met all the game specifications that we had defined for the WeShareIt Game. As a consequence, we developed WeShareIt as a new game aimed at focusing on the interaction between climate change adaptation, disaster risk reduction & management, water management, benefit sharing (energy, food, and nature), trust-building, situation awareness, and collaboration.

[2] http://personality-project.org.

[3] Openness, Conscientiousness, Extroversion, Agreeableness, and Neuroticism.

[4] http://ipip.ori.org/newNEOKey.htm#Trust.

WeShareIt is a hybrid board game designed to explore whether disaster diplomacy can foster water cooperation through joint planning, production, and trade in energy, food, and nature, within the Nile Basin. The game consists of five select boards. The goal of WeShareIt is for policymakers to get as many "happy faces" as possible. There are also regional collaboration strategies that need to be met by each player or a team of players. We designed the game with multiple continuing rounds, each consisting of a pay-out session (A) and a water allocation session (B). In the session, A, food, wood fuel (nature) and hydro-electric energy are harvested, bought and sold, in the trade round. After the trade, players invest in public services or buy solar panels (to reduce their energy need). In session B, the players may adjust their water allocation strategies to make their citizens happy and meet their regional collaboration strategies.

5 Game Application and Findings

Game design, testing and a series of iterations took place between October 2014 and October 2015. On 22 October 2015, WeShareIt was played by ten policymakers from the Kenyan Ministry of Water and Irrigation in Maji House (Ministry Headquarters), Nairobi, Kenya [36]. The players played three regular rounds and one drought round. In the drought round, their resources (food, energy, and nature) are halved. Since the players had not developed a joint action plan to buffer the river basin from future disasters, they were not prepared for the fourth round. None of the countries could meet their citizens' needs in the fourth round (see Fig. 4).

The findings discussed in this paper are general findings that seek to investigate the contribution of gaming to pre-disaster capacity development. The three contextual factors (trust, situation awareness and collaboration), identified during the scenario construction stage emerged during the game sessions as critical determinants of the outcomes. First, the riparian states could not **trust** other countries to be their sole providers or suppliers for their basic needs (food and energy). Second, the players barely made water allocation changes because these changes required trust and a robust collaborative process. Figures 4.1 and 4.2 indicate a correlation between trust and collaboration. When there was distrust, there was barely any collaboration between the players. Trust led to increased collaboration. Third, there was a false sense of security. This false perception led to low situation awareness. As a consequence, all countries were pre-occupied with local investments to be self-sufficient (national strategy to produce locally, all food and energy needs, without undermining the environment), and did not address trans-boundary strategies (cooperate and produce food and energy only according to one's comparative advantage). As a result, they were ill-prepared for the drought round.

From the players' statements in Fig. 4, we identified a shift in their mental models on managing uncertainties. One of the players representing Ethiopia made the first two statements (1 and 2) during the first three rounds. Later, he made the last statement, during the debriefing session. An assessment of the statements indicates that at first instance, the player was not ready to collaborate and was more focused on taking care of national interests. In the first three rounds, players did not incorporate uncertainties in their planning. Consequently, the players remained within their national social

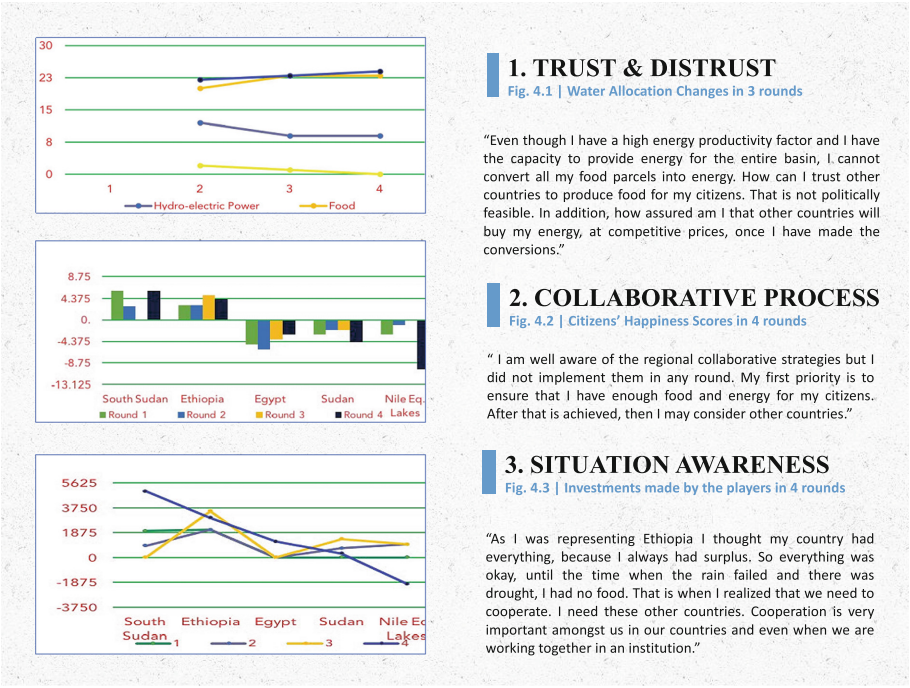

Fig. 4. On the left side is quantitative data illustrated by three (3) graphs to explain three significant findings of the initial game sessions. On the right side are excerpts of players' perceptions that were expressed during the game and at the debriefing stage that illustrate that the main factors that challenges were distrust, weak collaboration, and low situation awareness. Figure 4.1: Minimal changes to the original allocations despite the allocations producing adverse outcomes for three of the five players in subsequent rounds. These minimal changes were attributed to lack of trust in other countries to produce basic needs (energy and food) on behalf of other countries. Figure 4.2: Minimal collaborative actions between countries despite having three (3) countries having three (3) successive negative scores from the previous rounds. There was much focus on seeking internal solutions to the problems and not joint planning and decision-making. Figure 4.3: Low situation awareness characterized by long-term planning without taking into account deep uncertainties and disasters. Figures 4.2 and 4.3 have a similar trend, leading us to conclude that there was a correlation between where the countries were investing their resources and the game outcomes. All the countries invested in strategies aimed at making their citizens happy and took little account of the overall basin needs. When faced with climate change, the water resources diminished significantly reducing the hydro-electric energy and food supplies, and none of the countries could meet their citizens' needs, despite the comprehensive planning that had taken place before-hand.

networks (riparian state) and maintained the established roles and identities without questioning the game rules. However, after the drought, the players stopped playing and sought advice and the opinion of other players on how to address uncertainties. In the discussions, new roles and identities began to emerge. For example, Ethiopia and South Sudan understood their roles as respectively energy and food providers. The last

statement (Fig. 4.3) corroborates players increase in situation awareness. Players realized the value of cooperation because it prepared them to address future uncertainties, including disasters.

Moreover, there was more collaboration in round four than all the previous rounds. Figure 4.2 indicates a steep decline in adverse outcomes for Egypt for round 4 and a subsequent decrease in positive outcomes for Ethiopia, which was occasioned by the increased trust and situation awareness after the drought round. Ethiopia decided to forego some of its national priorities and ensure that it produces and sells sufficient energy to other riparian states, leading to a positive change for Egypt. The drought round increased situation awareness and raised the levels of trust to facilitate collaboration. Additionally, the sudden awareness that the system is unsafe and unknown led to distrust of the system and initiated a collaborative process, to address their challenges.

Despite weak collaboration in the first three rounds, the players ranked the collaborative process in the game highly (see Fig. 5). By their responses, we identified areas in the collaborative process in which they have sufficient capacity and the areas in which the players are in need of further support. We concluded that future work should give more priority to the capacity development of policymakers to (i) focus on collective interests, (ii) successfully negotiate and (iii) manage conflicts.

Furthermore, the participants were requested to rate their overall satisfaction with the game: 40% were extremely satisfied, 50% were very satisfied, and 10% were satisfied. No player was dissatisfied with the game session. Based on the positive outcome, we concluded that we could use WeShareIt game as a pre-disaster capacity development tool and gaming as a useful tool in preparing policymakers to utilize disasters as an opportunity for change.

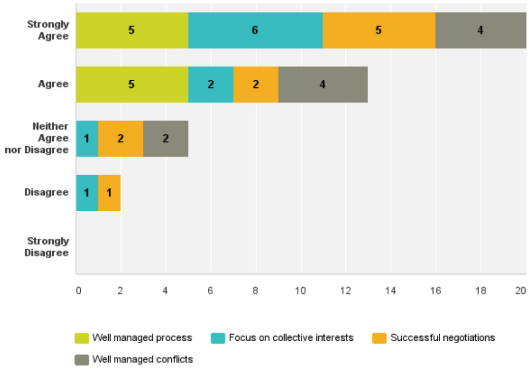

Fig. 5. The responses we received from the ten (10) players to Question 6 of the post-game questionnaire. The question is: "what is your analysis of cooperation in the game?"

Based on the player's recommendations, future work may entail decision support on complex interactions between the social, physical and built environments to minimize future adverse outcomes. We plan to do this through the use of already established

frameworks like the Cynefin Domains of Knowledge model [58] Moreover; we plan to improve on the current game and customize it for a smaller catchment in the Nile basin, known as the river Nzoia catchment. Additionally, we plan to play it with key policymakers, in the river Nzoia catchment.

6 Concluding Remarks

In this paper, we discuss the emerging concept of disaster diplomacy with specific reference to gaming. Thus, background information is provided to contextualize the opportunities that may face the Nile Basin by 2050 when we use climate change disasters as an opportunity for change. Also, three barriers emerge to the efficient utilization of climate change disasters as an opportunity for change: low trust, low situation awareness, and weak collaboration. Consequently, we developed a theoretical framework aimed at addressing the three barriers. After that, based on the already developed framework, a game known as WeShareIt was designed and applied in Nairobi, Kenya. Based on the initial game findings, it is evident that climate change induced disasters may provide an opportunity for change if the Nile Basin policymakers overcome the three. In particular, shared learning through a well-designed and applied climate change game can help policymakers overcome these barriers. Future work will entail more detailed assessments of game findings and provision of specific policy analysis support to the policymakers.

References

1. UNISDR (United Nations International Strategy for Disaster Reduction), Living with risk. A global review of disaster reduction initiatives. United Nations, Geneva (2004)
2. Baragona, S.: 2017 Most Expensive Year for US Natural Disasters. Economy (2018)
3. Zhang, B.: Top 5 Most Expensive Natural Disasters in History (2013)
4. Mochizuki, J., Chang, S.E.: Disasters as an opportunity for change: Tsunami recovery and energy transition in Japan. Int. J. Disaster Risk Reduct. **21**, 331–339 (2017)
5. Birkmann, J., et al.: Extreme events and disasters: a window of opportunity for change? Analysis of organizational, institutional and political changes, formal and informal responses after mega-disasters. Nat. Hazards **55**(3), 637–655 (2010)
6. Archer, D., Boonyabancha, S.: Seeing a disaster as an opportunity – harnessing the energy of disaster survivors for change. Environ. Urban. **23**(2), 351–364 (2011)
7. Kelman, I.: Beyond disaster, beyond diplomacy. In: Natural Disasters and Development in a Globalizing World, pp. 110–123 (2003)
8. Kelman, I.: Disaster diplomacy: can tragedy help build bridges among countries, p. 6. Fall, UCAR Quarterly (2007)
9. Kelman, I.: Disaster diplomacy: how disasters affect peace and conflict. Routledge, Abingdon (2011)
10. Kelman, I.: Hurricane Katrina disaster diplomacy. Disasters **31**(3), 288–309 (2007)
11. Enserink, B., Onencan, A.: Nile Basin Scenario Construction (2017)
12. Onencan, A., et al.: Coupling nile basin 2050 scenarios with the IPCC 2100 projections for climate-induced risk reduction. In: Humanitarian Technology Science, Systems and Global Impact, HumTech2016, Boston, USA (2016)

13. Kelman, I.: Acting on disaster diplomacy. J. Int. Aff. **59**(2), 215 (2006)
14. Quarantelli, E., Lagadec, P., Boin, A.: A Heuristic Approach to Future Disasters and Crises: New, Old, and In-Between Types (2017)
15. Kelman, I.: Reflections on disaster diplomacy for climate change and migration. In: Sudmeier-Rieux, K., Fernández, M., Penna, I.M., Jaboyedoff, M., Gaillard, J.C. (eds.) Identifying Emerging Issues in Disaster Risk Reduction, Migration, Climate Change and Sustainable Development, pp. 197–210. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-33880-4_12
16. Onencan, A.M., Enserink, B.: THE NILE BASIN BY 2050: strategic foresight on the nile basin water governance, p. 28 (2014)
17. Saritas, O., Nugroho, Y.: Mapping issues and envisaging futures: an evolutionary scenario approach. Technol. Forecast. Soc. Change **79**(3), 509–529 (2012)
18. Onencan, A.: TU Delft serious game elevates Nzoia (2017)
19. Mileti, D.S.: A Reassessment of Natural Hazards in the United States. Joseph Henry Press, Washington, D.C (1999)
20. Eakin, H., et al.: Opinion: urban resilience efforts must consider social and political forces. Proc. Nat. Acad. Sci. **114**(2), 186–189 (2017)
21. Waugh, W.L., Streib, G.: Collaboration and leadership for effective emergency management. Publ. Adm. Rev. **66**(s1), 131–140 (2006)
22. Zhou, W., et al.: Generating textual storyline to improve situation awareness in disaster management. In: 2014 IEEE 15th International Conference on Information Reuse and Integration (IRI). IEEE (2014)
23. Paton, D.: Preparing for natural hazards: the role of community trust. Disaster Prev. Manag.: Int. J. **16**(3), 370–379 (2007)
24. Sattler, K.L., et al.: Gaming: a unique way to teach active shooter preparedness and response in healthcare. Prehospital Disaster Med. **32**(S1), S214 (2017)
25. Lawrence, J., Haasnoot, M.: What it took to catalyze uptake of dynamic adaptive pathways planning to address climate change uncertainty. Environ. Sci. Policy **68**, 47–57 (2017)
26. Graafland, M., Bemelman, W.A., Schijven, M.P.: Game-based training improves the surgeon's situational awareness in the operation room a randomized controlled trial. Surgi. Endosc. **31**, 4093–4101 (2017)
27. Ong, D.C., Zaki, J., Gruber, J.: Increased cooperative behavior across remitted bipolar I disorder and major depression: insights utilizing a behavioral economic trust game. J. Abnorm. Psychol. **126**(1), 1 (2017)
28. Sanchez, E.: Competition and Collaboration for Game-Based Learning: A Case Study. In: Wouters, P., van Oostendorp, H. (eds.) Instructional Techniques to Facilitate Learning and Motivation of Serious Games. AGL, pp. 161–184. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-39298-1_9
29. Blanson Henkemans, O.A., et al.: Learning with Charlie: a robot buddy for children with diabetes. In: Proceedings of the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction. ACM (2017)
30. Meera, P., McLain, M.L., Bijlani, K., Jayakrishnan, R., Rao, B.R.: Serious game on flood risk management. In: Shetty, N.R., Prasad, N.H., Nalini, N. (eds.) Emerging Research in Computing, Information, Communication and Applications, pp. 197–206. Springer, New Delhi (2016). https://doi.org/10.1007/978-81-322-2553-9_19
31. Mayer, R.C., Davis, J.H., Schoorman, F.D.: An integrative model of organizational trust. Acad. Manag. Rev. **20**(3), 709–734 (1995)
32. Endsley, M.R.: Toward a theory of situation awareness in dynamic systems. Hum. Factors: J. Hum. Factors Ergon. Soc. **37**(1), 32–64 (1995)

33. Klabbers, J.H.: The Magic Circle: Principles of Gaming & Simulation. Sense Publishers, Rotterdam (2009)
34. Spada, H., et al.: A new method to assess the quality of collaborative process in CSCL. In: Proceedings of the 2005 Conference on Computer Support for Collaborative Learning: Learning 2005: The Next 10 Years! International Society of the Learning Sciences (2005)
35. Nile Basin Initiative (NBI): State of the River Nile Basin Report, Nile Basin Initiative, Entebbe, Uganda (2012)
36. Onencan, A., et al.: WeShareIt Game: strategic foresight for climate-change induced disaster risk reduction. In: Humanitarian Technology: Science, Systems and Global Impact 2016, HumTech2016. Procedia Engineering, Boston (2016)
37. Onencan, A., et al.: Weshareit: a Nexus approach to nile basin water resources management. In: Decision Making Under Deep Uncertainty (2015)
38. Nile Basin Initiative (NBI): Press statement issued by Hon. Mutaz Musa Abdalla Salim Chairperson of the Nile Council of Ministers and Minister of Water Resources and Electricity of the Sudan at the close of the 4th Nile Basin Development Forum, in Building Sustainable Trans-boundary Cooperation in a Complex River Basin: Challenges, Lessons and Prospects (Theme), N.B. Initiative (ed.), Nairobi, Kenya, p. 4 (2014)
39. Schul, Y., Mayo, R., Burnstein, E.: The value of distrust. J. Exp. Soc. Psychol. **44**(5), 1293–1302 (2008)
40. Lowry, P.B., et al.: Is trust always better than distrust? The potential value of distrust in newer virtual teams engaged in short-term decision-making. Group Decis. Negot. **24**(4), 723–752 (2015)
41. McKnight, D.H., Choudhury, V.: Distrust and trust in B2C e-commerce: do they differ? In: Proceedings of the 8th International Conference on Electronic Commerce: The New e-commerce: Innovations for Conquering Current Barriers, Obstacles and Limitations to Conducting Successful Business on the Internet. ACM (2006)
42. Dimoka, A.: What does the brain tell us about trust and distrust? Evidence from a functional neuroimaging study. MIS Q. **34**, 373–396 (2010)
43. McKnight, D.H., Cummings, L.L., Chervany, N.L.: Initial trust formation in new organizational relationships. Acad. Manag. Rev. **23**(3), 473–490 (1998)
44. Girons Lopez, M., Di Baldassarre, G., Seibert, J.: Impact of social preparedness on flood early warning systems. Water Resour. Res. **53**(1), 522–534 (2017)
45. Guo, S.-L., Lumineau, F., Lewicki, R.J.: Revisiting the foundations of organizational distrust. Found. Trends® Manag. **1**(1), 1–88 (2017)
46. Lewicki, R.J., McAllister, D.J., Bies, R.J.: Trust and distrust: new relationships and realities. Acad. Manag. Rev. **23**(3), 438–458 (1998)
47. Dooley, R.S., Fryxell, G.E.: Attaining decision quality and commitment from dissent: the moderating effects of loyalty and competence in strategic decision-making teams. Acad. Manag. J. **42**(4), 389–402 (1999)
48. Schulz-Hardt, S., et al.: Group decision making in hidden profile situations: dissent as a facilitator for decision quality. J. Pers. Soc. Psychol. **91**(6), 1080 (2006)
49. Taylor, R.: Situational Awareness Rating Technique (SART): The development of a tool for aircrew systems design. AGARD, Situational Awareness in Aerospace Operations, 17 p (1990). (SEE N 90-28972 23-53)
50. Nevejan, C.: Witnessed presence and the YUTPA framework. PsychNology J. **7**(1), 59–76 (2009)
51. Reckien, D., Eisenack, K.: Climate change gaming on board and screen. Simul. Gaming **3** (2), 44 (2013)
52. Massachusetts Institute of Technology/Climate Interactive, World Climate (2006)
53. Starbuck Company and Global Green, Planet Green Game, USA (2007)

54. Red Cross/Red Crescent Climate Centre, Before The Storm, The Hague, Netherlands (n.d.)
55. PetLab, Early Warning, Early Action. New York, NY (2009)
56. Floersheim-Weilbach, Aqua-Planing, Germany (n.d.)
57. Mannsverk, S.J.: Flooded-A Location-Based Game for Promoting Citizens' Flood Preparedness. Institutt for datateknikk og informasjonsvitenskap (2013)
58. Snowden, D.J., Boone, M.E.: A leader's framework for decision making. Harvard Bus. Rev. **85**(11), 68 (2007)