**APPENDIX A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Name** | **Game’s characteristic** | **Time to play** | **Number of players** | **Target Group** | **Type of hazard** | **Stage of DMR cycle** | **Links to the game’s page / materials** |
| **1.** | **Act to Adapt** developed with support from Plan International as a collaboration between The Red Cross Red Crescent Climate Centre, Plan International and the enGAgeMEnt Lab at Emerson College. Centre from the Climate and Development Knowledge Network (CDKN Action Lab Innovation Fund)  | Face-to-face multiplayer game with direct interaction | 10–30 min | 10–30  | Kids, youth (12–17) | Various weather-related hazards | Prevention/ mitigation and preparedness | <http://www.climatecentre.org/resources-games-v2/games-overview-v2//6/act-to-adapt> |
| **2.** | **Beat the Quake** by [SCEC](http://www.shakeout.org/) Southern California Earthquake Center at [USC](http://www.usc.edu/) | Online/ computer single-player game | 10–15 min | 1 | Communities exposed to earthquakes | Earthquake | Preparedness | <http://www.dropcoverholdon.org/beatthequake/> |
| **3.** | **Before the Storm** by Parsons The New School of Design’s PETLab and the Red Cross Red Crescent Climate Centre | Face-to-face multiplayer game with direct interaction | 60–90 min | 4–7  | Red Cross staff and volunteers, climate scientists and forecasters, politicians, and affected communities around the world  | Various weather-related hazards | Preparedness and response  | <http://petlab.parsons.edu/redCrossSite/rulesBTS.html#downloadsBTS><http://www.youtube.com/watch?v=Mpj_EbKdwEo>. |
| **4.** | **Build a Kit** by the Department of Homeland Security | Online/ computer single-player game |  10–30 min | 1 | Kids and their parents | All types of natural hazards | Preparedness | <https://www.ready.gov/kids/games/data/bak-english/index.html> |
| **5.** | **Buzz about Dengue** adapted by Red Cross Red Crescent Climate Centre from the original [Humans vs. Mosquitoes game](http://humansvsmosquitoes.com/), designed by Clay Ewing, Lien Tran, Mohini Freya Dutta, Ben Norskov, Eulani Labay, Sophia Colantonio, Lauren Graham, Vanessa Lamers, and Kanchan Shrestha. This version has been created in collaboration with the International Federation of the Red Cross and Red Crescent Societies and Extra Ludic.  | Face-to-face multiplayer game with direct interaction |  10–30 min | 6 | Anyone over the age of 12. May be played with communities at risk  | Dengue epidemic | Prevention/ mitigation, preparedness and response  | <http://www.climatecentre.org/resources-games/games/12/buzz-about-dengue><http://www.climatecentre.org/downloads/modules/games/A%20Buzz%20about%20Dengue%20.pdf> |
| **6.** | **Crossroad: Kobe** by Professor Katsuya Yamori of Kyoto University, jointly with Professor Toshiko Kikkawa of Keio University and Assistant Professor Tsuyoshi Ajiro of the Advanced Institute of Industrial Technology. | Face-to-face multiplayer game with direct interaction | 60–90 min | 5–7 | Central or local government officers, relief workers, local people, school children and their parents | All types of natural hazards (later versions included also other types of crises)  | Preparedness and response  | <http://1995kobe20th.jp/en/2016/01/1679/> |
| **7.** | **Cultural Memory Game** developed by the Centre for Systems Solutions as part of [EDUCEN project](http://www.educenproject.eu)  | Face-to-face multiplayer game with direct interaction | 90–120 min | 8–30  | Aid workers, everyone, insurers, local communities, ngos, policy makers, public administration, youth, museums | Flood, droughts | Full DRM cycle | <http://culturalmemory.games4sustainability.org/> |
| **8.** | **Decisions for the Decade**Pablo Suarez and Janot Mendler de Suarez for the Red Cross Red Crescent Climate Centre.This game was developed with support from the American Red Cross (International Services Team), and is a substantially simplified version of a game on deep uncertainty and robust decision making, designed for the World Bank Chief Economist for Sustainable Development. | Face-to-face multiplayer game with direct interaction | 30–60 min | 8–40 (4 (teams of 3–6)  | government officials at local to national level and a wide range of stakeholders affected by long-term climate risks | Floods and droughts | Prevention/ mitigation and preparedness | <http://www.climatecentre.org/resources-games/decisions-for-the-decade> |
| **9.** | **Disaster Awareness Game (DAG)**[Virginia Clerveaux](http://www.emeraldinsight.com/author/Clerveaux%2C%2BVirginia) (Department of Civil Engineering, Gunma University, Gunma, Japan)[Balfour Spence](http://www.emeraldinsight.com/author/Spence%2C%2BBalfour) (Department of Geography & Geology, The University of the West Indies, Kingston, Jamaica)[Toshitaka Katada](http://www.emeraldinsight.com/author/Katada%2C%2BToshitaka) (Department of Civil Engineering, Gunma University, Gunma, Japan) | Face-to-face multiplayer game with limited interaction | 30–60 min | 2–10 players (or groups of players) | Primary school children (minimum age of 9) | Local environmental hazards: earthquakes, hurricanes, storms, droughts, floods, volcanic eruption, tsunamis | Full DRM cycle | game available upon request: tv\_clerveaux@yahoo.com (?) |
| **10.** | **Disaster Imagination Game (DIG)**  | Face-to-face multiplayer game with direct interaction | 150–180 minutes | 2–5 groups of max. 10 people | Aid workers, public administration, local communities, NGOs, policy makers, law enforcement service | Any type of hazard imagined | Preparedness | <http://open_jicareport.jica.go.jp/pdf/11685823_09.pdf> |
| **11.** | **Disaster in My Backyard** by Provincial University College Limburg. Campus Vesta, training center of the Antwerp province and the Belgian First Aid & Support Teamcontact people: Kenny Meesters k.meesters@gmail.com;Bertel van de Walle b.a.vandewalle@uvt.nl | Face-to-face multiplayer game with direct interaction | 90–120 minutes | 4 teams of 4–6 players | Aid workers, law enforcement service, students, affected communities | Flood | Response | <https://vimeo.com/52799473><https://www.slideshare.net/kmeesters/iscram-presentatie-compressed> |
| **12.** | **Disaster Master** by FEMA /ready.gov /the Department of Homeland Security | Online/ computer single-player game | 10–30 min | 1 | Kids and their parents | Wildfire, tornado, hurricane, storm, earthquake, tsunami, otweaveextreme cold | Preparedness and response  | <https://www.ready.gov/kids/games/data/dm-english/> |
| **13.** | **Dissolving Disasters**by Red Cross Red Crescent Climate CentreThis game was designed for the Rockefeller Foundation Workshop Series on Resilience, held in New York City during July and August 2011. This game was developed with support from the American Red Cross (International Services Team), and from a research grant to the Red Cross Red Crescent Climate Centre from the Climate and Development Knowledge Network (CDKN Action Lab Innovation Fund).  | Face-to-face multiplayer game with direct interaction | 90–120 minutes | 10–40  | Community members /donors/ disaster managers/ volunteers/  | Floods, droughts | Prevention/ mitigation and preparedness | <http://climatecentre.org/resources-games/dissolving-disasters><https://reliefweb.int/report/madagascar/dissolving-disasters-madagascar-climate-games-vulnerable-nation> |
| **14.** | **Earth Girl. The Natural Disaster Fighter**by ART Group at the Earth Observatory of Singapore | Online/ computer single-player game | 10–30 minutes | 1 | Mainstream non-scientist audience of all ages, particularly children (7–12) and early teenagers (13–15) | Tsunami, flooding, volcanic eruptions | Preparedness and response  | <http://earthgirlgame.com/overview.php> |
| **15.** | **Earthquake Response** by Save the Children , Australia and Enabled Solutions | Online/ computer single-player game | 10–30 min | 1 | Children, youth | Earthquake | Preparedness and response | <http://www.enabledgames.com.au/stc/> |
| **16.** | **Evacuation Board Game**by Flood Site Project | Face-to-face multiplayer game with direct interaction | 30–60 min | 4 teams of 1–3 people | Children, youth | Flood | Preparedness and response  | <http://www.floodsite.net/juniorfloodsite/html/en/student/thingstodo/games/boardgame.html> |
| **17.** | **Evacuation Challenge Game**developed by the Centre for Systems Solutions as part of [EDUCEN project](http://www.educenproject.eu)  | Face-to-face multiplayer game with direct interaction | 90–120 min | 12–72  | Aid workers, law enforcement service, local communities, ngos, youth | Any hazard imagined(here zombie apocalypse) | Preparedness and response  | <http://evacuationchallenge.games4sustainability.org> |
| **18.** | **Evacuation Role Play Game**by Flood Site Project | Face-to-face multiplayer game with direct interaction | 30–60 minutes  | 4 teams of 1–3 people | Children, youth | Flood | Preparedness  | <http://www.floodsite.net/juniorfloodsite/html/en/student/thingstodo/games/roleplayinggame.html> |
| **19.** | **Extreme Event Game**developed by the National Academy of Sciences’ Koshland Science Museum in collaboration with the [ResilientAmerica Roundtable](http://sites.nationalacademies.org/PGA/resilientamerica/) with support from the Federal Emergency Management Agency, the Koshland Science Museum Endowment, and private donations. | Face-to-face multiplayer game with direct interaction | 30–60 minutes | 12–48  | Citizens of exposed or affected cities, Middle School and High School Students; Teachers; NGO’s volunteers, community’s members, employees of government and local administration , players aged 14 and up | Earthquake, flood, or hurricane  | Full DRM cycle | <https://www.koshland-science-museum.org/explore-the-science/extreme-event/game-setup>;  |
| **20.** | **Flood Resilience Game** developed by the Centre for Systems Solutions in collaboration with the International Institute for Applied Systems Analysis (IIASA), with funding from the Zurich Flood Resilience Alliance. | Face-to-face multiplayer game with direct interaction | 90–120 minutes | 8-16  | Aid workers, everyone, insurers, local communities, NGOs, policy makers, public administration, youth | Flood | Full DRM cycle | <http://floodresilience.games4sustainability.org><http://blog.iiasa.ac.at/2016/08/03/playing-at-flood-resilience-using-games-to-help-vulnerable-communities/><https://games4sustainability.org/2016/08/18/flood-resilience-game-for-flood-prone-communities/> |
| **21.** | **FloodSim**developed by PlayGen Ltd, commissioned by Norwich Union | Online/ computer single-player game | 30–60 min | 1 | Target group: general public, but also insurers and policy makers  | Flood | Prevention/ mitigation  | <http://playgen.com/play/floodsim/> |
| **22.** | **Florima**by Flood Site Project | Face-to-face multiplayer game with direct interaction  | 30–60 min | multiple 4 person group (up to 5–8 groups) | Children, youth, educators | Flood | Prevention/ mitigation and preparedness | <http://www.floodsite.net/juniorfloodsite/html/en/teacher/thingstodo/games/florima.html> |
| **23.** | **Forest@Risk** by Centre for Systems Solutions | Online/ computer multiplayer game with direct interaction | 90–120 min |  8 players (or 8 teams) | Business people, everyone, farmers, local communities, NGOs, policy makers, public administration, youth | Earthquakes, floods | Prevention/ mitigation  | <http://www.games4sustainability.org/gamepedia/forest-at-risk/> |
| **24.** | **Game of Floods** by the Marin County Community Development Agency in California | Face-to-face multiplayer game with direct interaction | 30–60 minutes | 6  | community members, planners, disaster risk managers, universities, and preservation societies. | Flood | Prevention/mitigation  | <http://www.marincounty.org/depts/cd/divisions/planning/csmart-sea-level-rise/game-of-floods>; <http://www.adaptationclearinghouse.org/resources/game-of-floods.html>;  |
| **25.** | **Gender and Climate Game**developed by Red Cross Red Crescent Climate Centre for Kenya Red Cross, PopTech, Nike Foundation, and Rockefeller Foundation  | Face-to-face multiplayer game with direct interaction | 60–90 minutes | 10–40  | Community members/donors/disaster managers/ volunteers/ branch officers | Flood, droughts | Prevention/ mitigation and preparedness | <http://climatecentre.org/resources-games/the-gender-and-climate-game><http://www.youtube.com/watch?v=R8eRhS2XnCA&feature=youtu.be>. |
| **26.** | **Gender Walk** by Red Cross Red Crescent Climate Centre | Face-to-face multiplayer game with direct interaction | 30–60 min | As many players as roles provided | Aid workers, local communities, NGOs, public administration | Various weather-related hazards | Prevention/ mitigation, preparedness  | <http://www.climatecentre.org/downloads/files/Faciliation%20Cards%20rev%202015small.pdf> |
| **27.** | **Gifts of Culture**developed by the Centre for Systems Solutions as part of [EDUCEN project](http://www.educenproject.eu)  | Face-to-face multiplayer game with direct interaction | 90–120 min | 8–16  | children, local communities, NGOs, policy makers, public administration, youth | Floods | Full DRM cycle | [http://giftsofculture.games4sustainability.org/en](http://giftsofculture.games4sustainability.org/en/#benefit) |
| **28.** | **Hazagora**by the Department of Geography at the Vrije Universiteit Brussel with the support of the Science Communication Expertise Brussels Innoviris | Face-to-face multiplayer game with direct interaction | 150–180 minutes | 5–10 | 1) Secondary school students (15 years old and more) and citizens, 2) Scientists and stakeholders involved in RM activities. | Geohazards (earthquakes, volcanic eruptions and tsunamis in particular) | Full DRM cycle | <https://www.wtnschp.be/project/hazagora/> |
| **29.** | **Hurricane Strike!**by The COMET Program at UCAR (University Corporation for Atmospheric Research)  | Online/ computer single-player game | 150-180min | 1 | Middle school students and their teachers | Hurricane | Preparedness and response | <https://www.meted.ucar.edu/hurrican/strike/> |
| **30.** | **Inside the Haiti Earthquake**by Bell New Media Development Fund, CTF Digital Fund, PTV Productions, TVO | Online/ computer single-player game | 60–90 minutes | 1 | Aid workers, journalists, NGOs, public administration | Earthquake | Response and recovery | <http://insidedisaster.com/haiti/experience> |
| **31.** | **Lords of the Valley** developed by the Centre for Systems Solutions | Online/ computer multiplayer game with direct interaction | 150–180 min | 12–36 players | NGOs, decision makers, stakeholders | Flood, drought | Prevention/ mitigation and preparedness | <http://lordsofthevalley.games4sustainability.org> |
| **32.** | **Paying for Predictions** by Red Cross Red Crescent Climate Centre | Face-to-face multiplayer game with direct interactions  | 30–60 minutes | 2–12 teams of 3 players  | Disaster managers, volunteer, branch officers, meteorological service authority, donors | flood, drought | Prevention/ mitigation, preparedness  | <http://www.climatecentre.org/resources-games/paying-for-predictions> |
| **33.** | **Ready!**by Red Cross Red Crescent Climate CentreThis game was developed with support from the American Red Cross (International Services Team), and from a research grant to the Red Cross Red Crescent Climate Centre from the Climate and Development Knowledge Network (CDKN Action Lab Innovation Fund). | Face-to-face multiplayer game with direct interaction | 30–60 minutes | As many teams of 5–10 players as desired.  | Community members. The game can also be played withdisaster managers/volunteers/ branch officers, etc. | Any hazard (it is most effective using a realistic scenario for the participants in the place where people experience the risk. | Preparedness and response | <http://www.climatecentre.org/resources-games/ready><http://climatecentre.org/downloads/files/Case%20studies/AW_RCCC_working%20paper%203%20READY%20web.pdf> |
| **34.** | **Riskland** by the Inter-agency Secretariat of the International Strategy for Disaster Reduction (UNISDR) for Latin American, and the United Nations Children’s Fund (UNICEF-TARCO) | Face-to-face multiplayer game with limited interaction | 30–60 minutes | 2 or more | The vulnerable community of Latin America and the Caribbean, kids aged 8–12 | May be adapted to any hazard | Prevention/ mitigation , preparedness  | <https://www.unisdr.org/2004/campaign/pa-camp04-riskland-eng.htm>  |
| **35.** | **Sai Fah: The Flood Fighter**by Opendream, The Department of Non-formal Education at the Ministry of Education in Thailand, UNESCO BANGKOK | Online/ computer single-player game  | 30–60 min | 1 | Children and their educators | Flood | Prevention/mitigation and preparedness and response | <http://www.preventionweb.net/educational/view/49559> |
| **36.** | **Save Natalie! The Preparedness Game**by UNICEF United Nations Children's Fund | Face-to-face multiplayer game with limited interaction | 10–30 minutes | 2 or more | Children and their educators | Volcano eruptions, floods, cyclones, earthquakes | Preparedness  | <http://helid.digicollection.org/en/d/Jdnd24/5.html> |
| **37.** | **SerGIS: Malmö Flood Scenario**by Brian Tomaszewski, David I. Szwartz and Jörg Szarzynski  | Online/ computer single-player game | 10-20 min | 1 | Students and other novices in DRM | Flood | Response | [http://geoapps64.main.ad.rit.edu/sergis/games/jeannette/Mal](http://geoapps64.main.ad.rit.edu/sergis/games/jeannette/Malmo)mo  |
| **38.** | **Stop Disasters!** by United Nations (UN), International Strategy for Disaster Reduction (ISDR) and Playerthree  | Online computer single-player game | 10–30 minutes | 1 | 9–16 year old children, teachers, parents | Wildfires, earthquakes, floods, tsunamis and hurricanes) | Prevention/ mitigation, preparedness  | <http://www.stopdisastersgame.org/en> |
| **39.** | **Story Go Round**Created by Jane Friedhoff, Mike Susol and Kelly Tierney | Face-to-face multiplayer game with direct interaction | 10–30 min | 4–30 players in teams of 4  | Volunteers, NGOs, employees of local administrations and government  | Any type of hazard | Preparedness and response | <http://janefriedhoff.com/images/Story%20Go%20Round%20v1%2005.09.2012.pdf> |
| **40.** | **Supervolcano**by BBC | Online/ computer single-player game | 10–30 minutes | 1 | aid workers, business people, law enforcement service, local communities, public administration, youth | Volcano eruption | Prevention/mitigation and preparedness  | <http://www.bbc.co.uk/sn/tvradio/programmes/supervolcano/game.shtml> |
| **41.** | **UpRiver** developed in partnership with the [Red Cross Red Crescent Climate Centre](http://www.climatecentre.org/), the [Zambian Red Cross](http://www.zamcross.org.zm/) and the Engagement Game Lab ([EGL](http://engagementgamelab.org/)) at Emerson College.  | Face-to-face multiplayer game with direct interaction | 30–60 min  | 4 or 8 | Disaster managers, community members  | Flood  | Prevention/ mitigation, preparedness  | <https://elab.emerson.edu/projects/upriver> |
| **42.** | **Upstream/Downstream**by Red Cross Red Crescent Climate Centre | Face-to-face multiplayer game with direct interaction | 90–120 min | 8–24 | Aid workers, farmers, local communities, NGOs, public administration, youth | Flood and drought | Prevention/ mitigation, preparedness | <http://preparecenter.org/sites/default/files/usds_rules_170714_0.pdf><http://vimeo.com/45150733> <http://vimeo.com/45097866> |
| **43** | **VR for a New Climate**developed through a collaboration between the Climate Centre, the Global Facility for Disaster Reduction and Recovery ([GFDRR](https://www.gfdrr.org/)), the [Development & Climate Days](http://www.climatecentre.org/programmes-engagement/d-c-days-at-cops/), and [VISYON](http://visyon360.com/).  | Online/ computer single-player game  | 10–30 minutes | 1 | Policy makers, practitioners, general public | Flood, sea level rise  | Prevention/mitigation, preparedness, response | <http://www.climatecentre.org/vr><https://ajem.infoservices.com.au/items/AJEM-32-02-05>  |
| **44.** | **Weather or Not** by PETLab, Red Cross Red Crescent Climate Centre | Face-to-face multiplayer game with direct interaction | 30–60 minutes | A group of about 20–250  | Red Cross staff and volunteers, climate scientists, politicians, and people around the world facing the increasingly catastrophic effects of climate change-related disasters. | Flood | Preparedness | <http://petlab.parsons.edu/redCrossSite/rulesWON.html>; |
| **45.** | **Young Meteorologist Program. Severe Weather Preparedness Adventure** bythe National Oceanic and Atmospheric Administration/National Weather Service and the National Education Association | Online / computer single-player game  | 30–60 min | 1 | Educators, meteorologists, kids, vulnerable communities  | Lightning, hurricanes, tornadoes, floods and winter storms | Preparedness | <http://youngmeteorologist.org/> |

**APPENDIX B**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Game | Analog, face-to-face | Online/ computer/ mobile | Analog but media supported (applications, videos, phones, etc.) | Augmented / virtual reality | Interactions with other players | Debriefing after the game | Multiplayer | Single player | Physical activity | Role-taking | Storytelling | Decision-making / strategy | Quiz/Point-and-click | Boards/ stylized maps | Cards | Dice | Tokens, pebbles, beans and other symbolic tokens | Real objects |
|  | **Act to Adapt** | x |  |  |  | x | x | x |  |  | x |  | x |  | x | x |  |  |  |
|  | **Beat the Quake** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  |  |
|  | **Before the Storm** | x |  |  |  | x | x | x |  |  | x |  | x |  |  | x |  |  |  |
|  | **Build a Kit** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  |  |
|  | **Buzz about Dengue** | x |  |  |  | x | x | x |  |  | x |  | x | x |  | x |  | x |  |
|  | **Crossroads: Kobe** |  |  | x |  | x | x | x |  |  |  | x | x |  |  | x |  |  |  |
|  | **Cultural Memory Game** | x |  |  |  | x | x | x |  |  | x |  | x |  | x | x | x | x |  |
|  | **Decisions for the Decade** | x |  |  |  | x | x | x |  |  | x |  | x |  | x |  | x | x |  |
|  | **Disaster Awareness Game (DAG)** |  |  | x |  |  | x | x |  |  |  |  |  | x | x | x | x | x |  |
|  | **Disaster Imagination Game (DIG)** | x |  |  |  | x | x | x |  |  | x |  | x |  |  |  |  |  | x |
|  | **Disaster in my Backyard** |  |  | x | x | x | x | x |  | x | x |  | x |  |  |  |  | x | x |
|  | **Disaster Master** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  |  |
|  | **Dissolving Disasters** | x |  |  |  | x | x | x |  | x | x |  | x |  |  |  | x | x |  |
|  | **Earth Girl. The Natural; Disaster Fighter** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  |  |
|  | **Earthquake Response** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  |  |
|  | **Evacuation Board Game** | x |  |  |  | x |  | x |  |  | x |  | x |  | x | x |  | x |  |
|  | **Evacuation Challenge Game** | x |  |  |  | x | x | x |  | x | x |  | x |  |  |  |  | x | x |
|  | **Evacuation Role Play** | x |  |  |  | x | x | x |  |  | x |  | x |  | x |  |  |  |  |
|  | **Extreme Event Game** |  |  | x |  | x | x | x |  |  | x |  | x |  | x | x |  | x |  |
|  | **Flood Resilience Game** | x |  |  |  | x | x | x |  |  | x |  | x |  | x | x |  | x |  |
|  | **FloodSim** |  | x |  |  |  |  |  | x |  | x |  | x |  |  |  |  |  |  |
|  | **Florima** | x |  |  |  | x | x | x |  |  | x |  | x |  | x | x |  |  |  |
|  | **Forest@Risk** |  | x |  |  | x | x | x |  |  | x |  | x |  |  |  |  |  |  |
|  | **Game of Floods** | x |  |  |  | x |  | x |  |  | x |  | x |  | x | x | x | x |  |
|  | **Gender and Climate Game** | x |  |  |  | x | x | x |  | x | x |  | x |  |  |  | x | x |  |
|  | **Gender Walk** | x |  |  |  | x | x | x |  | x | x | x |  |  |  |  |  |  |  |
|  | **Gifts of Culture** | x |  |  |  | x | x | x |  |  | x |  | x |  | x | x |  |  |  |
|  | **Hazagora** |  |  | x |  | x | x | x |  |  | x |  | x |  | x | x | x | x |  |
|  | **Hurricane Strike!** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  |  |
|  | **Inside the Haiti Earthquake** |  | x |  |  |  |  |  | x |  | x | x |  | x |  |  |  |  |  |
|  | **Lords of the Valley** |  | x |  |  | x | x | x |  |  | x |  | x |  |  |  |  |  |  |
|  | **Paying for Predictions** | x |  |  |  | x | x | x |  | x | x |  | x |  |  |  | x | x |  |
|  | **Ready!** | x |  |  |  | x | x | x |  | x |  |  | x  |  |  |  | x | x |  |
|  | **Riskland** | x |  |  |  |  |  | x |  |  |  |  |  | x | x | x | x | x |  |
|  | **Sai Fah: The Flood Fighter** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  |  |
|  | **Save Natalie! The Preparedness Game** | x |  |  |  |  |  | x |  |  |  |  |  |  | x | x | x |  |  |
|  | **SerGIS: Malmö Flood Scenario** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  | x |
|  | **Stop Disasters!** |  | x |  |  |  |  |  | x |  |  |  | x |  |  |  |  |  |  |
|  | **Story Go Round** | x |  |  |  | x | x | x |  | x |  | x | x |  |  | x | x |  |  |
|  | **Supervolcano** |  | x |  |  |  |  |  |  |  | x |  | x |  |  |  |  |  |  |
|  | **UpRiver** | x | x |  |  | x | x | x |  | x |  |  | x |  |  | x |  | x |  |
|  | **Upstream/Downstream** | x |  |  |  | x | x | x |  |  | x |  | x |  | x | x | x | x |  |
|  | **VR for a New Climate** |  |  |  | x |  |  |  | x | x |  |  |  |  |  |  |  |  |  |
|  | **Weather or Not**  |  |  | x |  | x | x | x |  | x | x |  | x |  |  |  |  |  |  |
|  | **Young Meteorologist Program. Severe Weather Preparedness Adventure** |  | x |  |  |  |  |  | x |  |  |  |  | x |  |  |  |  |  |

**APPENDIX C**

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|  | **Game** | **Declared objectives**  | **Observed / evaluated outcomes** | **Plot** |
| **1.** | **Act to Adapt** | 1) to experience the **impacts of climate change**; 2) to explore how different **community resources** are vulnerable to different types of extreme weather and hazards; 3) to explore ideas on what can be done individually and collectively to **reduce climate risks**, adapt and become more **climate resilient**. | No information found. | A giant board game during which the ‘community team’ have to prioritise vulnerable community resources and take collective or individual actions to protect them from the ‘hazard team’. The hazard team represent specific extreme weather events relevant to the community, which become more intense and frequent each round.   |
| **2.** | **Beat the Quake** | 1) to test earthquake safety **knowledge**;2) to learn how to make a home a **safe space during an earthquake**.  | **Gampell and Gaillard (2016**) conducted first the **content analysis** of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific **discourse analysis**, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | The game is a fun quiz that checks players earthquake safety knowledge. Players have to prepare for the earthquake; they click on the objects in a virtual living room and choose the best answer (from among three options) how to secure it before a simulated earthquake shakes and breaks those items not secured. During the game, players may pause, learn correct answers and read some preparedness tips.  |
| **3.** | **Before the Storm** | 1) to introduce the **weather forecasts**; 2) to **raise awareness** about climate-related disasters,3) to model and address **possible action**s and their outcomes (early warning, early action);4) to improve **decision–making** in crisis situations;5) to promote meaningful **dialogue** among diverse stakeholders about the need to **collaborate** on turning science-based predictions into concrete decisions. | A case study **(Mendler de Suarez *et al.* 2012**), in Senegal in 2009 for 40 scientists who produce forecasts, Red Cross workers and vulnerable people proved that through the gameplay process scientists confront the irrefutable reality that their technical language is not universal and requires translation into thresholds for action, whereas Red Cross staff and vulnerable people improved their understanding of science-based forecasts and available options to manage risks—thus achieving the game’s objective.   | Depending on the given role players make a disaster preparedness plan using data from weather forecasts or recommend one or more actions that could be taken in this situation. |
| **4.** | **Build a Kit** | To help children **prepare and build an emergency kit** in the case of emergency | **Gampell and Gaillard (2016**) conducted first the **content analysis** of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific **discourse analysis**, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | Player is on a mission to go through different locations and pick find what he need for an emergency kit.  |
| **5.** | **Buzz about Dengue** | 1) to **create awareness** about the cause and consequences of dengue disease;2) to provide **useful information** on how to **reduce the risk** of infection through **community mobilization and organization;**3) to **raise awareness of**  dengue and other mosquito-borne diseases and **the role of climate change** in this process. | Some information about the game's effectiveness is provided by **Mendler de Suarez *et al*. (2012)**. Gameplay sessions of the older version of the game (*Humans vs. Mosquitoe*s) in over 10 countries have raised dengue awareness by motivating students, Red Cross youth and other stakeholders to learn more about this climate risk management problem. Although designed to primarily target schoolchildren, its effectiveness for adult audiences was evident during the **UN Climate Conference held in 2011** in Durban, South Africa: the enthusiastic participation of members of parliament from African and Latin American countries, as well as the head of the International Federation of the Red Cross—Africa Zone, along with youth from across the world, led to memorable “huh?” and “aha!” moments and concreted ideas for scaling up the game in Ugandan schools. A Climate and Development Knowledge Network (CDKN) grant has provided funding for game designers from Yale and Parsons to deploy this game to study practical application and policy implications in selected African and Asian countries. | This is a quick, team-based strategy game that teaches players how to combat Dengue Fever. Players take on the roles of either humans or mosquitoes, and must balance protective actions and proactive actions to keep their community safe. |
| **6.** | **Crossroad: Kobe** | 1) to use **witnesses and survivors’ testimonials** as a lesson from which people can learn;2) to enhance **risk communication** and produce **better solutions** through the **sharing of accurate information** among governments, experts, companies, citizens and other parties concerned;3) to shift from more paradigmatic, scientific and top-down approach to risk reduction to the narrative mode, which deals with **human-to-human relations** (such as conflict resolution, consensus building);4) to help local people **organize ways** to survive & manage disasters. | The game was described in a number of articles published in journals, e.g. Kikkawa *et. al.* (2004), Yamori (2005), Yamori and Kikkawa (2005), Yamori (2007, 2008, 2011).There is an empirical evidence to support the positive impact of the game. **Kikkawa *et al.* (2004)** have provided questionnaire data (pre-post game survey) suggesting that players’ opinions become varied rather than polarized into their “yes” or “no” answers after playing the game. This suggests that playing *Crossroad: Kobe* could have led the players to become aware of different viewpoints by facing different opinions of other members and that the game broadens players’ perspectives and pushes them to account for a larger number of factors when considering disaster preparedness and responses. The feedback obtained by similar pre-post surveys—**Yamori et al. (2005)** and **Yamori and Kikkawa** **(2005)—**shows that the majority (68% and over 90% respectively) of the game’s users find the game useful (interesting and broadening their perspectives). | During the game players read 10–20 episodes describing an actual dilemma that the veterans of Kobe earthquake faced. While one of the players is reading, the rest are required to make a decision between two conflicting alternatives by showing either the Yes or the No card and justifying their choice to the other players. Players discuss each episode. The discussion is enhanced by examining support materials (videos, basic background information and related statistics).  |
| **7.** | **Cultural Memory Game** | 1) to help players **understand the role** of **cultural memory** in shaping the present and the future condition and, how it can become useful to build resilience; 2) to let players learn how to **recognize signs of cultural memory** connected to specific disasters (relate facts);3) to connect cultural memory and **disaster protection measure**s. 4) to provide **museums and civil protection organizations** with a tool for gathering input from the young people about museum / civil protection disasters-related **educational activities.** | The game was not broadly applied yet. However, the tests conducted with both disaster professionals (March 2017, Dordrecht, Netherlands) and the target group (youth) (March–June 2017, Wroclaw, Poland; Volos, Greece) by the **Centre for Systems Solutions**  indicated that the game has potential to increase the overall disaster awareness, relying on past records, and motivate the players to employing better protection measures to build resilient communities..  | Nowadays a thriving metropolis, an anonymous city Cultural Memory Game is set in, witnessed a severe disaster almost a century ago. However, with an influx of new people and no major disaster having occurred since then, players (assuming the roles of city inhabitants) are blissfully neglecting any need for implementing prevention and preparedness measures… until the next disaster strikes. |
| **8.** | **Decisions for the Decade** | 1) to train **planning for extremes** to better manage risk;2) to train **cooperation** to better manage risk;3) to help people recognize that there are **aspects of the future** climate that are **deeply uncertain**, and therefore **managing risks** may require being **prepared** for **surprises**;4) to support learning and dialogue about key aspects of long-term **investments under uncertainty.** | *The Global Assessment Report on Disaster Risk Reduction 2015* **(Suarez et al., 2014\*)** sheds some light on the game’s role for triggering the understanding of deep uncertainty in decision-making. The game has been played with several audiences, e.g. in December 2013 it was used to launch a collaboration with stakeholders in Peru on using *Robust Decision Making* to ensure long-term water security. In January 2014, it was used at a kickoff workshop in Colombo, Sri Lanka for a master planning effort on flood risk and wetland management – as well as at a meeting of lead coordinating authors of the Intergovernmental Panel on Climate Change (IPCC). Feedback from the game sessions reveals that it triggers discussion on deep uncertainties and how to manage them in real world settings. The game primes participants to think about the unknown, to challenge each other on assumptions about the future, and to explore how different types of analyses – those that focus on robustness—can help address the changing challenges they face. As one example, a participant in one gameplay session remarked, “At first I thought it was very unfair to change the probabilities of the disasters, but afterwards, I realized that this happens in the real world all the time. We have to plan for surprises.” At another event, a participant noted, “Without the game, we don’t get a feeling of uncertainty. We always make decisions based on the past. This is not the correct approach,” and, in reference to their mission of flood risk management, added, “We need to know what the robust flood risk actions are for us!” | Each participant is a provincial governor and small teams make up the governing body of a nation. All participants begin the game with a budget of ten beans (for a ten-year cycle), and seek to maximize the prosperity of their province and country by investing their budget in long-term development. However, floods and droughts threaten this investment. The threat of extreme events is depicted by an object which changes at the beginning of each cycle, making it near-impossible to understand the chances of disaster. |
| **9.** | **Disaster Awareness Game (DAG)** | 1) to measure levels of disaster awareness among children in multicultural environments as a means of **determining and prioritizing** interventions for **disaster education**;2) to use children as conduits for the **education** of adults (including migrant parents who do not know local language) on **DM** issues that are relevant to their environment.3) to assist in **dispelling myths about hazards**, disasters and the management issues that pertain to them;4) to navigate players through **preparedness, prevention, mitigation, emergency response and recovery/rehabilitation**;5) to encourage **positive behavior among vulnerable people** at all stages of the disaster management cycle. | The game was described in a number of articles published in scientific journals, e.g. **Clerveaux and Spence (2008**); **Clerveaux and. Spence (2009) or Clerveaux *et al.* (2010).** The game’s effectiveness was evaluated during a two-day workshop in a multicultural setting of Grade 5 students in September, 2007, Turks and Caicos Islands (TCI) (**Clerveauxn and Spence 2008; 2009 and Clerveaux *et al* 2010)**. It was attended by 76 students (53 Anglophone and 23 non-Anglophone). The methodology wa undertaken in 4 stages: 1) evaluation the existing levels of disaster awareness among the target population via a questionnaire, 2) Presentations on local hazards and the relevant disaster management contexts, 3) exposure to the board game with related question cards and a score sheet, which was later used to 4) evaluate the levels of awareness prior to and after exposure to the game. A notable increase in risk perception was observed for both Anglophone and non-Anglophone sample students for both ﬂoods and hurricanes. There was a signiﬁcant increase in children’s knowledge of preparedness measures in relation to floods and hurricanes. Application of the DAG in the TCI demonstrates that the technique is effective in addressing the multicultural challenges that will be increasingly faced by Caribbean disaster managers. In addition, the technique is useful in identifying gaps in disaster education and by extension provides an informed basis for the prioritization of disaster education interventions. | The whole kit include lectures/presentations on local hazards, a board game with related question cards (multiple choice questions). The game consists of 3 levels (levels of questions differ). Players play by rolling a dice and moving along a board. If a player lands on a box with a hazard picture, he/she has to answer a question.  |
| **10.** | **Disaster Imagination Game (DIG)**  | 1) To raise **awarenes**s on DRM;2) To support **preparednes**s (by helping participants identify hazards, specific vulnerabilities, manage mitigation measures and response to disasters);3) To trigger **community participation** in planning for disasters.  | **Yanagawa, Y. et al (2016)** notice that after performing DIG (analog) exercise, the participants (the mayor of the city, official workers, representatives of local medical care organizations, fire department, policemen, and citizens of Izunokuni City, 2015) recognized the importance of self-help, mutual assistance, and maintenance of roads. In addition, it was observed that the participants deepened their understanding of relief activities, and admitted that building face-to-face relationship within community is one of the most important factors in disaster relief.  | Participants of DIG are appointed members of the virtual commanding post of disaster relief activities. By recording various details on maps, participants can easily grasp the situation of affected areas, and also easily discuss how to command relief activities.  |
| **11.** | **Disaster in My Backyard**  | 1) to help participants gain a **better understanding** of the operational circumstances**,** problems and situations faced during disasters;2) to become acquainted with **disaster management in practice**;3) to introduce people to the field of disaster management in general and **information management** in particular;4) to provide a training on **decision making**, uncertainty exercises, similar to a real life scenarios.  | The game and its outcomes were described by **Meesters and van de Walle (2013) and Meesters et al. (2014)*.*** The game was test conducted at the 2012 ISCRAM summer school for 24 PhD students from 11 countries yielded positive reactions from the participants and professionals (observing the gameplay). According to these professionals, the decision making process, uncertainty and communication difficulties are similar to **real-life experiences**. This realistic circumstances and the introduced technology allowed participants to experience circumstances faced by emergency responders, thus the declared objectives of the game were mostly met. In 2014, the game was played once again, this time during “Tag der Logistik” (day of logistics). Two sessions were played; the first with 27 players, the second with 21 players. After the game the participants were presented with a short exploratory survey, consisting of open questions. It was completed by 48 respondents. The survey was focused on the participants’ feedback on their performance (i.e. the challenges faced), the insights gained, and the lessons learned. In addition to the survey, the players participated also in an informal debriefing with organizers. As far as the survey is considered, the majority of players (67%) indicated that they had a problem in creating a situational overview and coordination between the teams. When it comes to the lessons learned. many people (47%) admitted that they recognized the importance of communication and coordination in a crisis situation. Reflecting on things they would do differently, many players answered that they would try to better divide tasks (44%) and achieve better coordination (38%). In addition, informal debriefing revealed that participants appreciated the realism of the game and deeply immersed in the activity, experiencing similar challenges as those felt by communities in a real post-disaster setting.  | The game is set in a rainy period; heavy rains have caused the rivers to burst from their banks. The residents of the affected area need to be evacuated, some needing assistance. The players have to manage the information flow, organize the response and assist the affected population. At the heart of the game is the mobile application provided to the participants. It is connected to a central database from which the game can be controlled and updated. The players use the app to scan QR codes placed throughout the game. |
| **12.** | **Disaster Master**  | 1) to help parents and educators **teach** young children on emergencies. | **Gampell and Gaillard (2016)** conducted first the content analysis of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*,, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific discourse analysis, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | To become a disaster master, a player experiences "serious" adventure, stepping into the heart of the action to face everything from home fires to earthquakes. They have to make the right choice and earn points to get to the next level.  |
| **13.** | **Dissolving Disasters** | 1) to support experiential learning and dialogue on the concept of “**resilience**”;2) to enhance **communication skills** under uncertainty;3) to enhance **decision making** under uncertainty;4) to understand the importance of roles of donors in humanitarian and development work. | The game is used within the Fagnavodrevo project (**Kueng, N. 2017**), implemented in Madagascar’s north-west Sofia region by the Malagasy Red Cross (MRC) and supported by the German Red Cross that is aimed at strengthening the resilience and disaster management capacity of 23 communities and more than 30,000 people in an area prone to floods and cyclones. MRC staff observes that the game encouraged communities to work together for the success of harvests and diversify their production where appropriate, to simultaneously prepare for floods, droughts and other extreme-weather events. Also **Suarez *et al*. (2014)** observed that from the outset of the game, players realized the need to discuss individual and collective strategies within their team. Participants identified the need to anticipate and manage changing risks when designing and implementing humanitarian and development work to build resilience.  | Players become donors or subsistence farmers and face changing risks. They must make individual and collective decisions, with consequences. Rich discussions emerge, and there will be winners and losers. |
| **14.** | **Earth Girl. The Natural Disaster Fighter** | 1) to **increase the awareness of natural disaster**s in the region (Southern Asia): tsunami, flooding and volcanic eruptions.  | The user-tests conducted on players and scientists **(Kerlow 2011; Kerlow *et al.* 2012)** were predominantly focused on the level of difficulty, scientific-reliability and playability. No relevant information on game’s effectiveness is provided. Other study was led by **Gampell and Gaillard (2016)** who conducted first the content analysis of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific discourse analysis, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | The game is split into three levels: tsunami, flooding, and volcano, each starting with a cinematic animated instruction. Each level combines action with knowledge acquisition. Players move forward through the first part of each level by rescuing villagers (In the tsunami scenario – the player must push villagers in the opposite direction to the approaching tsunami to rescue them. In the flooding scenario – the player must jump on the platforms (up and down) to reach the people who need help. After that s/he must bring them to a safe place. In the volcano – the player must run and push people to save them from falling rocks from the volcano.) This first part is followed by a quiz that presents multiple-choice questions relevant to the hazard being played. Correct answers enhance the players’ scientific knowledge and provide Earth Girl with additional health to save villagers. After completing the quiz correctly, the player may move to another part of the game. |
| **15.** | **Earthquake Response**  | 1) to **engage** a younger, new audience **in life-saving work**;2) to raise **awarenes**s of the needs of disaster victims and life-saving work of emergency relief | **Gampell and Gaillard (2016)** conducted first the content analysis of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Disaster Watch*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific discourse analysi**s**, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. |  An 8.2 magnitude earthquake has struck a densely populated island in the Atlantic Ocean. Thousands are injured and many more feared dead. Damage to buildings and infrastructure is widespread. The player has been sent by Save the Children organization to distribute life-saving aid to people affected. Put in the shoes of an aid worker, players try to identify needs, set up facilities, manage the logistics of incoming materials and allocate resources optimally. As the players save lives by supplying water, shelter, and medical aid to victims of the disaster, a level by level narration teaches them about disaster relief. |
| **16.** | **Evacuation Board Game** | 1) to learn how **traffic** is managed during the **evacuation**;2) to highlight the importance of **responsibility** and its effect on process of **evacuation;**3) to discuss topics such as: disaster **preparedness**, **disaster management, safety,** etc. | No information found. | The evacuation board game provides a simplified picture of traffic management during an evacuation. Because of the threat of a flood, the citizens of the area Greenwood must evacuate before the water level rises above 12. The game is played by four teams of 1–3 people; three teams of the municipalities, chaired by the mayor, and the traffic manager. The mayors take decisions together about the traffic streams and inform the traffic manager about their decision. The traffic manager commands a limited number of police officers and police cars per turn, to regulate traffic so that the evacuation will go efficiently. The game is played in turns. Every turn, the water rises one level. When the water has risen above level 12, the area is flooded completely and no further evacuation is possible. That is the end of the game. |
| **17.** | **Evacuation Challenge Game** | 1) to guide people through **evacuation process** and let them experience all the challenges it involves;2) to promote **empathy and tolerance between people** of different linguistic and cultural backgrounds and/or with disabilities, during evacuationand risk situations;3) to experience problems arising in a **multicultural and multilinguistic environment,** especially in the context of emergencie**s;**4) to realize the importance of **communication;**5) to train **decision making** skills. | The simulation, run in many places (including Wageningen, Netherlands, Valladolid, Spain and Istanbul, Turkey), has shown that in most cases the evacuation team fails to save all the participants. What is more, a vast majority of those left behind belong to the disadvantaged group. The results of the game are usually somewhat shocking, and thus draw players’ attention to the issues they have never taken into consideration during managing evacuation. As Dr. Çağlar Akgüngör from the AKUT Search and Rescue Association in Istanbul noticed after a simulation, the debriefing session often reveals various misconceptions that are deeply rooted in people’s minds. In this way players realize how difficult communication is when you can't understand people. They also learn empathy for the disabled during evacuation. | The Evacuation Challenge Game presents challenges connected with disaster response and evacuation during a disaster in a culturally and linguistically diverse environment. Participants take on the roles of citizens and rescue team members, soon realizing that the road to safety won’t be easy. |
| **18.** | **Evacuation Role Play Game** | 1) to learn about **evacuation plans** and about organization structure | No information found. | The role-playing game that presents many aspects of the evacuation planning.It is a way to get an insight in the process of evacuation and the preparation of an evacuation. Players enter the roles of the mayor, the disaster management official, the police officer, the medical advisor or the ordinary citizens. Each player receives an evacuation map and receives time to prepare for an information meeting about the evacuation scheme of the Greenwood area. The mayor starts the meeting. The disaster management official briefly explains the evacuation scheme that has been prepared for the area, and the discussion starts about the appropriateness of the proposition. |
| **19.** | **Extreme Event Game** | 1) to build **resilience** in the face of a disaster (by being able to assess the impact, prioritize resources, build coalitions, and adapt to changing circumstances);2) to improve **civic literacy / engagement** related to disaster resilience;3) to learn how to **collaborate** to solve problems **within small and large groups.** | As stated on the game’s website, its content draws on recommendations in the seminal National Research Council report and has been reviewed by experts and staff of the National Academies. In addition, the game was tested and refined over a 2-year beta period, so it is known that it works well with a variety of settings and groups. After iterative testing with different groups, evaluations showed that participants understood the importance of building coalitions, planning, communication, and how various sectors can or should work together in a community. | Players adopt the worldview of a character living in a fictitious city. They must work with others in their sector (one of the following: Households, Community Groups, Businesses, First Responders, Local & State Government, or Federal Government) to decide which resources to invest in to help make their city more resilient. Then, a simulated disaster occurs, complete with sound effects and narrative drama! The game becomes more intense as players use their resources—and collaborate with each other—to solve challenges in neighborhoods around the city. The game ends with a thought-provoking discussion to uncover lessons learned throughout the game. |
| **20.** | **Flood Resilience Game**  | 1) to help participants ­such as NGO staff working on flood-­focused programs ­ to identify novel policiesand strategies which **improve flood resilience;**2) to experience the effects on resilience of **investments in different types of “capital” – such as financial, human, social, built, and natural;** 3) to demonstrate the benefits of investment in **risk reduction** before the flood strikes;4) to discover the types of **decisions** needed to **avoid creating more flood risk in the future, incentivizing action before a flood** through enhancing **participatory decision-making;**5) to explore the complex outcomeson the economy, society and the environment from long-term development pathways. | The Game was tested and evaluated by adult NGOs and aid workers, i.a. in Lima (Peru) and Jakarta (Indonesia) in 2016. The testers’ feedback on the game’s effectiveness was mostly positive. The testers marked that they began the game with little knowledge about the real flood vulnerability of their community and throughout the play they progressed from reactive actions (levees, preparedness) towards avoiding risk creation (prospective risk reduction). They also claimed that they learnt to make better decisions in regard to investing in different types of assets, and developed ability to collaborate. It may be thus assumed that the game meets its aims.  | The game is set in a community living in an area exposed to floods, occurring with different severity. Players take roles of members of different citizen groups (workers, farmers, entrepreneur, financial services agent), local government and water board officials. Players’ decisions and actions focus on what happens before flood, and impact their outcomes following the flood. Each round players can learn and perform specific Flood Resilience Actions, based on the Zurich Flood Resilience Measurement tool. |
| **21.** | **FloodSim** | 1) to raise **public awareness** in of issues around flood policy and government expenditure in the UK; 2) to provide feedback to **insurers and policy makers about public attitudes** towards different flood protection options;3) to help citizens understand government policy and **motivate them to take action**, leading to questions in parliament and increased pressure on politicians. | The game’s outcomes were described, i.a. by **Rebolledo-Mendez et al (2009)**. The game was played by a large number of users (N=25,701) in a period of 4 weeks in 2008. Quantitative and qualitative analyses (on a reduced data set) were carried out in order to explore the impact of *FloodSim* play in raising the general public awareness around flooding in the UK. The results suggest *FloodSim* was hugely successful in generating general public interest and there was evidence that (a) *FloodSim* increased awareness at a basic level and (b) that despite the simplicity of the simulation, players perceived *FloodSim* to be an accurate source of information about flood risk and prevention. This suggests that serious games such as *FloodSim* have potential to engage the public and raise awareness of societal issues. However, *FloodSim* only raised awareness at a basic level. It is suggested that more needs to be done to endow serious games with pedagogical principles and more care should be given to the accuracy of the information they convey. Also **Gampell and Gaillard (2016)** conducted first the **content analysis** of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Disaster Watch*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific discourse analysis, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | *FloodSim* puts the player in control of flood policy in the UK for three years. Players decide how much money to spend on flood defences, where to build houses and how to keep the public informed. But as in real life, money is limited. The player must weigh up flood risks in different regions against the potential impact on the local economy and population. The game brings to life the complexity of the issue and the trade-offs that policy-makers are grappling with in real life. |
| **22.** | **Florima** | 1) to enhance **understanding of** flood risk managementin a high-stress environment;2) to highlight the process of **decision-making and fast reaction** to new situations. | No information found.  | A board game about flood risk management. This game is played in groups of four people. They each manage part of the area (industrial, natural, rural or urban) and invest money in different measures against flooding (represented by cards), such as emergency services, calamity preparation, levee reinforcement, insurance, etc., which apply either to their individual area or to all areas. While doing it, they have to weigh the costs against the benefits of each measure. The game has two goals: individual and collective. Individually, each player tries to earn as much money as possible. Collectively, each group aims at as few casualties as possible and protect their “country” against flood. |
| **23.** | **Forest@Risk**  | 1) to explore **community pathways** to sustainable forest management and disaster (earthquake and flood) preparedness and protection;2) to understand the challenges and social dilemmas involved in management of a mixture of **common-pool resources and public goods.** | More than 20 runs of the game have been conducted in China, India, Nepal and Singapore, and observations and preliminary results of the game runs have been reported in **Liu *et al*. (2017)**. Participants (~400) included community conservation and development project stakeholders, researchers, civil society organization staff, general public and government officials, researchers, students (high school, college and postgraduate). The uncertainties introduced by the hazards substantially increased the difficulty for the players to navigate through the complexity of the system, communicate about it, and coordinate. The game results vary substantially from sustainable management of forests and disaster risk, to complete collapse of the system, and to successful recovery after initial trend of deforestation (i.e., being resilient). Preliminary observations showed that groups that were able to communicate effectively and nurture trust usually resulted in higher forest cover, but not always higher level of community wealth and lower level of income disparity. Some feedback from players indicated that the game is effective in facilitate the understanding of social dimension (e.g., importance of social capital) of DRR and resilience building. | Players become members of the community and make decisions with regard to common-pool resource (i.e. forest) and public goods/investments (i.e. earthquake and flood protection infrastructure). The community faces hazards with unknown frequency and intensities to players. Individual income players gain, comes from his/her own decisions, but the costs depend on actions of the whole community . Players can choose how much of the resource they want to harvest. Players carry out community meetings to discuss and make rules for managing common and public goods.  |
| **24.** | **Game of Floods**  | 1) to **educate** on climate impacts and adaptation options;2) to encourage **public engagement** and **discussions** regarding the tradeoffs of adaptation measures.The game is a model for public engagement and education on climate change adaptation (seal level rise).  | **Bliss, L. (2017)** mentions some general feedback provided by the players, noting that the game helped expand awareness of community planning and may prove valuable as seeds of real-world adaptations. Moreover, after presenting the game to West Marin workshop participants in 2015, county staffers took the game to a handful of conferences around California. It caught the attention of planners, universities, and preservation societies,, which is hoped to raise risk-awareness of general public. | Players get the roles of planning commissioners weighing adaptation strategies against the very wet future of a hypothetical Marin Island. It’s a resource-management game, in the style of *Settlers of Catan*: There’s a hexagonal playing board with colorfully mapped flood zones; players choose community “assets” that they commit to protecting, such as a seabird colony, a parking lot, or an electrical substation. Players think through strategies to accommodate, defend, or retreat from their chosen parcels. They consider the potential loss or deterioration of homes, community facilities, roads, agricultural land, beaches, wetlands, lagoons, and other resources.  |
| **25.** | **Gender and Climate Game** | 1) to help subsistence farmers explore the option of **climate-change-resistant crops** to build **resilience;** 2) to help the Red Cross elicit farmer conversation about the **inequities confronted by women in a changing climate;****3) t**o understand the **role of gender in humanitarian** and development **planning**;**4) to learn about decision making under uncertainty;** **5) to** learn **communication skills**.  | The case study of the village of Matuu in Kenya **(Mendler de Suarez *et al.* 2012)** has shown that players are able to observe the outcomes of their actions, e.g. see their assets grow or dwindle based on how planting decisions match rainfall. Important “huh?” moments occur when both male and female players in the fictional role of “female farmers” realize that there is essentially no way for them to individually reverse the initial disadvantage women experience as a result of their gender in the game. The “aha!” moment often comes at the end, when everybody sees that ‘real’ women in the role of males perform at least as well as their male counterparts (often much better), and that it is within the power of the community to change gender inequalities, or at least begin to openly discuss them. The authors are thus positive that the game brings overlooked linkages to the light and may prove a useful tool for supporting gender-related issues in building community resilience and disaster awareness.  | A participatory activity to support experiential learning and dialogue on the differential vulnerability of women and men facing climate variability and change. Players first take on the role of subsistence farmers facing changing risks—then ‘walk in the shoes’ of a specific gender role. As farmers, players make disaster risk reduction choices: to invest money (represented by beans) in flood risk reduction (that it, to plant rice—which performs well under excessive or normal rains) or in drought risk reduction (that is, to plant cassava—which performs well under dry or normal conditions). No risk reduction, represented by planting maize (which fails when there is either too much or too little rain) costs no money. After this phase, weather conditions are introduced by rolling a die (6—flood, 1—drought), and the planting decisions result in harvest or disaster— gaining or losing beans. Players who do not have enough beans remaining to pay for response to a disaster must ‘migrate to the city to find work’ (leave the game). After this phase, gender dimension is introduced. The game proceeds similarly, but this time, if there is no disaster those that have planted a resilient crop gain 2 beans if they are playing men, but only earn 1 bean if they are women (due to their many other duties). |
| **26.** | **Gender Walk**  | 1) to explore **gender dynamics** within a community;2) to reflect on how adaptation measures can effectively address **gender dynamics;** 3) to **raise awareness** of gender-related problems encountered in a **climate change adaptation**.  | No information found. | This game explores gender dynamics within a community. Every participant receives a piece of paper that describes his or her role in the exercise (e.g. male headmaster of the school, single mother with 2 children, girl looking after the goats, wife of the local chief, male farm worker). Then they are asked to stand on one side of the room. The moderator reads out the list of questions (e.g. the president of the country is coming for a community visit. Are you invited? Do you qualify for a loan at the local bank?). If a participant can answer the question with a "yes" they may take one step forward. The game ends with a discussion. |
| **27.** | **Gifts of Culture** | 1) to understand how **cultural factors** affect disaster preparedness and ability to cope;2) to improve **collaboration** and **information sharing skills**, especially between organizations and individuals representing diverse cultural backgrounds;3) to improve community flood **resilience**;4) to diagnose organizational problems, **improve dialogue** and effective collaboration in professional environment. | The game was e.g. tested in Stockholm in 2016. The game’s participants’ feedback suggests that they learned the value of international and intercultural cooperation and undertaking long-term investments, realizing how difficult DRM is without proper information flow and willingness to overcome barriers between different people.  | Players become the representatives of various groups living in the flood-prone valley. Though they represent various views and ideals, they all have the same goal – for their group to have a better life. How will they achieve that with the constant threat of flood looming above their heads? |
| **28.** | **Hazagora** | 1) to better **understand** the geohazards and disasters;2) to o provide secondary students with key **scientific information** about the mechanisms of geohazards, their intensity, spatial extent, and impacts on infrastructure, natural resources and livelihoods; 3) to highlight the role played by the livelihood and the access to natural resources of families and communities in **controlling their vulnerability profile.**4) to **develop a resilient community** in the face of periodic geological hazards.5) to generate **discussion** about risk management strategies among DRM practitioners. | The game’s effectiveness tests were described by **Mossoux *et al*. (2016).** A total of nine game sessions (75 players in total) have been organized in different countries (Belgium, Comoros Islands, Democratic Republic of Congo, and Tanzania). The profiles of the players, aged 16 to 61, were varied, involving groups of students (secondary and university), citizens, junior university staff, and stakeholders with different academic backgrounds and experience with hazardous events. The progress of each game session was recorded using a digital voice recorder and pictures were taken to illustrate the development of the families and infrastructures established on the board game at the end of each year and after each hazardous event. In addition, an observer, different from the game master, took notes to document the remarks and strategies adopted by the players. In order to assess whether the learning objectives of the game were met (developing a community resilience), a short questionnaire was distributed before starting the game to define the profile of the players, their relation with hazardous events and their knowledge on the factors influencing disasters. At the end of the game, a second questionnaire to evaluate the players’ opinion of the game and their knowledge of the factors influencing disasters was completed. The same set of statements, related to the factors influencing disasters, was proposed in both surveys but in a different order to avoid automatic answering. The player was asked to express his level of agreement with each statement using a five-level Likert scale. The survey demonstrates that most players already had some understanding about disasters before the game but that their knowledge tended to improve after the game. The objectives achieved depend on the targeted public. For people with little knowledge about geohazards or disasters, Hazagora mainly manages to improve their understanding of geohazards and the factors controlling a disaster. For people confronted in their daily life with geohazardous events, the game is mainly able to generate discussions which may help in developing risk management strategies. Hazagora contributes to make players more aware of (1) mechanisms of hazards, their intensity, spatial extent, and impacts on infrastructures, natural resources, and livelihood; (2) the elements influencing the vulnerability of a community with respect to hazardous phenomena; and (3) potential strategies that can be applied to make a community more resilient. Indeed, new DRR strategies can be implemented in the game which allow players to test various risk management approaches without having to deal with the real consequences of their decisions. The game is therefore a new relevant alternative among the many tools and methods that have already been proposed for raising awareness on disaster risk reduction. | During the game, the players embody five characters that live on the Hazagora volcanic island: the mayor, the fisherman, the lumberjack, the farmer and the tourist guide. They have to develop themselves on the island and sustain their community. But they also have to prepare themselves to face several hazards that can hit the island such as earthquakes, lava flows, tephra fall, and tsunamis. The players can therefore acquire during the game protections cards or define during council meetings specific communities strategies in order to become more resilient. During the game, players learn about the mechanism of the hazards, their impacts and protection measures that can be implemented.  |
| **29.** | **Hurricane Strike!** | 1) to introduce **basic concepts of atmospheric science**, climate, and geography.2) to learn life-saving **safety** and **preparedness skills.** | No information found.  | *Hurricane Strike!* creates a scenario to frame the scene for learning activities. The learner is a virtual house guest of the Castillo family in Fort Walton Beach, Florida. Over the course of seven days, Hurricane Erin forms in the Atlantic Ocean, crosses the Florida panhandle, and then makes another landfall at Fort Walton Beach. During these days, the learner is introduced to many basic concepts of atmospheric science, climate, and geography, while also learning some important and possibly life-saving safety and preparedness skills. Each day's scene is composed of three main pieces: the forecast update (accessed by clicking the TV), a safety interactive piece (accessed by clicking Hugo, the dog), and science and safety content available from a laptop computer (accessed by clicking the large, red, left arrow to go to the computer room). |
| **30.** | **Inside the Haiti Earthquake** | 1) to **challenge assumptions** about relief work in disaster situations; 2) to **gain information** about the earthquake;3) to promote **empathy and civic engagement**. | **Bachen *et al.* (2016)** have examined the effectiveness of the simulation in promoting empathy, a disposition that some educators and game designers argue is especially important for students to learn as part of civic and moral education. Their study on 146 U.S. college students (54 males, 92 females, between 18–24 years old) playing one of two roles in the game (a journalist or Haiti survivor) suggests that the immersion and interaction (so called presence) experienced in the game triggered empathy in players, which significantly increased their interest in learning more about the game topics (natural disasters and international response to them). The survey conducted by **Jenner (2014)** also confirms that the simulation may act as a catalyst for carrying out actions beyond the game’s environment, i.e. finding out more about the issues dealt with or entering into discussion. It also triggered emotional engagement, while “players” claimed that they felt closer to victims and were able to understand their position. Some participants also pointed that *Inside the Haiti Earthquake* made the complexities of humanitarian relief “easier” to understand. The analysis of the simulation as an example of transmedia journalism, on the other hand, was conducted by **Pase  *et al* (2012**). The authors’ analysis of the simulation suggests that it has the potential to amplify the news experience, appealing to more than one sense for the assimilation of content, and building personalized net of knots and nexuses. In this way the simulation may support people in becoming more critical with regard to the common “assumptions about relief work in disaster situations.” Moreover, **Gampell and Gaillard (2016)** conducted first the content analysis of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Disaster Watch*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific discourse analysis, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | It is a immersive simulation based on real footage from the Haiti Earthquake. The player can take on one of three roles: the aid worker, the journalist, the survivor. In each of these roles, the player must make decisions which are presented in a given situation. After selecting answers begins the real relation from Haiti. Each decision leading to other problems which builds up during disasters |
| **312.** | **Lords of the Valley** | 1) to develop skills for effective **communication and collaboration**;2) to learn how to align goals, negotiate and **coordinate actions** | The game has been played with a varied audience, ranging from teenagers to NGO’s staff. Their feedback collected after the game sessions was generally positive. Players stated that the game’s advantage is the experiential potential: it helps people experience real-life challenges in a safe environment, and supports understanding of complexity of policy making in the context of DRM. | The *Lords of the Valley* game is a professional role-play simulation that takes place in the valley of the river exposed to unexpected droughts and floods. Players assume the roles of farmers-businessmen, public officials, banker, and NGO’s worker. They attempt to achieve their own goals, facing many challenges arising from the decisions of their co-players and the unpredictability of the environment. |
| **32.** | **Paying for Predictions** | 1) to illustrate the potential **value and limitations of forecasts** for the humanitarian sector and to help break down some of barriers to their effective use; 2) to convey the idea that it takes **investment of time and resources** for organizations to access and understand those forecasts.;3) to communicate that climate change and other trends are augmenting the risk of floods, and as a result forecasts become progressively more valuable to **reduce losses**;4) to **facilitate a dialogue proces**s between forecasters, humanitarian workers, government agents, donors and people at risk;5) to promote better **dissemination and interpretation of forecast** (e.g. **deliver them to right decision-makers**);6) t o enhance DRM employees and volunteers to **take action** and not be afraid of taking measures “in vain’” | Some information about the game’s effectiveness is provided by **Mendler de Suarez *et al.* (2012**). The data (from more than 10 sessions on 4 continents with hundreds of people) shows that game can accelerate learning about common errors of risk estimation and judgment committed by humanitarian workers, which can help people improve how they link early warnings with early action in the real world. It also contains a strong element of self-discovery, as individuals must express their risk preferences and make their ideas and feelings known to fellow team members while collectively discussing how much to invest in bidding for the forecast. A consistent lesson emerging from debrief discussion is that many people, who invested too little or too much in preparedness in early rounds, gain a better sense of the system and probabilities as the game evolves, and then converge towards the dominant strategy of investing in preparedness only at the right level of risk. These results were further confirmed by the case study (**Suarez *et al.* 2014)** conducted from mid 2012 until March 2013. The data collected through observation of their bids (during the game) and surveys (after the game) shows that the majority of people that bid 3 or 4 beans tend to stick to their bid (which, according to observed and modeled gameplay, leads to better outcomes). On the other hand, those who bid too much or too little are most likely to change their bid: Most players with lower bids recorded intention to bid higher, whereas players that paid too much for early warning tend to bid lower in the future. This constitutes evidence that gameplay helped participants reexamine their choices and apply what they learned in ways likely to improve their future performance.It’s worth noticing that the game inspired *Forecast Based Financing*—a novel humanitarian financing system where action is automatically triggered based on climate forecasts or observations. | Players play in teams of 3 people. They all become Red Cross Red Crescent workers, who face changing risks. Each group of 3 is a region, each person is a local branch. The beans they got represent the money/resources of every Red Cross Red Crescent Branch, and they cannot be shared. Players make individual and collective decisions on what (if any) flood preparedness measures to bid on. |
| **33.** | **Ready!** | 1) to increase **preparedness** of communities and NGO workers for taking action in response to early warning (to generate “early warning – early action” contingency plan);2) to enhance **communication** skills;3) to enhance  **teamwork**.  | The game was described and evaluated, i.a. by **van der Homberg *et al.* (2015)**. The researchers developed a paper-based survey for NGO staff and community people. The results showed that the staff saw great potential in embedding Ready! in DRR processes and that the community highly appreciated the game. It helped players prioritize early actions and make better decisions. The usefulness of the game was considered to be positive (they admitted that the game helped them make decisions and plan better). Regarding the learning outcomes, the results seem to indicate that the game has an added value for common CMDRR.The effectiveness of the game was also tested in Namibia with the representatives of two communities (Lisikili and Isize) subjected to annual flooding (**Macklin, C., 2012**) and in several other countries and settings by over 400 participants. Results from each site vary because of culture, differences in the activities and projects surrounding the games, but one of the most important lesson for the participants was the ability to apply actions from the game into real life.  | It is a combination of role-play and race. The facilitator selects an emergency scenario. The community is divided into teams of about 6 players. Each team must come up with early actions they can think of to complete in the event of the emergency scenario given and then select 8 of most important to which they assign priority and difficulty level. Then the race starts: the cards with the actions are put in different places in the room. Each group has 1 minute to complete their actions: In order to complete an action, a player must roll the die attached to that action until she rolls a 1.  |
| **34.** | **Riskland**  | 1) to provide Latin American and the Caribbean children as well as the school community with **tools and actions** which can reduce the impact **and increase risk reduction** 2) to **provide key information**, **basic terminologies** and ideas related to natural hazards and how to prevent disasters. 3) to trigger **people’s participation** in disaster prevention activities.  | The Riskland game was used as an educational component of the UNESCO Cross-Cutting Theme Initiative in 2004 (***A Final Report on the UNESCO Cross-Cutting Theme Initiative* 2005; Shaw and Rouhban 2005)** aimed at reduction of natural disasters in Asia, Latin America, and the Caribbean through incorporating risk management in public policy and city development plans. Within the project, the Spanish version of the game was implemented in several elementary schools in Antofagasta (Chile) and Kathmandu (Nepal). The students’ feedback was delivered at the final symposium, where they stated that the program helped them understand that everybody, including children and elderly people, should be informed on potential natural hazards. The participants also prepared concrete recommendations for future. The toolkit was also used during The World Disaster Reduction Campaign for 2006–2007 held under the theme "Disaster Risk Reduction Begins at School" **(Angulo-Thorlund 2007).** The campaign aimed at encouraging the integration of disaster risk education in school curricula in countries vulnerable to natural hazards. As part of the programme in Bangladesh, the disaster toolkit, including the game Riskland, was adapted to local contexts and language (as "Jhukipur theke Nishchintopur"—from Riskland to Land of Resilience). It received very positive feedback from children, who stated that “playing this game can improve their lives”, “with this game, it is possible to take steps toward disaster risk reduction;" and that they’ve learned “many things about natural disasters and risk”. It was also highly appreciated by the teachers, who expressed an opinion that “this school kit will help develop a knowledge bank in each community; therefore it will help promote a culture of sharing knowledge and practical experience on disaster risk reduction." The Initiative can be considered successful in helping children learn about disaster risks on a larger scale. Some information on Riskland’s application at school is also provided in Unicef’s report **(Selby and Kagawa 2012),** which reports the findings of a UNICEF/UNESCO Mapping of Global DRR Integration into Education Curricula consultancy. The researchers were tasked with capturing key national experiences in the integration of disaster risk reduction in the curriculum, identifying good practice, noting issues still lacking and reviewing learning outcomes. The game was integrated with e.g. Kazakhstan’s and Bangladesh’s curriculum. In the latter case, the game and its accompanying resources were received enthusiastically by school children, who claimed that it “has a lot of interesting things”. However, except for emotional reactions, no other learning outcomes were evaluated/observed.  | The board game is part of the whole educational kit “Let’s learn to prevent disasters!”. It includes booklet, on-line activities, and the board game 'Riskland' whereby players learn about what they can do to reduce disaster impacts by answering questions and advancing along the board’s winding path.  |
| **35.** | **Sai Fah: The Flood Fighter** | 1) to enhance **awareness** and **understanding** of **flood safety** and survival in a fun and dynamic way;2) to **impart key concepts in disaster risk reduction** to learners;3) to equip the general public with **readiness skills to mitigate** the effects of future flood disasters. | **Gampell and Gaillard (2016)** conducted first the content analysis of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Disaster Watch*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific discourse analysis, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | *Sai Fah: The Flood Fighter* follows the adventures of a young boy on a journey to reunite with his mother during a flood disaster. Players learn flood safety lessons as they encounter flood hazards, from live electrical current to dangerous wildlife. Each level of the game provides a new challenge – and lesson – on the safest course of action before, during and after floods. |
| **36.** | **Save Natalie! The Preparedness Game** | 1) to raise the children's' **awareness** and **preparedness** in the face of disaster by providing substantial information about the disaster. | No information found.  | In this board game, each player follows the spiral in a clockwise direction by moving the number of squares shown on the dice. The first player to reach the center, and save Natalie, with the exact number shown on the dice is the winner. Extra squares force player to take additional actions (e.g. go back to the beginning, stop for 2 rounds, etc.). The information printed on the board give some clues on how to act during and after a disaster.  |
| **37.** | **SerGIS: Malmö Flood Scenario** | 1) to **measure and teach critical spatial thinking** (reflection, spatial reasoning, problem solving processes and scepticism to challenging assumptions about spatial data, representations, methods and analytical outcomes) in a variety of application domains, such as DRR | Some information about preliminary evaluation of the tool (using a different game scenario) may be found in literature **(Tomaszewski, Szarzynski and Schwartz 2014; Tomaszewski, Schwartz and Szarzynski 2016); Tomaszewsk and Schwartz (2017).** The developers are gathering evidence on novice spatial thinking supported with GIS tools via think-aloud sessions. So far they tested 10 college students (6 females, 4 males) having pror GIS knowledge but new to crisis response, using not a flood but a city hurricane scenario (loosely based on actual events from 2012 Hurricane Sandy). The participants used the environment to answer a series of questions and they verbally expressed what they are thinking spatially about when using the environment. The sessions were transcribed and keyword frequency content analysis was performed to find thematic patterns that matched the National Research Council (2016) definition of spatial thinking, understood as an amalgam of three items: concept of space, tools of representation and processes of reasoning, and spatial thinking concepts (such as buffer, location, distance, identity, etc.) based on Lee and Bednaz (2012) research to develop a spatial thinking ability test (STAT). As a result of this process, main themes emerged: 1) process of reasoning (the participants were making distance estimations and reasoned about relationship between spatial patterns and potential vulnerable population impacts), 2) tools of representation (the participants were able to use different representation types such as points, lines and polygons to e.g. mark elevations on the map), 3) operations based on spatial thinking concepts (the participants were dealing with overlay and dissolve tasks that demanded advanced operations, such as clip, intersect or union to determine e.g. priority evacuation areas or medical treatment areas). All the above processes revealed areas of learning and knowledge gaps in GIS operations and mapping and geographic information, as some of the participants were not familiar with certain operations or terms (e.g. “choropleth map”). In addition to these themes, the gaming scores of the participants were also analyzed. The analysis revealed that participants with limited GIS experience, but with spatially-oriented education background, had higher game scores when compared to participants lacking spatially-oriented education background. With these results, it may be stated that the tool fulfills its objective to measure the level of students’ critical spatial thinking, as the aloud session revealed some learning gaps which may be further addressed via education. The game also provides some training of critical elements of spatial thinking. Little is known, however, how the game actually contributes to increasing spatial thinking ability, as the test did not directly focused on this issue.  | SerGIS: Malmö Flood Scenario is based on real geospatial data. A player becomes a new recruit to the city’s disaster relief program. Malmö, where the simulation takes place, has been experiencing severe flooding, especially in fall.Therefore players go through a non-linear question/answer structure and are awarded points for question responses and a final score at the end of the game. The multiple-choice questions relate to an artificial flooding scenario. Each time a player makes a choice, they are given expert feedback about it.The expertise is expected to help build critical spatial thinking skills and understand the capacities of GIS in general. |
| **38.** | **Stop Disasters!** | 1) to **understand** the risk brought on by **poor city management**;2) to **develop knowledge** about disaster **preparedness,** disaster **management** and connected problems;3) to learn what type of **preparations** are necessary to withhold **against** different natural disasters.  | Some information about the game’s impact on raising awareness on disasters among elementary school children in Rio de Janeiro is provided by **Felicio *et al.* (2014)**. The study was conducted on 185 children aged 10–13 playing a flood scenario. Before and after the game session, the participants answered a survey checking their basic knowledge and awareness of natural disasters. The results of the test suggest that the game raised basic awareness of natural awareness, however many students also suggested some changes to the game (graphics, difficulty of the missions, sound) that could improve game’s attractiveness.Another the study on 27 people (18 male and 9 female, between 26–35 years old) was conducted by **Pereira *et al.* (2015)** using a specific scenario – wildfire. The study’s aim was to collect evidence on the impact that the game had on players in terms of both its awareness raising potential (knowledge that could help players individually and collectively deal with wildfires) and overall player’s experience (interest/enjoyment, perceived competence, effort/importance, value/usefulness, pressure/tension and perceived choice). The disaster awareness was measured by a pre-test/post-test questionnaire, while the players’ game experience was measured by a post-test questionnaire. The results suggest that the game has raised the players’ awareness to wildﬁre prevention measures, both at an overall level and in speciﬁc topics: vacant land management, inhabited land management, community initiatives/materials and also community mechanisms. It was also found that for most players the game was perceived to be a fun/enjoyable and valuable/useful in a context of low tension/anxiety. Also **Gampell and Gaillard (2016)** conducted first the content analysis of selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Disaster Watch*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific discourse analysis, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | The object of *Stop Disasters* is to prevent people from being injured or dead. A player can choose the scenario and the level of difficulty. His aim is to build upon an established community: providing defences and upgraded housing to prepare for the inevitable disaster.The information panel provides a player with some substantial statistics about the population and budget, along with a mini map and a probability indicator. Additionally, when the player performs certain action, he/she can unlock key facts about scenario— these range from simple awareness messages regarding local communities to best practices.  |
| **39.** | **Story Go Round** | 1) to spark **creative thinking** about how communities can **mitigate disaster** by using local capacities in resourceful ways;2) to encourage **collaborative problem solving and planning**;3) to **bridge the gap between the local knowledge** of the community and the data banks of the Red Cross, by making Vulnerability and Capacity Assessment (VCA) research easier and more engaging;4) to create spaces for **discussion** of what items to **prioritize in disaster scenarios;**5) to teach **probability**, simulating **forecasting**, and opening communication about tradeoffs. | No information found | Players react to a disaster forecast by collaboratively creating a story of how they would react to the disaster. While doing it, they use the cards handed by the moderator (Things To Use—items existing in the community that could help mitigate the disaster or help save important items, Things To Save—valuables that the players would want to protect from the disaster). The players are given 10 minutes to create a story together using the cards they have, with the facilitator introducing a Wild Card (problems or events that could arise during a disaster scenario) after 5 minutes. This ends with each group taking turns acting out their story (charade style) for the other groups or spectators. The viewers then tell the story they thought was acted out. The story creators describe the story they had intended. After this, a die is cast to see whether the disaster occurred, to guide players to think about priorities and tradeoffs in disaster preparation.  |
| **40.** | **Super Volcano** | 1) to **raise awareness** of how volcano work and what threats they present to society. | There is no information about the evaluation of the simulation’s effect on players. However, the whole program was mentioned by **Miller, C.,F. and Wark, D. A. (2008**) who claimed that the BBC's campaign introduced the term *supervolcano* to both general public and scientific community, which triggered interest in this rare phenomenon. Hank Hesler, the Yellowstone’s park’s (where the supervolcano is located) geologist also said that the program evoke great public interest in the geology and geothermal features, and “people want to learn more.” In the same article, it is mentioned that shortly after the showing of *Supervolcano*, the U.S. Geological Survey (USGS) released the first-ever comprehensive and systematic review of the 169 U.S. volcanoes. USGS also established a framework for a National Volcano Early Warning System (NVEWS) which calls for a 24/7 Volcano Watch Office, and enhanced instrumentation and monitoring at targeted volcanoes – including Yellowstone. |  The game is the part of the whole BBC's campaign (consisting, i.a., of a docudrama "Supervolcano", a documentary "Supervolcano: The Truth about Yellowstone" and a simulation game "Supervolcano"). In the game, a player becomes the new Chief at the Emergency Management Agency for Bluebear Country. The game starts just before eruption. The player is given a rough estimation of time and reach of the tragedy, and in the next six minutes he has to prepare emergency response plan. When the time finishes, the 14-day timeline starts, and the player can watch how the disaster unfolds.  |
| **41.** | **UpRiver**  | 1) to help flood-prone communities **better understand** the causes of river flooding;2) to highlight the importance of upstream-downstream **communication and collaboration** for **reducing flood losses;** 3) to put into place an actual **communication network that relays upstream information** (thus triggering preparedness measures downstream);4) to **crowdsource river level data to improve the accuracy of computer models.**  | The game was e.g. tested in Zambia **(Bhagani 2014)**. After the experience, the Climate Centre’s Associate Director for Research and Innovation, Pablo Suarez said: “In the communities where we have had the fortune of going more than once, the game experience is remembered fondly and is frequently viewed as an eye-opener and the moment that created the appetite for people to want to learn more. One can see in the eyes of the participants the positive influence of the game experience which is fundamentally about experiential learning.” | *UpRiver* is a two-part early warning / early action game. The first part is a participatory game to convey the mechanics of how river levels change through space and time, and the importance of upstream-downstream communication to manage disaster risks. The second part, and SMS-based game played on cell phones, aims to further these concepts by simultaneously putting in place and actual communication network for relaying upstream information, and crowdsourcing river level data to help calibrate science-based hydrological models—thus accelerating more reliable flood predictions. In the analog game, players stimulate water levels along the river by standing in a line with cups filled with different amounts of water. Rainfall and evaporation are represented as sponges that add or subtract water from the cups (based on somewhat predictable yet random process involving special cards and dice). Players are asked to predict the final river level, and need to take early action if they anticipate that a flood will occur (i.e. water overflowing the cup). The default condition is that each player can only see what is going on in her own location. In the digital version, UpRiver is played via text message, with multiple players in various communities along the river—a web platform processes game inputs, manages flow of information from and to players, and allows to record and visualize crowdsourced data along the river. Predictions need to be submitted via SMS at scheduled deadlines chosen to match the periods of expected dynamism in river levels. In both the digital and analog games, players earn game currency by reporting water level about their local area. Those who outperform others in figuring out the river system win a small prize. |
| **42.** | **Upstream/Downstream** | 1) to promote **learning** about disaster risk, climate change and sound ecosystem management among vulnerable **communities that share a river watershed.**2) to promote **communication and collaboration** about disaster risk, climate change and sound ecosystem management among vulnerable **communities that share a river watershed.**3) to help identify a problem for assessing flood and drought risk and **define what options to take (decision-making).** | The game was tested with the target audience ( rural communities in Nicaragua). During playtesting (**Mendler de Suarez *et al*. 2012)**, players jointly came up with an innovative strategy to address changing risks: that downstream farmers would support their upstream neighbors (with loans after disasters and with subsidies to plant new trees in order to reduce risk of flood induced by deforestation) in what basically amounts to payment for ecosystem services—an environmental management approach that had not yet been introduced in the Moropoto area but was formulated independently by players.The emotional journey for each player can be described as going from the experience of challenges (i.e., climate risks seem almost impossible to manage due in part to the consequences of other people’s actions) to fellowship (i.e., working with farmers from other villages along the shared river opens new horizons for understanding and addressing the problem), to make-believe (i.e., in the simulated future, inter-community collaboration leads to climate-compatible development).  | The players assume the roles of farmers living in the upstream or downstream area (represented by the board). The goal of each farmer is to accumulate wealth by investing wisely in one’s farm (remembering about the possibility of droughts and floods). Lack of options among upstream farmers leads to deforestation (they sell timber to earn money), increasing flood risk downstream, which in turn makes downstream farmers look upstream as part of their own system. |
| **43.** | **VR for a New Climate** | 1) to **explore** diminishing Arctic sea ice;2) to help people experience **consequences of climate change** and extreme events;3) to explore the use of **Forecast Based** Financing ; | According to **Suarez (2017**), these two virtual reality experiences have enabled hundreds of participants to explore how science and finance can work in alliance to act faster and avert disasters. VR helps participants to envision the magnitude and implications of the changing global climate. This innovation is traveling to events worldwide, offering discovery and inspiration. As **Goering (2016)** notices, the game's testers find the game more engaging than just listening to information. She thus suggests that this type of a virtual reality game “can help create better understanding." | Confront the following tasks: 1) redirecting Arctic sea ice volume for the coming decades, and 2) managing flood operations through forecast-based financing downstream of a dam in the West African nation of Togo. |
| **44.** | **Weather or Not** | 1) to practise **forecast-based decision making** in relation to disasters;2) to make **good humanitarian decision;**3) to raise **awareness** about **climate-related disasters**;4) to model and address possible **actions and their outcomes** in crisis situations. (early warning, early action). | As stated by **Suarez and Macklin (2011)**, this game provides a simplified way for forecasters to experience the very real challenges faced by disaster risk managers once a forecast is issued. Forecasters recognize that actual forecasts are not as simple as in the game, and understand the need to improve the prediction tools. Similarly, after playing the game, disaster risk managers understand that at present, their default option is often to do nothing until the disaster materializes.  | Players become Red Cross teams in charge of shelter, health, etc. and must decide whether or not to preposition tents, medical kits or other relief items before a disaster materializes, based on a forecast of likely flooding. Upon becoming director of operations, players must consult with team members to choose between the risks of acting in vain (wasting resources, loss of trust) and failing to act (people suffering). |
| **45.** | **Young Meteorologit Program. Severe Weather Preparedness Adventure** | 1) to offer a safe, non-threatening **learning environment** that shows kids what they need to do to **prepare now to protect themselves** and help their families when a real disaster comes;2) to **help educators** and meteorologist communicate how to survive severe weather crises to students and their communities. | **Gampell and Gaillard (2016)** conducted first the content analysisof selected video games (including, i.e. *Beat the Quake*, *Build a Kit*, *Disaster Master*, *Disaster Watch*, *Earth Girl: The Natural Disaster Fighter*, *Earthquake Response*, *FloodSim*, *Inside the Haiti Earthquake*, *Sai Fah: The Flood Fighter*, *Stop Disasters*, *Young Meteorologist: Severe Weather Preparedness Adventure*). If possible each video game was played to determine which DRR actions were present within that particular video game. The actions of each category: prevention, mitigation and preparedness, became the criteria for the analysis. Further, the games with the highest scores in terms of DRR content were selected for specific discourse analysi**s**, which aimed at uncovering and understanding how disasters and DRR activities are portrayed and communicated to players. The results of the research suggest video games have the potential to be positive tools to reinforce messages surrounding DRR, yet more research (especially players’ experience evaluation) is needed. | The *Young Meteorologist* Program centerpiece is an interactive online game featuring a 21st-century Owlie, a junior data collector for the Weather Center, who helps kids learn more about and get prepared for dealing with real life severe weather and natural hazards. |

**APPENDIX D**

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| **1. EDUCATION, AWARENESS-RAISING IN REFERENCE TO DISASTERS IN GENERAL (24 segments)** |
| **2. Beat the Quake** | To **test** earthquake **safety knowledge.** |
| **5. Buzz about Dengue** | To create **awareness** about the cause and consequences **of dengue disease**. |
| **9. Disaster Awareness Game (DAG)** | To measure levels of **disaster awareness** among children in multicultural environment as a means of determining and prioritizing interventions **for** **disaster education**.  |
| **9. Disaster Awareness Game (DAG)** | To use children as conduits for the **education** of adults on **DRM** issues that are relevant to their environment. |
| **9. Disaster Awareness Game (DAG)** | To assist in **dispelling myths about hazards**, disasters and the management issues that pertain to them.  |
| **9. Disaster Awareness Game (DAG)** | To raise **awareness** on DRM. |
| **12. Disaster Master** | To help parents and **educators** **teach** young children on **emergencies**. |
| **14. Earth Girl. The Natural Disaster Fighter** | To increase the **awareness of natural disasters** in Southern Asia: tsunami, flooding and volcanic eruptions. |
| **15. Earthquake Response**  | To **raise awareness** of the needs of disaster victims and life-saving work of emergency relief. |
| **21. FloodSim** | To raise **public awareness** of the **issues around flood policy** and government expenditure in the UK.  |
| **22. Florima** | To enhance **understanding of** flood risk managementin a high-stress environment.  |
| **28. Hazagora** | To provide secondary students with key **scientific information** and better understanding of the mechanisms of geohazards, their intensity, spatial extent, and impacts on infrastructure, natural resources and livelihoods |
| **29. Hurricane Strike!** | To introduce **basic concepts of atmospheric science**, climate, and geography**.** |
| **30. Inside the Haiti Earthquake** | To gain **information** about the earthquakes. |
| **30. Inside the Haiti Earthquake** | To **challenge assumptions** about relief work in disaster situations. |
| **34. Riskland** | To provide key **information**, basic **terminologies** and ideas **related to natural hazards** and how to prevent disasters.  |
| **35. Sai Fah:The Flood Fighter** | To enhance **awareness** & **understanding** of **flood safety** & survival in a fun and dynamic way. |
| **36. Save Natalie! The Preparedness Game** | To raise the children's' **awareness** & preparedness in the face of disaster by providing **substantial information.**  |
| **38. Stop Disasters!**  | To develop **knowledge about** disaster preparedness, **disaster management** and connected problems. |
| **40. Supervolcano** |  To raise **awareness** of how volcano work and what threats they present to society. |
| **41. UpRiver** | To help flood-prone communities better **understand** the causes of river flooding. |
| **43. VR for a New Climate** | To **explore** diminishing Arctic sea ice. |
| **45. Young Meteorologist Program. Severe Weather Preparedness Adventure** | To offer a safe, non-threatening **learning environment** that shows kids what they need to do to prepare now to protect themselves and help their families when a real disaster comes. |
| **45. Young Meteorologist Program. Severe Weather Preparedness Adventure** | To help **educators** and meteorologist **communicate how to survive** severe weather crises **to students** and their communities. |
| **2. BEING PREPARED FOR DISASTERS/ TO MANAGE DISASTERS (24 segments)** |
| **2. Beat the Quake** | To learn **how to make a home a safe space** during an earthquake. |
| **3. Before the Storm** | To model and address possible **actions and their outcomes in crisis situations**. |
| **4. Build a Kit** | To help children **prepare** and build an **emergency kit** in the case of emergency. |
| **8. Decisions for the Decade**  | To help people recognize that there are aspects of the future climate that are deeply uncertain, and therefore managing risks may require **being prepared for surprises**. |
| **9. Disaster Awareness Game (DAG)** | To navigate players through **preparedness, prevention, mitigation, emergency response and recovery/rehabilitation.** |
| **10. Disaster Imagination Game (DIG)** | To support **preparednes**s (by helping participants identify hazards, specific vulnerabilities, manage mitigation measures and response to disasters). |
| **11. Disaster in My Backyard** | To help participants gain a betterunderstandingof the **operational circumstances, problems and situations faced during disasters.** |
| **11. Disaster in My Backyard** | To become acquainted with **disaster management in practice**.  |
| **16. Evacuation Board Game** | To discuss topics such as: disaster **preparedness**, **disaster management, safety** etc. |
| **23. Forest@Risk** | To explore community pathways to sustainable forest management and **disaster preparedness.** |
| **27. Gifts of Culture** | To understand how cultural factors affect **disaster preparedness** and ability to **cope**. |
| **29. Hurricane Strike!** | To learn life-saving **safety** and **preparedness skills.** |
| **31. Lords of the Valley** | To learn how to align goals, negotiate and **coordinate actions.** |
| **33. Ready!**  | To **increase preparedness** of communities and NGO workers for taking action in response to early warning (to help generate “early warning – early action” contingency plan.) |
| **34. Riskland** | To provide Latin American and the Caribbean children as well as the school community with **tools and actions** which can **reduce the impact.**  |
| **35. Sai Fah: The Flood Fighter** | To equip the general public with **readiness skills to mitigate** the effects of future flood disasters. |
| **36. Save Natalie! The Preparedness Game** | To **raise** the children's' awareness & **preparedness** in the face of disaster by providing substantial information |
| **38. Stop Disasters!**  | To develop knowledge about disaster **preparedness,** disaster **management** and connected problems. |
| **38. Stop Disasters!**  | To learn what type of **preparations** are necessary to withhold against different natural disasters. |
| **39. Story Go Round** | To create spaces for discussion of what items to **prioritize in disaster scenarios.** |
| **39. Story Go Round** | To spark creative thinking about how communities can **mitigate disaster** by using local capacities in resourceful ways. |
| **41. UpRiver** | To put into place an actual communication network that relays upstreaminformation (thus **triggering preparedness measures** downstream). |
| **44. Weather or Not** | To model and address possible **actions and their outcomes in crisis situations**. |
| **45. Young Meteorologist Program: Severe Weather Preparedness Adventure** | To offer a safe, non-threatening learning environment that shows kids what they need to **do to prepare now to protect themselves** and help their families **when a real disaster comes**. |
| **3. PARTICIPATION, ENGAGEMENT, CIVIC LITERACY, ACTION-TAKING (17 segments)** |
| **3. Before the Storm** | To promote meaningful **dialogue** among diverse stakeholders about the need to collaborate on **turning** science-based predictions **into concrete decisions**. |
| **8. Decisions for the Decade**  | **To support** learning and **dialogue** about key aspects of long-term investments under uncertainty |
| **10. Disaster Imagination Game (DIG)** | To trigger **community participation** in planning for disasters. |
| **15. Earthquake Response** | To **engage** a younger, new audience **in life-saving work**. |
| **19. Extreme Event Game** | To **improve civic literacy / engagement** related to disaster resilience.  |
| **20. Flood Resilience Game** | To discover the types of decisionsneeded to avoid creating more flood risk in the future, incentivizing action before a floodthrough enhancing **participatory decision-making.**  |
| **21. FloodSim** | To help **citizens** understand government policy and **motivate them to take action**, leading to questions in parliament and increased pressure on politicians. |
| **24. Game of Floods** | To encourage **public engagement and discussions** regarding the tradeoffs of adaptation measures.  |
| **27. Gifts of Culture** | To diagnose organizational problems, **improve dialogue** and effective collaboration in professional environment.  |
| **28. Hazagora** | To **generate discussion** about risk management strategies among DRM practitioners. |
| **30. Inside the Haiti Earthquake**  | To promote empathyand **civic engagement**. |
| **32. Paying for Predictions**  | To enhance DRM employees and volunteers to **take action** and not be afraid of taking measures “in vain”.  |
| **32. Paying for Predictions**  | To **facilitate a dialogue proces**s between forecasters, humanitarian workers, government agents, donors and people at risk.  |
| **33. Ready!**  | To increase preparedness of communities and NGO workers for **taking action in response** to early warning (to generate **“early warning – early action”** contingency plan |
| **34. Riskland** | To **trigger people’s participation** in disaster prevention activities. |
| **38. Stop Disasters!**  | To help players understandthe risk brought on by **poor city management**. |
| **39. Story Go Round** | To create spaces for **discussion** of what items to prioritize in disasterscenarios.  |
| **4. TEAM BUILDING, COOPERATION, SENSE OF COMMUNITY AND FACE-TO-FACE RELATIONSHIP (16 segments)** |
| **3. Before the Storm** | To promote meaningful dialogue among diverse stakeholders about the need to **collaborate** on turning science-based predictions into concrete decision.  |
| **6. Crossroad: Kobe** | To help local people **organize ways** to survive & manage disasters. |
| **6. Crossroad: Kobe** | To shift from more paradigmatic, scientific and top-down approach to risk reduction to the narrative mode, which deals with **human-to-human relations** (such as conflict resolution, consensus building).  |
| **8. Decisions for the Decade**  | To train **cooperation** to better manage risk. |
| **17. Evacuation Challenge Game** | To promote **empathy and tolerance between people** of different linguistic and cultural backgrounds and/or with disabilities, during evacuationand risk situations. |
| **19. Extreme Event Game** | To learn how to **collaborate** to solve problems **within small and large groups.** |
| **23. Forest@Risk** | To explore **community pathways** to sustainable forest management and disaster preparedness. |
| **27. Gifts of Culture** | To improve **collaboration** &information sharing skills, esp. **between organizations & individuals** from diverse cultural backgrounds. |
| **27. Gifts of Culture** | To diagnose organizational problems, **improve dialogue** and **effective collaboration** in professional environment. |
| **30. Inside the Haiti Earthquake** | To **promote empathy** and civic engagement. |
| **31. Lords of the Valley** | To develop skills for effective communication and **collaboration**. |
| **32. Paying for Predictions**  | To **facilitate a dialogue process between forecasters, humanitarian workers, government agents, donors and people** at risk |
| **33. Ready!**  | To enhance **teamwork**.  |
| **39. Story Go Round** | To encourage **collaborative problem solving and planning.**  |
| **41. UpRiver** | To highlight the importance of **upstream-downstream communication and collaboration** for reducing flood losses |
| **42. Upstream/Downstream** | To promote **dialogue and collaboration** about disaster risk, climate change and sound ecosystem management among vulnerable **communities that share a river watershed.** |
| **5. COMMUNICATION AND INFORMATION FLOW (14 segments)** |
| **6. Crossroad: Kobe** | To enhance **risk communication** and produce better solutions through the **sharing of accurate information** among governments, experts, companies, citizens and other parties concerned. |
| **6. Crossroad: Kobe** | To shift from more paradigmatic, scientific and top-down approach to risk reduction to **the narrative mode**, which deals with human-to-human relations (such as conflict resolution, consensus building) |
| **11. Disaster in My Backyard** | To introduce people to the field of disaster management in general and **information management** in particular. |
| **13. Dissolving Disasters** | To enhance **communication skills**, under uncertainty. |
| **17. Evacuation Challenge Game** | To realise the importance of **communication between** people of different linguistic and cultural backgrounds. |
| **25. Gender and Climate Game** | To learn **communication skills**. |
| **27. Gifts of Culture** | To improve collaboration and **information sharing skills**, especially between organizations and individuals representing diverse cultural backgrounds.  |
| **31. Lords of the Valley** | To develop skills for effective **communication** and collaboration. |
| **32. Paying for Predictions**  | To promote better **dissemination** and interpretation of forecast(e.g. **deliver them to right decision-makers**) |
| **33. Ready!**  | To enhance **communication skills.**  |
| **39. Story Go Round** | To **bridge the gap between the local knowledge** of the community **and the data banks of the Red Cross**, by making Vulnerability and Capacity Assessment (VCA) research easier and more engaging.  |
| **41. UpRiver** | To put into place an actual **communication network that relays upstream information** (thus triggering preparedness measures downstream). |
| **42. Upstream/Downstream** | To promote **communication** and collaboration about disaster risk, climate change and sound ecosystem management **among vulnerable communities that share a river watershed.**  |
| **45. Young Meteorologist Program. Severe Weather Preparedness Adventure** | To help educators and meteorologist **communicate** how to survive severe weather crises **to students and their communities**. |
| **6.** **DISASTER RESILIENCE (13 segments)** |
| **1. Act to Adapt** | To explore ideas on what can be done individually and collectively to reduce climate risks, adapt and become more **climate resilient**.  |
| **1. Act to Adapt** | To explore how different community resources are **vulnerable** to different types of extreme weathers and hazards.  |
| **7. Cultural Memory Game** | To help players understand the role of cultural memory in shaping the present and the future condition and, how it can become useful to **build resilience**.  |
| **9. Disaster Awareness Game (DAG)** | To encourage **positive behaviour among vulnerable people** at all stages of the disaster management cycle. |
| **13. Dissolving Disasters** | To support experiential learning and dialogue on the concept of “**resilience**” |
| **19. Extreme Event Game** | To build **resilience** in the face of a disaster (by being able to assess the impact, prioritize resources, build coalitions, and adapt to changing circumstances). |
| **20. Flood Resilience Game** | To help participants ­such as NGO staff working on flood-­focused programs ­ to identify novel policiesand strategies which **improve flood resilience.** |
| **20. Flood Resilience Game** | To **experience the effects on resilience** of investments in different types of “capital” – such as financial, human, social, built, and natural.. |
| **20. Flood Resilience Game** | To explore the **complex outcomes on** the economy, society and the environment **from long-term development pathways**. |
| **25. Gender and Climate Game** | To help subsistence farmers explore the option of **drought-resistant** crops to build **drought- resilience.** |
| **27. Gifts of Culture** | To improve community flood **resilience**.  |
| **28. Hazagora** | To **develop a resilient community** in the face of periodic geological hazards.  |
| **28. Hazagora** | To highlight the role played by the livelihood and the access to natural resources of families and communities in **controlling their vulnerability profile.** |
| **7.** **DECISION-MAKING (12 segments)** |
| **3. Before the Storm** | To improve **decision–making** in crisis situations.  |
| **8. Decisions for the Decade**  | To support learning and dialogue about key aspects of long-term **investments under uncertainty.** |
| **11. Disaster in My Backyard** | To provide a training on **decision making**, uncertainty exercises, similar to a real life scenarios.  |
| **13. Dissolving Disasters** | To enhance **decision making** under uncertainty. |
| **17. Evacuation Challenge Game** |  To train **decision making** and communication skills.  |
| **20. Flood Resilience Game** | To **discover** the **types of decisions** needed **to avoid** creating more flood **risk** in the future, incentivizing action before a flood through **enhancing** participatory **decision-making**.  |
| **22. Florima** | To highlight the process of **decision-making and fast reaction** to new situations.  |
| **25. Gender and Climate Game**  | To learn **decision making** under uncertainty. |
| **32. Paying for Predictions**  | To promote **better** dissemination and **interpretation of forecast** (e.g. deliver them to **right decision-maker**s)  |
| **39. Story Go Round** | To create spaces for discussion of **what items to prioritize in disaster scenarios.**  |
| **42. Upstream/Downstream** | To help identify a problem for assessing flood and drought risk and **define what options to take**.  |
| **44. Weather or Not** | To make **good humanitarian decision, to help better decision-making** |
| **8. REDUCING PRESENT AND FUTURE RISKS (12 segments)** |
| **1. Act to Adapt** | To explore ideas on what can be done individually and collectively to **reduce climate risks**, adapt and become more climate resilient. |
| **5. Buzz about Dengue** | To provide useful information on how to **reduce the risk** of infection through community mobilisation and organisation. |
| **8. Decisions for the Decade**  | To train **planning** for extremes to **better manage risk**. |
| **8. Decisions for the Decade**  | To realize that **managing risks** may require being prepared for surprises. |
| **9. Disaster Awareness Game (DAG)** | To **navigate** players **through** preparedness, **prevention**, mitigation, emergency response and recovery/rehabilitation. |
| **20. Flood Resilience Game** | To demonstrate the benefits of investment in **risk reduction** before the flood strikes. |
| **20. Flood Resilience Game** | To discover the types of decisionsneeded to **avoid creating more flood risk in the future, incentivizing action before a flood** through enhancing participatory decision-making**.** |
| **22. Florima** | To enhance **understanding of** **flood risk management** in a high-stress environment. |
| **28. Hazagora** | To generate discussion about **risk management strategies** among DRM practitioners. |
| **34. Riskland** | To trigger people’s participation in **disaster prevention** activities. |
| **35. Sai Fah: The Flood Fighter** | To **impart key concepts in disaster risk reduction** to learners. |
| **42. Upstream/Downstream** | To help identify a problem for **assessing flood and drought risk and define what options to take.**  |
| **9. EDUCATION / AWARENESS RAISING IN REFERENCE CLIMATE CHANGE (IMPACTS) / CLIMATE-RELATED DISASTERS (9 segments)** |
| **2. Act to Adapt** | To experience the **impacts of climate change.**  |
| **3. Before the Storm** | To raise **awareness** about **climate-related** **disasters**.  |
| **5. Buzz about Dengue** | To raise **awareness of**  dengue and other mosquito-borne diseases and **the role of climate change** in this process. |
| **24. Game of Floods** | To **educate on climate impacts** and adaptation options.  |
| **26. Gender Walk** | To raise **awareness** of gender-related problems encountered in a **climate change adaptation.**  |
| **32. Paying for Predictions**  | To **communicate** **that** **climate change** and other trends **are augmenting the risk of floods**, and as a result forecasts become progressively more valuable to reduce losses. |
| **42. Upstream/Downstream** | To promote **learning about** disaster risk, **climate change** and sound ecosystem management.  |
| **43. VR for a New Climate** | Tohelppeople **experience** consequences of **climate change** and extreme events.  |
| **44. Weather or Not** | To raise **awareness** **about climate-related disasters**. |
| **10. FORECASTS USE IN DRM (9 segments)** |
| **3. Before the Storm** | To introduce the **weather forecasts.**  |
| **3. Before the Storm** | To raise awareness about climate-related disasters, to turn **science-based predictions** into concrete decision.  |
| **32. Paying for Predictions**  | To illustrate the potential **value and limitations of forecasts** for the humanitarian sector and to help break down some of barriers to their effective use. |
| **32. Paying for Predictions**  | To convey the idea that it takes investment of time and resources for organizations **to access and understand those forecasts**. |
| **32. Paying for Predictions**  | To communicate that climate change and other trends are augmenting the risk of floods, and as a result **forecasts** become progressively more **valuable to reduce losses**. |
| **32. Paying for Predictions**  | To promote better **dissemination and interpretation of forecast** (e.g.deliver them to right decision-makers) |
| **39. Story Go Round** | To teach **probability**, simulating **forecasting**, and opening communication about tradeoffs.  |
| **43. VR for a New Climate** | To explore the use of **Forecast Based Financing**. |
| **44. Weather or Not** | To practise **forecast-based decision making** in relation to disasters.  |
| **11. MULTICULTURAL ASPECTS IN DRM (6 segments)** |
| **9. Disaster Awareness Game (DAG)** | To measure levels of disaster awareness among **children in multicultural environments** as a means of determining and prioritizing interventions for disaster education.  |
| **9. Disaster Awareness Game (DAG)** | To use children as conduits for the education of adults (including **migrant parents who do not know local language**) on DRM issues that are relevant to their environment. |
| **17. Evacuation Challenge Game** | To promote empathy and tolerance between peopleof **different linguistic and cultural backgrounds** and/or with disabilities, during evacuationand risk situations. |
| **17. Evacuation Challenge Game** | To experience problems arising in a **multicultural and multilinguistic environment,** especially in the context of emergencies. |
| **27. Gifts of Culture** | Tounderstand how **cultural factors** affect disaster preparedness and ability to cope. |
| **27. Gifts of Culture** | To to improve collaboration and information sharing skills, especially between organizations and individuals representing **diverse cultural backgrounds**. |
| **12. GENDER ASPECTS IN DRM (5 segments)** |
| **25. Gender and Climate Game**  | To help the Red Cross elicit farmer conversation about the **inequities confronted by women** in a changing climate.  |
| **25. Gender and Climate Game**  | To understand the **role of gender in humanitarian** and development **planning**. |
| **26. Gender Walk** | To explore **gender dynamics within a community**. |
| **26. Gender Walk** | To reflect on how adaptationmeasures can effectively address **gender dynamics**. |
| **26. Gender Walk** | To raise the awareness of **gender-related problems** in a climate change adaptation.  |
| **13. EVACUATION (5 segments)** |
| **16. Evacuation Board Game** | To learn **how traffic is managed** during the **evacuation**. |
| **16. Evacuation Board Game** | To highlight  **the importance of responsibility** and its effect on **process of evacuation.** |
| **17. Evacuation Challenge Game** | To **guide** people **through evacuation process** and let them experience all the challenges it involves |
| **17. Evacuation Challenge Game** | To promote empathy and tolerance between people of different linguistic and cultural backgrounds and/or with disabilities, **during evacuation** and risk situations.  |
| **18. Evacuation Role Play Game** | To learn about **evacuation plans** and about organisation structure. |
| **14. SUSTAINABLE RESOURCE / CAPITAL MANAGEMENT (5 segments)** |
| **8. Decisions for the Decade**  | To support learning and dialogue about key aspects of **long-term investments** under uncertainty. |
| **20. Flood Resilience Game** | To experience the effects on resilience of **investments in different types of “capital” – such as financial, human, social, built, and natural.**  |
| **23. Forest@Risk** | To explore community pathways to **sustainable forest management** and disaster preparedness. |
| **23. Forest@Risk** | To understand the challenges and social dilemmas involved in **management of common-pool resources**.  |
| **28. Hazagora** | To highlight the role played by the livelihood and the **access to natural resources** of families and communities in controlling vulnerability profile. |
| **15. STATISTICS/ DATA COLLECTION (5 segments)** |
| **3. Before the Storm** | To **collect data** on how humanitarian workers estimate probabilities (may be useful in developing **Forecast Based Financing” systems**) |
| **7. Cultural Memory Game** | To provid**e** **museums and civil protection organizations with** a tool for gathering **input from the young people** about museum / civil protection disasters-related educational activities**.** |
| **9. Disaster Awareness Game (DAG)** | To **measure levels** of disaster awareness among children in multicultural environments as a means of **determining and prioritizing** interventions for **disaster education.** |
| **21. FloodSim** | To **provide feedback to insurers and policy makers about public attitudes** towards different flood protection options |
| **41. UpRiver** | To **crowdsource river level data to improve the accuracy of computer models.**  |
| **16. IMPORTANCE OF MEMORY / PAST EXPERIENCES (4 segments)** |
| **6. Crossroad: Kobe** | To use **witnesses and survivors’ testimonials** as a lesson from which people can learn.  |
| **7. Cultural Memory Game** | To help players **understand the role of cultural memory** in shaping the present and the future condition and, how it can become useful to build resilience.  |
| **7. Cultural Memory Game** | To let players learn how to **recognize signs of cultural memory** connected to specific disasters (relate facts). |
| **7. Cultural Memory Game** | To connect **cultural memory** and disaster protection measures |
| **17. SPATIAL THINKING (1 segment)** |
| **37. SerGIS: Malmö Flood Scenario** | To **measure and teach critical spatial thinking** (reflection, spatial reasoning, problem solving processes and scepticism |

**APPENDIX E**

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| **GAMES** | **CONFIRMED POSITIVE CHANGE** | **EVALUATION TECHNIQUE** |
| **1. Act to Adapt** | ? | ? |
| **2. Beat the Quake** | Gampell and Gaillard (2016) | content and discourse analysis |
| **3. Before the Storm** | Mendler de Suarez *et al*. (2012) | game sessions (observation) and players’ feedback |
| **4. Build a Kit** | Gampell and Gaillard (2016) | content and discourse analysis |
| **5. Buzz about Dengue** | Mendler de Suarez *et a*l. (2012) | game sessions (observation) and players’ feedback |
| **6. Crossroad: Kobe** | Kikkawa *et al*. (2004) | 1) a pre-game survey; 2) an exposure to the game; 3) a post-game survey |
| Yamori *et al*. (2005)  | 1) a pre-game survey; 2) an exposure to the game; 3) a post-game survey |
| Yamori and Kikkawa (2005)  | 1) a pre-game survey; 2) an exposure to the game; 3) a post-game survey |
| **7. Cultural Memory Game** | The Centre for Systems Solution’s database | game sessions (observation) and players’ feedback |
| **8. Decisions for the Decade**  | Suarez *et al.* (2014\*) | game sessions (observation) and players’ feedback  |
| **9. Disaster Awareness Game (DAG)** | Clerveaux and Spence (2008), Clerveaux and Spence (2009); Clerveaux *et al.* (2010) | 1) a pre-game survey, 2) an initial game exposure, 3) providing the participants with disaster management information and 4) a post-game assessment |
| **10. Disaster Imagination Game (DIG)** | Yanagawa *et al*. (2016) | game sessions (observation) and players’ feedback.  |
|  | Meesters and van de Walle (2013) | game sessions (observation) and players’ feedback  |
| Meesters et al. (2014) | game sessions and a post-game survey  |
| **12. Disaster Master** | Gampell and Gaillard (2016) | content and discourse analysis |
| **13. Dissolving Disasters** | Kueng, N. (2017) | game sessions (observation) and players’ feedback |
| Suarez *et al.* (2014)  | game sessions (observation) and players’ feedback |
| **14. Earth Girl. The Natural Disaster Fighter** | Gampell and Gaillard (2016) | content and discourse analysis |
| **15. Earthquake Response**  | Gampell and Gaillard (2016) | content and discourse analysis |
| **16. Evacuation Board Game** | ? | ? |
| **17. Evacuation Challenge Game** | Centre for Systems Solutions’ database | game sessions (observation) and players’ feedback |
| **18. Evacuation Role-Play Game** | ? | ? |
| **19. Extreme Event Game** | Information on the game’s website | game sessions (observation) and players’ feedback  |
| **20. Flood Resilience Game** | Centre for Systems Solution’s database | game sessions (observation) and players’ feedback |
| **21. FloodSim** | Rebolledo-Mendez, G. et al (2009) | a qualitative and quantitative analysis of 1) the demographic information left on the game’s site, 2) feedback left on the site, 3) telephone semi-structured interviews |
| **22. Florima** | ? | ? |
| **23. Forest@Risk** | Liu, W. *et al.* (2017)  | game sessions (observation) and players’ feedback |
| **24. Game of Floods** | Bliss (2017) | game sessions (observation) and players’ feedback |
| **25. Gender and Climate Game**  | Mendler de Suarez *et al.* (2012) | game sessions (observation) and players’ feedback  |
| **26. Gender Walk** | ? | ? |
| **27. Gifts of Culture** | Centre for Systems Solution’s database | games sessions (observation), players’ feedback |
| **28. Hazagora** | Mossoux *et al*. (2016)  | 1) a pre-game survey; 2) an exposure to the game; 3) a post-game survey |
| **29. Hurricane Strike!** | ? | ? |
| **30. Inside the Haiti Earthquake** | Jenner (2014) | a mixed method: 1) surveys, 2) qualitative interviews, 3) focus group discussions |
| Bachen *et al*. (2016) | 1) a pre-game survey; 2) an exposure to the game; 3) a post-game survey |
| **31. Lords of the Valley** | Centre for Systems Solutions database | game sessions (observation) and players’ feedback |
| **32. Paying for Predictions**  | Mendler de Suarez *et al* (2012) | game sessions (observation) and players’ feedback  |
| Suarez *et al.* (2014) | game sessions (observation) and a post-game survey  |
| **33. Ready!**  | van der Homberg *et al*. (2015) | game sessions (observation) and a paper-based self-assessment survey (closed and open questions) |
| [Macklin (2012)](http://climatecentre.org/downloads/files/Case%20studies/AW_RCCC_working%20paper%203%20READY%20web.pdf) | game sessions (observation) and players’ feedback  |
| **34. Riskland** | A Final Report on the UNESCO Cross-Cutting Theme Initiative (2004); Shaw and Rouhban (2005); Angulo-Thorlund (2007); Selby and Kagawa (2012) | game sessions (observation) and players’ feedback |
| **35. Sai Fah: The Flood Fighter** | Gampell and Gaillard (2016) | content and discourse analysis |
| **36. Save Natalie! The Preparedness Game** | ? | ? |
| **37. SerGIS: Malmö Flood Scenario** | Tomaszewski *et al.* (2014), Tomaszewski *et al*. (2016) | content analysis of participants’ verbal reactions to in-game questions + analysis of the game’s scores |
| **38. Stop Disasters!**  |  Felicio, S.P.A.S. et al (2014) | 1) a pre-game survey; 2) an exposure to the game; 3) a post-game survey |
| Gampell and Gaillard (2016) | content and discourse analysis |
| Pereira *et al* (2015) | 1) a pre-game survey; 2) an exposure to the game; 3) a post-game survey |
| **39. Story Go Round** | ? | ? |
| **40. Supervolcano** | ? | ? |
| **41. UpRiver** | Bhagani (2014) | game sessions (observation) and players’ feedback |
| **42. Upstream/Downstream** | Mendler de Suarez *et al.* (2012) | game sessions (observation) and players’ feedback  |
| **43. VR for a New Climate** | [Suarez](https://ajem.infoservices.com.au/items/AJEM-32-02-05) (2017) | game sessions (observation) and players’ feedback |
| Goering (2016)  | game sessions (observation) and players’ feedback |
| **44. Weather or Not** | Suarez and Macklin (2011) | game sessions (observation) and players’ feedback  |
| **45. Young Meteorologist Program. Severe Weather Preparedness Adventure** | Gampell and Gaillard (2016) | content and discourse analysis |