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*Supplement of*

## ***Breaking the Silos: an online serious game for multi-risk disaster risk reduction (DRR) management***

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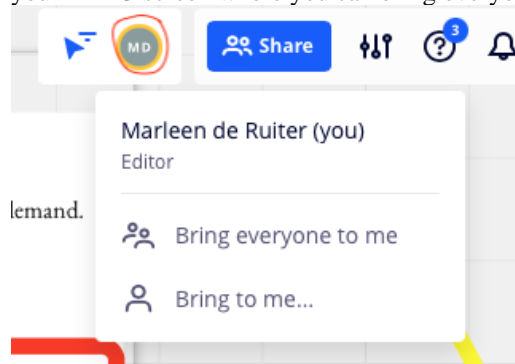
## S1. MODERATOR GUIDELINES AND STOYLINE

1. Moderate to narrate the background story
 

“During today’s game you are all taking on the role of an important decision maker or key stakeholder who are all involved in the disaster management of a fictional country. Today’s game takes place in a country with a strong economic dependence on the agricultural sector. 80% of the population of this country depends on this sector for their livelihood. The socioeconomic inequality in the country is high. The island is impacted by different climate-related hazards. Risk knowledge is very fragmented. The country has gone through political unrest during the past decade and has therefore not been able to maintain or improve its Disaster Risk Reduction measures. You want to show that your country can efficiently deal with disasters and be a world example. If you do so, you will attract financial aid from the international community.”

2. Round 1

- a. Call the players to the centre of the main board game (there is a function on the top right of your MIRO screen where you can bring everyone to where you are at)



- b. Moderator to read the first-round story:
 

“Let’s start the first round. The country was hit by a medium intensity tropical cyclone a week ago. The impacts were substantial: close to 20,000 people were impacted, more than 400 buildings were damaged or completely demolished, 2 hospitals were severely damaged, 1 airport. Finally, the tropical cyclone destroyed agricultural areas, threatening food security. The key decision makers and stakeholders (identified as such by the president) are getting together today for your daily briefing. The meeting is chaired by the president. The main agenda item for this meeting is to make a decision on how to spend up to 30,000 coins on disaster risk reduction. Everyone has their own interests, knowledge and perception; some of them may be conflicting. As knowledge is fragmented, you will need to collaborate to get a complete picture. Different DRR measures take different amounts of time to implement, have different costs, and target the risk of different hazards. This may help you to prepare for the next disaster.”
- c. Moderator to remind participants to please focus on their own information cards rather than reading other people’s roles.
- d. Put timer to 3 minutes in MIRO to allow the participants to read their role card and remind them that it is up to them whether they share knowledge.
 



“Please be reminded that the president has the final say, that the Minister of Finance is responsible for doing the calculations of the total costs of the DRR measures and for making sure you do not go over budget and remember that the international community can provide financial support after the first-round if, by the end of the first round, you meet their requirements.


You will now have exactly 15 minutes to discuss what DRR measures each of you would like to take and then you have another 10 minutes to come to a final decision that is within your budget.”
- f. (Moderator starts the timer in Miro for 15 minutes.

- g. After 15 minutes, set the timer for 10 minutes and ask the president to use a maximum of 10 minutes to come to a final decision that is within the budget.

3. End of round 1

- a. Now that all the icons are on the board, fill in the DRR measures.  
 b. If they planted crops in an area that is too highly populated (identified by crosses in Excel) they can't plant those crops.  
 c. Check that they did not go over budget how much they have left. This is automatically calculated. If they overspend it is your call what measures you cut. Report back to the group after the break.  
 d. Take a screenshot of the recovery objectives, the revised budget and the new impact table paste them next to the main board. Remove the previously impacted cell: in MIRO click on the red crosses, unlock it, and delete. Copy-paste the new crosses of the next disaster on the main board game: go to the "Crosses" frame (you can get a list of the frames by clicking on the lower left

button , unhide it (  ) then copy-paste the new crosses on the new impacted cells

on the map. Don't forget to lock (  ) the group of crosses so that the players don't move them.

- e. Finally, add the crane icon to any NBS, dam and relocation icons on the board. The crane icon is in the hidden admin board frame.

4. Round 2

- a. Discuss the recovery (the met/not met column). Have all the impacted hospitals, buildings, airports, crop requirements been met?  
 "The international aid community set several targets for the country to meet in order to get additional finances. These were to take measures to address all the damages to hospitals, crops, airports, and the population. You met ..... of these targets. But you did not meet... As a result, you receive an additional 5000 coins in funded / you receive no additional funding."

- b. Explains the situation:

"It is now several months after the tropical cyclone caused severe damage and while recovery efforts are still ongoing, the country is now hit by a new disaster, a very severe drought in the South of the country. This has caused large damages to the important agricultural areas of the island. XX people were affected. This is XX more/fewer than would have been the case without your DRR measures XX buildings were damaged. This is XX more/fewer than would have been the case without your DRR measures. XX hospitals and XX main airports were affected. This is XX more/fewer than would have been the case without your DRR measures. XX cells of agricultural area were affected. This is XX more/fewer than would have been the case without your DRR measures.

You find yourselves back in a meeting room with the same actors as months ago. This drought has created major disruptions in the construction of long-term DRR measures: even though you invested the money in these DRR measures, the construction of dams and NBS are heavily delayed due to economic disruption caused by the drought disaster. This is signalled by the crane icons on the NBS and dam icons of round 1. In other words:

- If you planned DRR measures that took longer than months to complete (a dam, nature-based solutions or relocation incentives), they have not yet been constructed, so they do not work in this disaster!
- If you moved people (refugees) after the tropical cyclone to the south, they are now impacted by the drought.
- You have been allocated some new funds, both from tax collection and, if successful in round 1, from international aid: what will you do to help your country recover? Note that you can remove a DRR measure from previous rounds but will not recover funds already spent.

You will now have exactly 7 minutes to discuss what DRR measures each of you would like to take and then you have another 3 minutes to come to a final decision that is within your new budget."

- c. Go through the 'updated budget'. Show them how much funds they have now from the screenshot.  
In your new budget, you now have **XX** coins. This includes **10,000** from tax collection, **5000 or 0** from international funds, and any money you may have had left over from last year. The Minister of Finance needs to add the new numbers into the calculation sheet and clear its budget sheet.
- c. Start timer give them 7 min to discuss things, followed by 3 minutes to come to a final conclusion - start the timer again.

5. Repeat from point 3 on for subsequent rounds.

**S2. DRR measures calculation tool for moderators**

This tool is not visible to the players. It allows the moderator to copy the location and number of DRR measures implemented per DRR measure. The tool automatically calculates:

- The amount of coins spend;
- Whether the requirement to be eligible for international aid has been met;
- The (a)synergies between DRR measures;
- The impacts of the disasters and the change in risk due to the implemented DRR measures compared to a status quo.

The tool consists of the following parts:

- Random disaster and impact generator for round 1.

Based on the random generator (see below), write an X the area affected						
	A	B	C	D	E	F
1						
2						
3					X	X
4				X	X	X
5					X	X
6						
7						
8						
9						
10						
11						

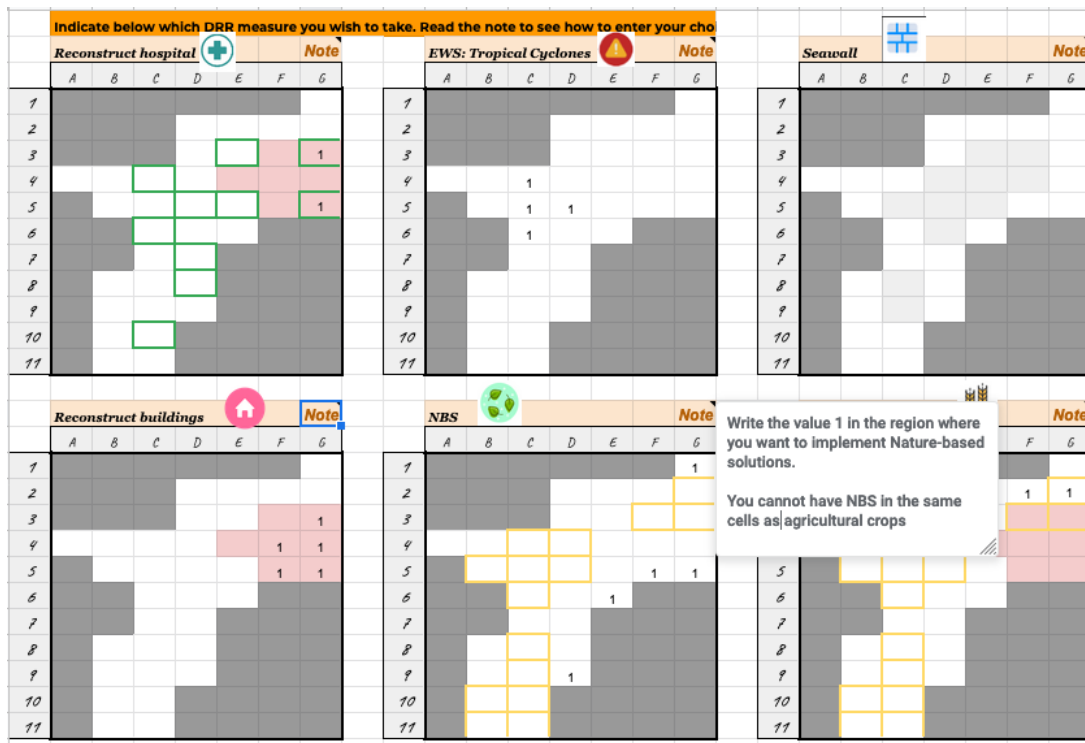
Element	Impact of tropical cyclone
People	18,800
Buildings	420
Hospitals	2
Main Airport	1
Agricultural area	2

Random generator	
1- To start the random generator, write an X in the red cell	
2- Write down the values in the yellow cells as they will automatically change once you select the affected areas!	
	X Obtained
Random hazard	2 Tropical C. (1=Tropical cyclone, 2= Drought, 3=Flood)
Random intensity	2 MEDIUM (1=Low,2= Medium, 3=High)
Random nb. cells	15 7

*Random disaster and impact generator for round 1.*

- Insert implemented DRR measures.



Overview of implemented DRR measures.

- Overview of coins spent on DRR measures.

Measure	Cost	unit	Min nb. of unit	Nb. selected	Subtotal	Implementation time
	(coins)				(coins)	
Reconstruct hospital	3,000	/building	1	2	6,000	MEDIUM
Reconstruct buildings	600	/ cell	1	5	3,000	SHORT
EWS: Tropical Cyclones	1,000	/cell	4	4	4,000	MEDIUM
Seawall	500	/cell	1	0	-	SHORT
NBS	200	/cell	1	5	1,000	LONG
Plant normal crops	300	/cell	1	7	2,100	MEDIUM
Drought-resistant crop	500	/cell	1	8	4,000	MEDIUM
EWS: Flood	1,000	/cell	4	0	-	MEDIUM
Dikes	600	/cell	1	4	2,400	MEDIUM
Relocation incentive	500	/cell	1	5	2,500	LONG
Dams	10,000	/cell	1	0	-	LONG
Reconstruct airport	4,000	/building	1	1	4,000	SHORT
Evacuate impacted population	200	/cell	1	7	1,400	SHORT
<b>TOTAL</b>					<b>29,000</b>	
<b>BUDGET (local currency)</b>						
Reported amount	30,000					
Expenses	29,000					
Money left	1,000					

Overview of coins spent on DRR measures.

- Random disaster and impact generator for round 2 and later (Fig. S2.4), including an overview of the effects of the implemented DRR measures

Based on the random generator (see below), write an X the area affected							Element	Recovery objectives	(2)	(3)	(4) = (2)-(3)		
	A	B	C	D	E	F	G		New event: very severe drought				
1								Evacuate people or rebuild	MET				
2								Hospitals	MET	Summary	Impacts of new events	Impacts w/o previous DRR measures	Your achieved risk change
3								Main Airport	MET	People	24300	24300	0
4								Agricultural needs	MET	Buildings	0	0	0
5									International funds of 5,000 given	Hospitals	0	0	0
6										Main Airport	0	0	0
7										Agricultural needs	2	5	-3
8		X	X	X				<b>REVISED BUDGET</b>					
9		X	X	X				Previous funds	1,000				
10		X	X					International funds	5,000				
11		X						Tax collection	10,000				
								Total	16,000				

Random generator			
1- To start the random generator, write an X in the red cell			
2- Write down the values in the yellow cells as they will automatically change once you select the affected areas!			
	X	Obtained	
Random hazard	1	Drought	(1=Tropical cyclone, 2= Drought, 3=Flood)
Random intensity	2	HIGH	(1=Low,2= Medium, 3=High)
Random nb. cells	6	9	

Random disaster and impact generator for round 2.

### S3. Minister of Finance calculator

This calculator is placed next to the role card of the Minister of Finance and allows them to assess how many coins are spend on the different DRR measures.

Only modify cells with a yellow background						
Measure	Cost	unit	Min nb. of unit	Nb. selected	Subtotal (coins)	Implementation time
	(coins)					
Reconstruct hospital	3,000	/building	1		-	MONTHS
Reconstruct buildings	600	/ cell	1		-	WEEKS
EWS: Tropical Cyclones	1,000	/cell	4	2	-	MONTHS
Seawall	500	/cell	1		-	WEEKS
NBS	200	/cell	1	3	600	YEARS
Plant normal crops	300	/cell	1	5	1500	MONTHS
Drought-resistant crop	500	/cell	4	5	2500	MONTHS
EWS: Flood	1,000	/cell	1	2	2000	MONTHS
Dikes	600	/cell	1	1	600	YEARS
Relocation incentive	500	/cell	1		-	YEARS
Dams	10,000	/cell	1		-	WEEKS
Reconstruct airport	4,000	/building	1		-	WEEKS
Evacuate impacted population	200	/cell	1		-	WEEKS
<b>TOTAL</b>					7200	
<b>BUDGET</b>						
Enter your allowed budget here:	(coins)					
	16000	<b>** Note: you cannot spend more than what you have. This will be double checked by the moderator!</b>				
Expenses	7200					
Money left	8800					

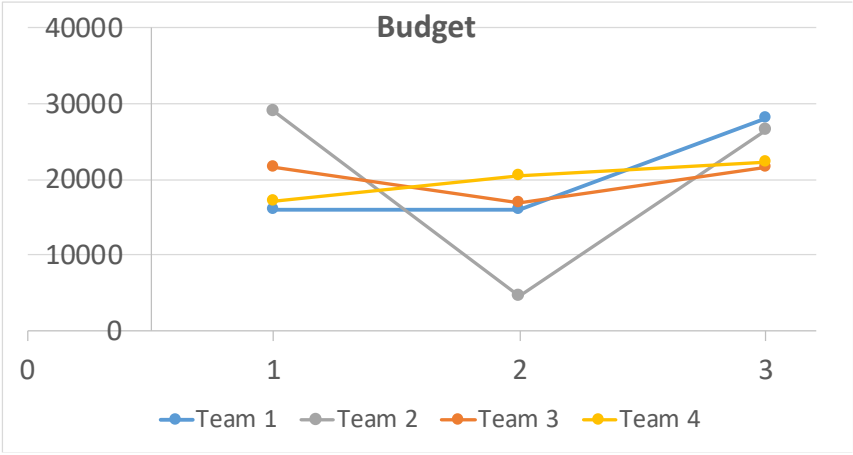
Minister of finance calculator.

#### S4. Overview of gameplay and coins spent per team for UR2020

##### Overview of gameplay and coins spent

	<b>Budget</b>			
(coins)	<b>Group 1</b>	<b>Group 2</b>		
Budget at start round 1	30,000	30,000		
Expenses round 1	15,900	29,000		
Expenses round 2	16000	4600		
Money left	28,100	26,400		
	<b>ROUND 1: Implemented DRR Measures</b>		<b>ROUND 2: Implemented DRR Measures</b>	
<b>Measure</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 1</b>	<b>Group 2</b>
Reconstruct hospital	6,000	6,000	-	-
Reconstruct buildings	-	3,000	-	-
EWS: Tropical Cyclones	-	4,000	4000	4000
Seawall	-	-	-	-
NBS	-	1,000	3000	-
Plant normal crops	2,400	2,100	-	-
Drought-resistant crop	3,500	4,000	-	-
EWS: Flood	-	-	6000	-
Dikes	-	2,400	3000	600
Relocation incentive	-	2,500	-	-
Dams	-	-	-	-
Reconstruct airport	4,000	4,000	-	-
Evacuate impacted population	1,400	1,400	-	-
	<b>ROUND 1: Achieved risk change</b>		<b>ROUND 2: Achieved risk change</b>	
<b>Summary</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 1</b>	<b>Group 2</b>
People	0	0	-3696	-3530
Buildings	0	0	-76.8	-60
Hospitals	0	0	0	-1
Main Airport	0	0	0	-1
Agricultural needs	-4	-3	-1	0
	<b>ROUND 1</b>		<b>ROUND 2</b>	
<b>Element</b>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 1</b>	<b>Group 2</b>
Evacuate people or rebuild	MET	MET	MET	MET
Hospitals	MET	MET	MET	MET
Main Airport	MET	MET	MET	MET
Agricultural needs	MET	MET	MET	MET
<b>Total</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>

For the achieved risk change, the negative numbers show that the impacts of the second and third events with the implemented DRR measures are smaller than they would have been had the team not implemented the DRR measures.



Overview of budget per round per team.