Instructions

Sea levels are rising world-wide as warming oceans expand and melt glaciers and ice sheets. Stronger storms coupled with rising seas can significantly damage— even destroy—property, infrastructure, public facilities, natural habitats, and other resources we depend on. In the face of these threats, planning commission members are tasked with collaboratively developing an Adaptation Plan using the strategies (game pieces) for the scenarios provided.

1. To begin, the facilitator reads the scenario aloud.

2. Role the di to determine who goes first. The highest roll goes first. If a tie for first occurs, the tied players re-roll. Take turns clockwise around the table.

3. In turn, each player selects an asset to accommodate, defend, or retreat from. No need to duplicate assets. Use the worksheet provided to record your choice, costs, and pros and cons.

4. Next, in turn, each player places and states aloud their preferred adaptation strategies on or around the island. Conflicting strategies are allowed.

5. Use the remaining time to finalize the group's proposal by resolving conflicts. Consider the following factors to inform the proposal: (1) Costs/funding, (2) Private property impacts, (3) Environmental impacts, (4) Equity/social justice concerns, (5) Others. Use your worksheet to take notes.

SEA LEVEL RISE SCENARIO: 2050

Red = Permanent Sea Level Rise Flooding

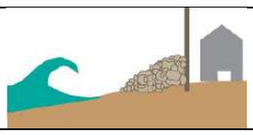
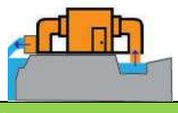
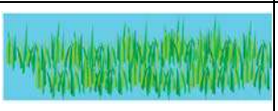
Orange = Temporary Annual Storm Flooding

Yellow = Temporary 100-year Storm Flooding

Asset Legend

Game of Floods Marin Island

Adaptation Game Piece Reference Sheet

Name	Piece	Piece Units	Cost ($)	Enviro. Impact EEE (neg.) EE(caution) E (positive)	Flood Protection Short, med, or long-term	Protects against: Temp. flooding	Storm surge	Sea level rise	Wave impacts	Erosion	Feasibility: Sheltered Areas	Open Coast
Hard (Traditional) Engineering												
Traditional Levee		1 Mile	$$$$	EEE	med ●	x	x	x			x	
Seawall or Revetment		1 Mile	$$$	EEE	med ●		x		x	x	x	x
Tidal Gate		Creek width	$$$$$	EEE	med ●	x	x	x			x	
Flood wall & pump station	Requires electricity 	1 Mile	$$$	EEE	short ○	x	x	x			x	
Soft Engineering												
Horizontal Levee		1 Mile	$$$$	E	long ●	x	x	x	x		x	
Wetland/ shoreline vegetation		1 Acre	$$$	E	med ●	x	x		x		x	
Beach Maintenance & Dune Restoration		1 Mile	$$$	EE	short ○	x	x		x		x	x
Offshore structure		1 Mile	$$	EE	med ●	x	x		x		x	x
Accommodate (flood tolerant)												
Elevate buildings		4 Buildings	$$$	EE	med ●	x					x	x
New/elevate road	(each piece is 2 miles)	1 Mile	$$$$$	EEE	long ●	x		x			x	x
New floodable development		Neighb-orhood	$$$$$	EE	long ●	x					x	x
Manage Retreat (relocate/zoning and policy changes)												
Retreat		4 Buildings	$$$	E	long ●	x		x		x	x	x
Move here		4 Buildings	$$$	EEE	long ●	x	x	x	x	x	x	x
Post-storm prohibitions		Indirect Cost	$	EE	long ●						x	x
Stricter land use zoning		Indirect cost	$	EE	short ○						x	x

Schedule

8:30-9 – Registration
9:00 – Welcome - Jack Liebster
9:15 – Short Films (to set the tone)

- KQED Flim
- Morgan Freeman (if I can acquire)

9:30 – Background on C-SMART to date – Jack Liebster
9:40 – Adaptation Options: Roger Levanthal (May 30), Jack Liebster (June 6)
10:10 – Introduction to the game: Bridgit
10:20 – Break
10:30 – Reconvene in small groups and begin the game
11:45 - Workbook Exercise – (Evaluate Boards)
12:05 - Report to large group, Jurors provide feedback
12:20 – Next Steps/Evaluations/Refreshments/Open House
1:00 - End

Table Materials

- Tabletop Game Board
- Game Piece Key Handout (1 per person)
- Game Pieces
- Facilitator Script/Blank labels
- Planning Commission Worksheets (1 per person)
- Scenario Cards (1 per person)
- Sticky Arrows
- Easel
- Large Notepad
- Markers
- Dice

Game of Floods

Introductions (2 minutes)

[Facilitators] *Hello, my name is _____ and I work for _____. Could you each introduce yourselves to me?*

[Go around the table and have each participant introduce themselves]

Review Adaptation Strategies (5 minutes)

[Facilitators] *Ok, now let's review the adaptation strategies which were reviewed.*

[Go over each column on the Adaptation Game Piece Reference Sheet]

[Facilitators] *Who would like to be the group reporter? The reporter will need to take notes on the easel, and report back to the entire group after the game.*

[Wait for a Volunteer]

[Facilitators] *Great, thank you REPORTER'S NAME for volunteering!*

Scenarios (3 minutes)

[Facilitators] *I'll start by reading the scenario card aloud – please follow along on your handout. The scenario describes Marin Island in 2050, with a 10 inches SLR (red zone), plus an annual storm (orange zone), and 100 year storm (yellow zone).*

[Facilitators : Read the scenario as follows]

Red Exposure Zone: 10 Inches Permanent Sea Level Rise Flooding
Orange Exposure Zone: Temporary Annual Storm Flooding
Yellow Exposure Zone: Temporary 100-Year Storm Flooding

Local communities are impacted. Many seaside homes are permanently flooded and uninhabitable, while others experience more frequent flooding causing electrical and septic systems to shut off occasionally. Saltwater intrusion in wells is decreasing the potable water supply, and property values are declining while insurance rates continue to rise. Many residents relocating, causing a decline in the population needed to support the local economy leading to closing businesses and escalated prices for food, gasoline, and other supplies. Roads in the red area flood daily compromising emergency access increasing congestion and, in some cases, block accesses for hours at a time. The hospital and fire department experience regular flooding, causing emergency services to be compromised and has left those in need without service. Local beaches are eroding, resulting in compromised aesthetics, sense of place, recreational uses, and ecological functions. Wetlands have disappeared, removing important breeding grounds for marine life. Grazing land is eroding and distribution lines are flooded disrupting local agricultural operations.

Asset and Strategy Identification (5 minutes)

[Facilitators] *Let's play the Game of Floods! Start by choosing an asset which is vulnerable. Remember, an asset is a place that you value and could include your home, a favorite restaurant, your favorite spot to access the coast, wetlands, infrastructure, or more. On your planning commissioner worksheet, write down the asset*

[Facilitators] *Once you have chosen an asset, think and write on your worksheet about what adaptation strategies are necessary for protection. When choosing adaptation strategies, consider the following questions:*

1. *Could this strategy have other positive impacts for the community or environment, such as recreation or wildlife habitat?*
2. *Could this strategy have negative impacts for the community or environment?*
3. *Is this strategy financially feasible?*

On your planning commissioner worksheet, write down the adaptation strategy(ies), costs, and pros and cons.

[Facilitators] *Now let's figure out who goes first!*

[Go around the table clockwise and have each participant roll the di. Whoever gets the highest number goes first. If there is a tie for the highest, have those participants re-roll.]

Gaming (50 Minutes)

[Facilitators – Start in Order]

Please name your asset, and place a sticky arrow pointing to it.

Place the adaptation strategy(ies) game pieces down (but do not stick for now) to protect the asset. For now it is ok if conflicts arise.

[Repeat this process for each participant. While light discussion is fine – please ensure to keep the activity on track so each participant has a turn. If two people choose the second asset, ask

the second person to select a different asset. Move onto the discussion phase once all participants have taken their turns.]

Discussion + Costs (10 Minutes)

[Facilitators] *Now let's discuss our plan! We are working towards consensus. Does anyone see any conflicts? This could include: proposals which are excessively costly, negative private property impacts, negative environmental impacts, equity/social justice concerns, or other. If there are conflicts can compromises be made?*

[Let the participants discuss freely until consensus has been achieved]

[Facilitators] *Great! Now let's actually stick the adaptation strategy down!*

[Have participants remove the adaptation strategy from the sticky label and place on the board]

[Facilitators] *Additionally, we'll need to add up the costs. Let's tally everyone's dollar signs.*

[Tally the dollar signs on the Cost Tally Sheet sheet]

[Facilitators] *Excellent! These are a lot of great ideas!*

Insert Reporter's Name, let's identify some of the main points, and write them on the easel to share.

[Allow a couple of minutes for focused discussion on main points]

[Facilitators] *Insert Reporter's Name, are you prepared to share the main points and costs?*

[Ensure the reporter is prepared]

[Facilitators] *You all have mastered the game of floods and are ready to start protecting your community from Sea Level Rise!*

GAME OF FLOODS

Sea Level Rise Scenario

This sheet outlines consequences that could occur from increased sea level rise and storm surges in 2050, assuming no adaptation occurs.

Red Exposure Zone: 10 Inches Permanent Sea Level Rise Flooding
Orange Exposure Zone: Temporary Annual Storm Flooding
Yellow Exposure Zone: Temporary 100-Year Storm Flooding

Local communities are impacted. Many seaside homes are permanently flooded and uninhabitable, while others experience more frequent flooding causing electrical and septic systems to shut off occasionally. Saltwater intrusion in wells is decreasing the potable water supply, and property values are declining while insurance rates continue to rise. Many residents relocating, causing a decline in the population needed to support the local economy leading to closing businesses and escalated prices for food, gasoline, and other supplies. Roads in the red area flood daily compromising emergency access increasing congestion and, in some cases, block accesses for hours at a time. The hospital and fire department experience regular flooding, causing emergency services to be compromised and has left those in need without service. Local beaches are eroding, resulting in compromised aesthetics, sense of place, recreational uses, and ecological functions. Wetlands have disappeared, removing important breeding grounds for marine life. Grazing land is eroding and distribution lines are flooded disrupting local agricultural operations.

GAME OF FLOODS

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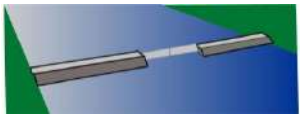
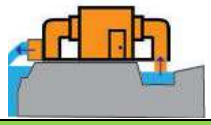
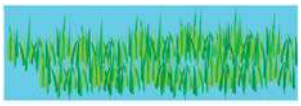
Game of Floods *Marin Island*

Adaptation Game Cost Tally Sheet

Name	Piece	Piece Units	# Game Pieces	x	Cost ($)	=	Total Cost
Hard (Traditional) Engineering[1]							
Traditional Levee		1 Mile		x	$2 million	=	
Seawall/Revetment		1 Mile		x	$3 million	=	
Tidal Gate		Creek width		x	$25 million	=	
Flood wall & pump station		1 Mile		x	$3 million	=	
Soft Engineering							
"Horizontal" Levee		1 Mile		x	$4 million	=	
Wetland/shoreline vegetation		1 Acre		x	$2 million[2]	=	
Dune Restoration and Beach Maintenance (nourishment & groins)		1 Mile		x	$5 million[3]	=	
Offshore structure		1 Mile		x	$2 million[4]	=	

[1] Marin County Department of Public Works (DPW), 2015.
[2] Giacomini Wetland Restoration, National Park Service, 2008.
[3] Assume $100/cubic yard to move sand. Waikiki Beach, 2010.
[4] Based on average cost of artificial reef projects, Florida Fish and Wildlife Conservation, 2013.

Accommodate (raise/flood proof)							
Elevate buildings		4 Buildings		x	$400,000[5]	=	
New/elevate road	 (each piece is 2 miles)	1 Mile	_____ x 2	x	$50 million[6]	=	
New floodable development		Neighborhood (10 buildings)		x	$24 million	=	
Manage Retreat (relocate/zoning and policy changes)							
Retreat		4 Buildings		x	$800,000	=	
Move here		4 Buildings		x	$4 million	=	
Post-storm building requirements		Neighborhood		x	$100,000	=	
Stricter land use zoning		Neighborhood		x	$100,000	=	
	Total Cost of Proposed Adaptation Plan:						

NOTE: The adaptation strategy cost estimates developed for the Game of Floods are intended to give a general idea of the magnitude of expense associated with the strategy, and should not be used beyond their intended purpose as an educational tool.

[5] Marin County Department of Public Works (DPW), 2015.
[6] California Department of Transportation (Caltrans), 2015.