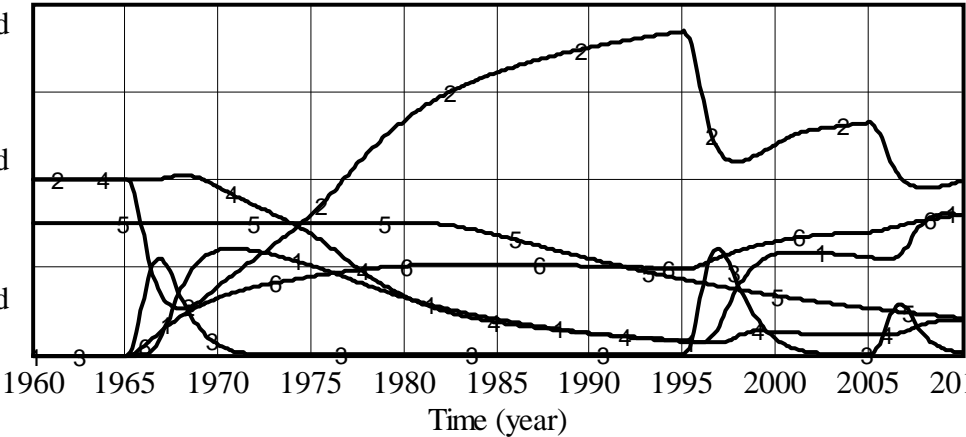


# Appendix D: Flood-1a Policy Analysis Notes

<b>Policy Run Details</b> Base Base Base Flood-1A	<div data-bbox="1121 305 1285 344">Indicators</div>  <div data-bbox="598 831 1806 974">           Mitigated Property : base 1 1 1 1 1 1 1 1 1 1 % developed            Vulnerable Property 2 2 2 2 2 2 2 2 2 2 % developed            Damaged Properties : base 3 3 3 3 3 3 3 3 3 3 % developed            Undeveloped Property : base 4 4 4 4 4 4 4 4 4 4 % developed            Natural Barriers 5 5 5 5 5 5 5 5 5 5 flooding            Structural Projects 6 6 6 6 6 6 6 6 6 6 flooding         </div>	
<b>Scenario</b> Base Conditions  <b>community</b> A community that uses levees to protect property owners. This is the false sense of security community	<div data-bbox="577 1047 686 1071">see chapter 3</div> <div data-bbox="1759 1047 1858 1076">Analysis</div>	
<b>Description</b> see chapter 3  No policy parameters are changed. Base conditions apply.		

## Policy Run Details

base\_high frequency\_1a

Base

High Frequency

Flood-1A

**Scenario** doubles the frequency of the base

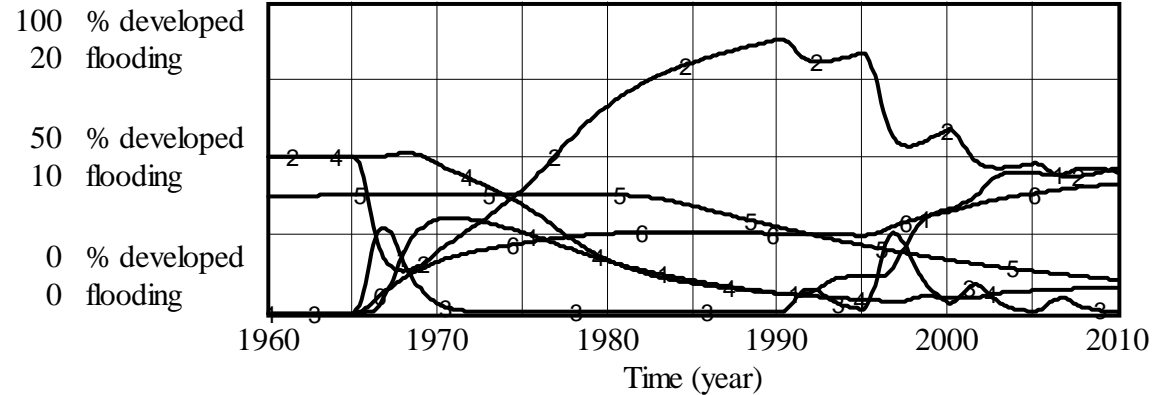
**community** A community that uses levees to protect property owners. This is the false sense of security community

## Description

1. vulnerable property is the same until the the 1990 event - lower from 1990 - 1995.
- 1a. From 1995 to 2000 vulnerable property is the same.
- 1b. Vp is lower from 2000 - 2010
2. Damage occurs during 5 events but 1965 and 1995 is the highest
- 2b. Damage= long time to recover in 1995
3. mitigated= 1992- 2010 is higher than the base run.
4. undeveloped property is nearly the same.
5. environment (nat barriers) is identical
6. structural mit - slightly higher from 2002-2010 - otherwise the same

No policy parameters are changed. Base conditions apply.

## Indicators



Mitigated Property : base\_high frequency\_1a 1 1 1 1 1 % developed  
 Vulnerable Property 2 2 2 2 2 % developed  
 Damaged Properties : base\_high frequency\_1a 3 3 3 3 3 % developed  
 Undeveloped Property : base\_high frequency\_1a 4 4 4 4 4 % developed  
 Natural Barriers 5 5 5 5 5 flooding  
 Structural Projects 6 6 6 6 6 flooding

The 1990 is key to this analysis:

1. structures do not come in after the damaging event in 1990.
2. recovery with mitigation is big in 1990
3. indicator of perceived risk= unchanged until the 2000 event
4. therefore - recovery with mit in 1990 is due to local incentives/regulations, as local resources are used in recovery. In fact, b/c it is a small recovery the "fraction recovered from local" is 1. Therefore, the locals call the shots and recovery happens with mitigation. There is no recovery as open space in the 1990 event.
5. damages= 1995 flooding ratio is high, vp is damaged, structures come in. After 1995 the feds come in with relief and open space is created (not as much as base). 1995 recovery with mit is the local effect - still from 1990 but also b/c locals cover much of the 1995 recovery.
6. In 2000 and 2005 the damages are perceived minor. Therefore, no new structural projects. However, as with 1990 recovery with mit. PE for mit= higher in the last period, but with same general shape. They are more active earlier (1992). However, agenda density for nonstructural mit is not substantially different.

## Analysis

base_low frequency_1a
Base
Low Frequency
Flood-1A

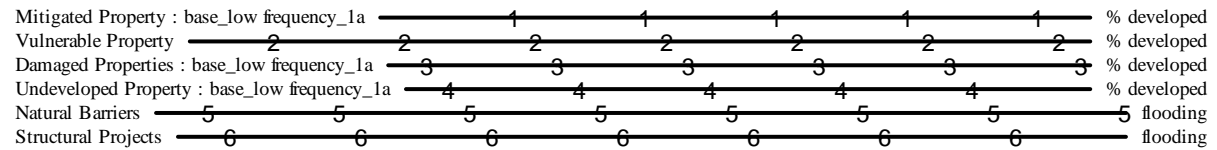
one flood every twenty years

**community**

1. vulnerable property = much higher until 2005
2. mitigated property = much lower until 2005
3. undeveloped property= very low but large increases in the last 5 years compared to base run
4. natural barriers = same but slight increase at end of run
5. structural projects= hold constant and increase in 2005

No policy parameters are changed. Base conditions apply.

100 % developed  
20 flooding



1. knowledge of vp is very low for most of the run
2. PE for mit are low
3. agenda for mit is low
4. memory for damage is low
5. the sense of security is very high - no damage in the 1985 event - structures hold constant (community has revenue).
6. Total Damaged Property= is larger in this run than the base!!!

## Policy Run Details

base\_major event 1995\_1a

Base

Major Event 1995

Flood-1A

## Scenario

An flood 1.5 times the normal event is added to the "normal" event in 1995

## community

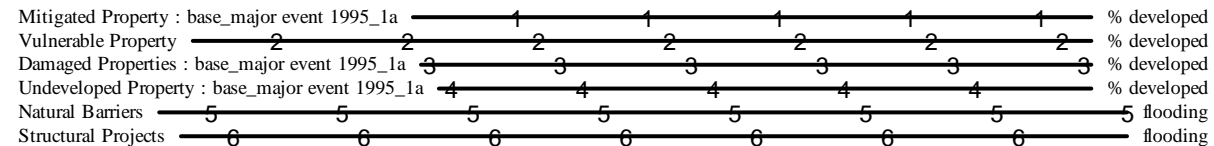
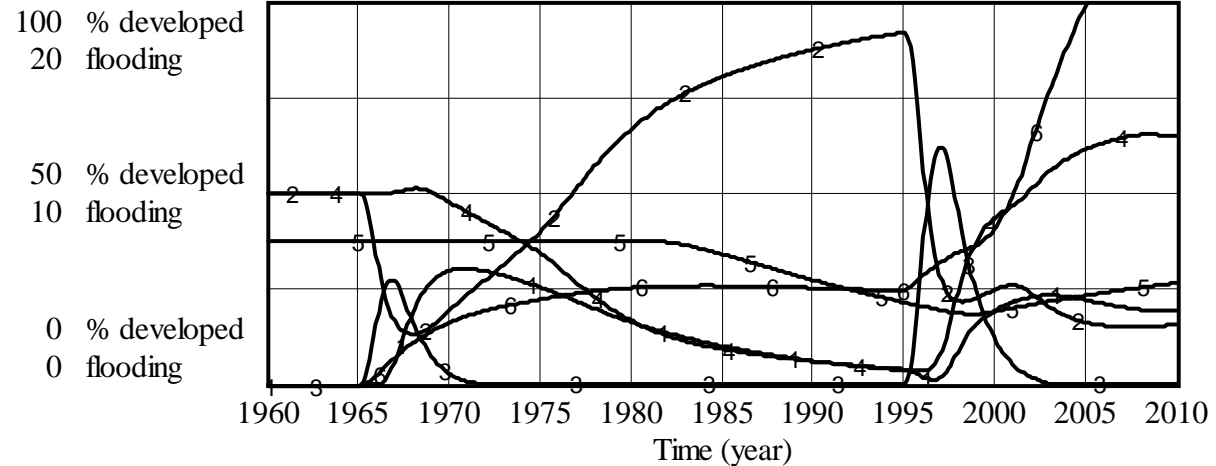
A community that uses levees to protect property owners. This is the false sense of security community

## Description

1. vp drops below 25% during the 1995 recovery period (which is very long)
2. mitigated property finishes lower than the base run.
3. damaged property = very high in 1995 and finishes higher overall at the end of the run.
4. Undeveloped property = increaess very high after the 1995 event and finishes much higher than the base run.
5. natural barriers = increases in 1999 after the recovery with open space.
6. structural projects = increase in 1995 but major increas in 2000

No policy parameters are changed. Base conditions apply.

## Indicators



1. mitigated lower - b/c locals are not handling the recovery. Feds come in and thus, more recovery with open space.
2. structural mit= the mit gap is very high in 1995 but not much is done. Why? All local resources are spent on recovery - nothing left for structures. Need to wait until the 2000 event, which sends local funds for strucutal mitigation.
3. Indicator of percieved risk = rises above the initial value between 2001 and 2007. This changes everything. Willingness to retrofit goes up, relocating vulnerable goes up. A tipping point has been reached in flood-1a.
4. agenda density for nonstructural is only slightly higher, as PE for mit
5. Memory of damage is very large after the 1995 event.
6. indicator of perceived risk= .however, knowledge finishes lower than base run. Therefore, most of the decisions to relocate are based on direct experience (memory). The levee failure contributes to this indicator in 1995. the forced relocation pushes down the government relief and gov insurance effect. However, damage memory effect is very important during the final period for indicator of perceived risk.

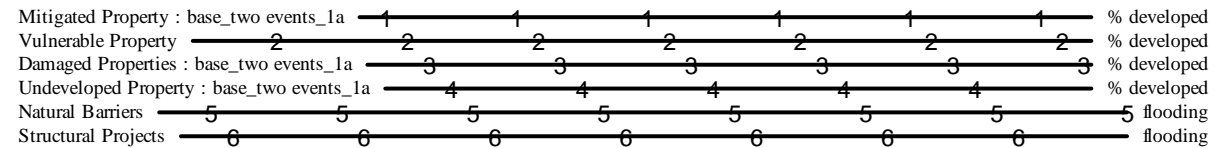
## Analysis

base_two events_1a
Base
two major events
Flood-1A

<b>community</b>	A community that uses levees to protect property owners. This is the false sense of security community
------------------	--

1. vp = the values are different but the behavior is the same
2. mitigated = higher than the base - does not fade as quickly
3. damaged = major damages in each event - the last is the worst - total damages are much higher at the end of the base run.
4. undeveloped = open space created after the 1980 event but short lasted. However, 2005 indicates major shift to open space
5. natural barriers = hold up for several more years - 1995 the decline begins. Levels off after the 2005 event.
6. structural = major increases in 1980 and gradual increase in 2005.

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- ## V. Analysis

## Policy Run Details

CRS\_base\_1a

CRS

Base

Flood-1A

## Scenario

Base Conditions

## community

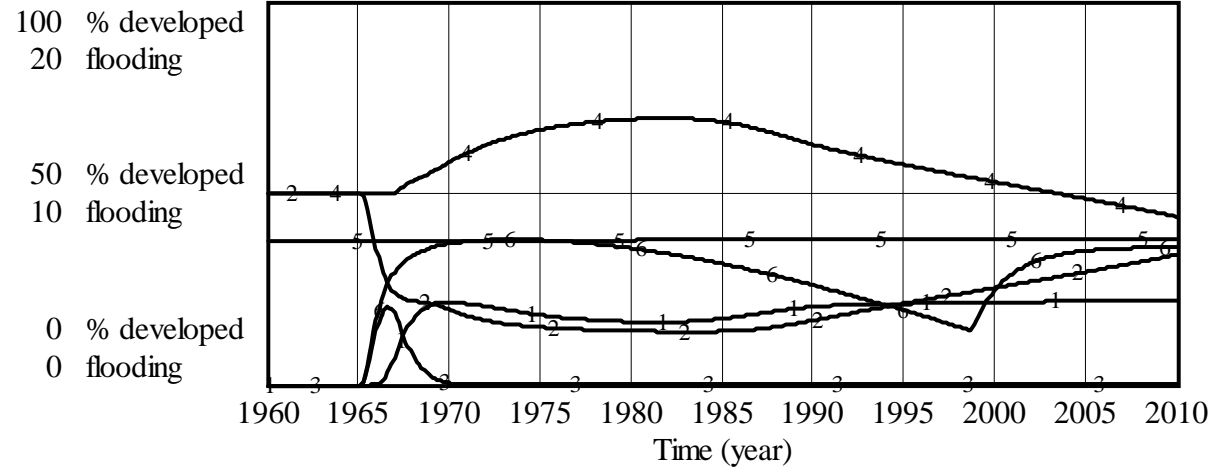
A community that uses levees to protect property owners. This is the false sense of security community

## Description

1. MP does not peak as high after the 1965 event but levels off and remains constant. Lower than base in 2010.
2. VP stays below base for entire run. Almost Slowly increases from 1985 to 2010 but less than base.
3. Only one event results in damage
4. U.P. increases from 1968 to 1982. Slow decline but well above base in 2010.
5. Natural barriers never erode
6. structural projects quickly increase above base after 1965 - decline below base in 1995 - increase to approx same level as base in 2010.

What if a community decided to enact and implement policies in all 4 CRS categories

## Indicators



Mitigated Property : CRS_base_1a	1	1	1	1	1	1	1	% developed
Vulnerable Property	2	2	2	2	2	2	2	% developed
Damaged Properties : CRS_base_1a	3	3	3	3	3	3	3	% developed
Undeveloped Property : CRS_base_1a	4	4	4	4	4	4	4	% developed
Natural Barriers	5	5	5	5	5	5	5	5 flooding
Structural Projects	6	6	6	6	6	6	6	6 flooding

1. Intended result - policy entrepreneurs for mitigation are active and stay active; higher agenda density for nonstructural mitigation; knowledge Analysis from 1965 to 2010.
2. Protective policy stakeholders are not as active and the agenda for structural mit and relief is also lower.
3. Memory of damage fades at a much slower pace which helps maintain the indicator of perceived risk.
4. Indicator of perceived risk is at or near the initial value for the entire run. The community is very aware of the risk.
5. Interesting - stakeholders for land development are more active in this run.
6. Overall - this is the most effective policy mix. The community does not overdevelop. The environment is maintained. Enough attention is paid to structures to make sure they are maintained (more effort could be made). Mitigation dominates the local agenda and risk is perceived. Damage is lower than any other policy run - 25% of the base run total damage.

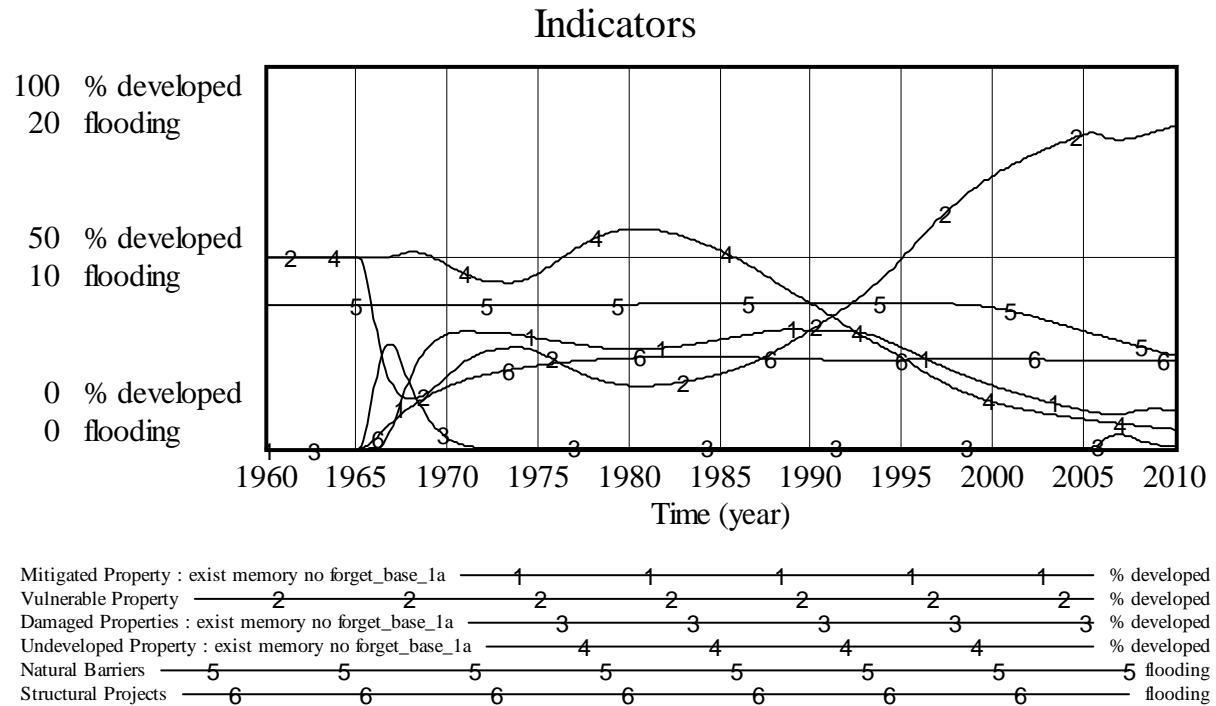
exist memory no forget_base_1a
exist memory no forget
Base
Flood-1A

## Base Conditions

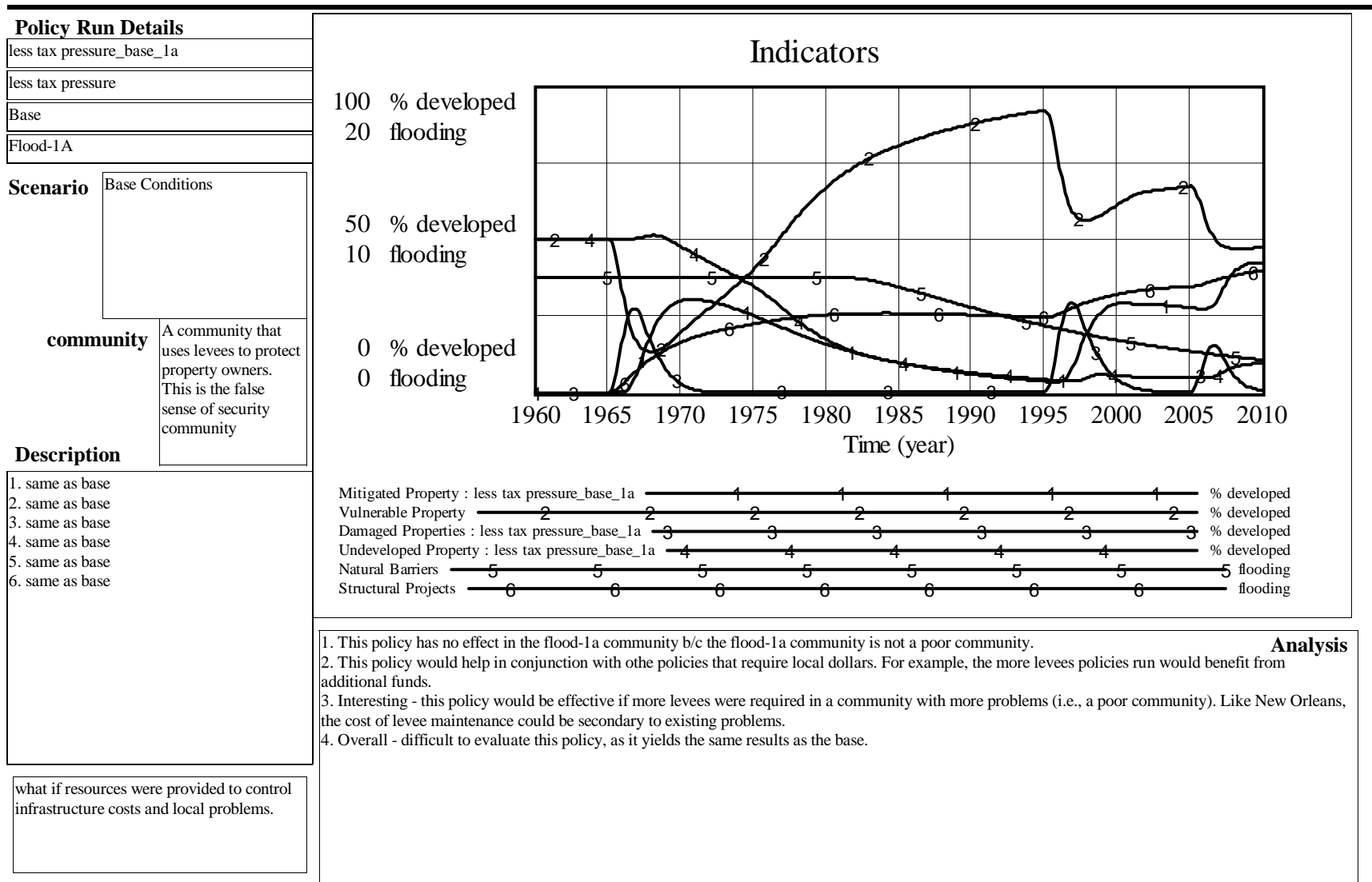
**community**

1. mitigated property stabilizes from 1970 to 1995 and declines in the final period
2. vulnerable property stays lower than the base from 1970 to 1995. However, it finishes at a higher level than the base run.
3. no damage in 1995 and very little damage in 2005. total damage is .5 the size of base run.
4. An increase to undeveloped property from 1973 to 1980. There is more undeveloped property from 1975 to 2005. However, in 2010 there is less undeveloped property than the base.
5. Natural barriers stay strong until 2000 - greater than the base run in 2010 but declining.
6. Structural mitigation levels off in 1995 and is approx. .5 less than the base run in 2010.

what if public information campaigns used existing damage and provided reminders to keep memory alive



<ol style="list-style-type: none"> <li>1. most notable difference is the increase to knowledge from 1970 to 1995.</li> <li>2. PE for mitigation stay active from 1975 to the end of the run. While finishing lower than the base, their early activity increases the agenda density for nonstructural mitigation in the middle period.</li> <li>3. The shift from vulnerable to mitigated and undeveloped property keeps stakeholders for protective policies low for most of this run.</li> <li>4. The intended "local" effect brings higher memory of damage after the first event.</li> <li>5. Very interesting - the indicator of perceived risk is greater than the initial value and much greater than the base from 1970 to 1995.</li> <li>6. Also interesting - Stakeholders for land development are active for a longer period of time. From 1975 to 1995 the rate of decline is zero and by 2010 the number of active stakeholders is still greater than the base.</li> <li>7. Result is more development at the end of the base and more vulnerable property. This policy is effect for most of its run but finishes off less effective than the base. A "better before worse" policy perhaps.</li> </ol>	<p style="text-align: right;"><b>Analysis</b></p>
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## Policy Run Details

low relief agenda\_base\_1a

low relief agenda

Base

Flood-1A

## Scenario

Base Conditions

## community

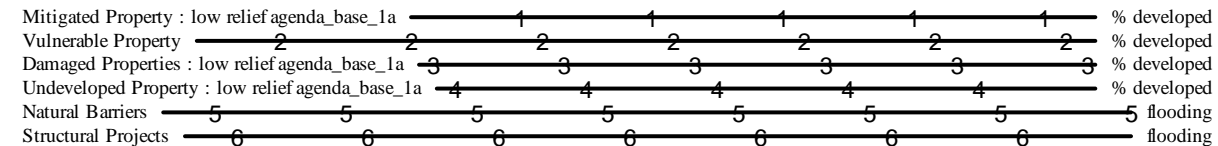
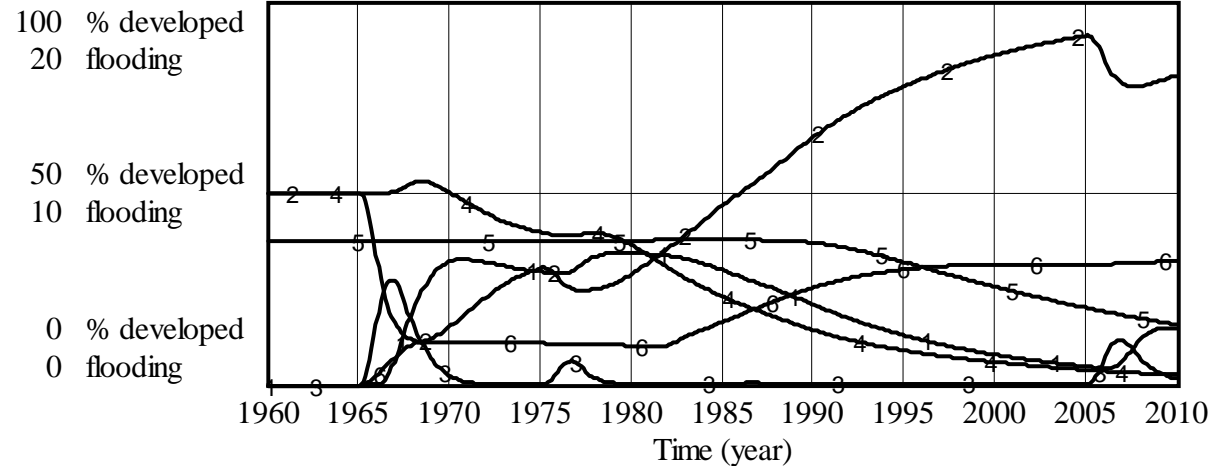
A community that uses levees to protect property owners. This is the false sense of security community

## Description

1. MP increases above 1970 base peak (30) from 1978-1985 - steadily declines. MP finishes 1/2 the base run level.
2. VP mirrors MP - less than base until 1996 and finishes 25% higher than the base.
3. interesting - damage occurs in 1975 - no damage in 1995 and some damage in 2005
4. open space greater than base from 1975 to 1998. however, U.P. is lower than base in 2010.
5. natural barriers are stronger than base from 1982 - declining with base.
6. very interesting - structural projects level off in 1968 at 1/2 the base level. The 1975 event results in damage; the increase to structural mit takes place in 1980. The level increases above the base from 1990 to 2000!! Structures are constant but lower than the base in 2010.

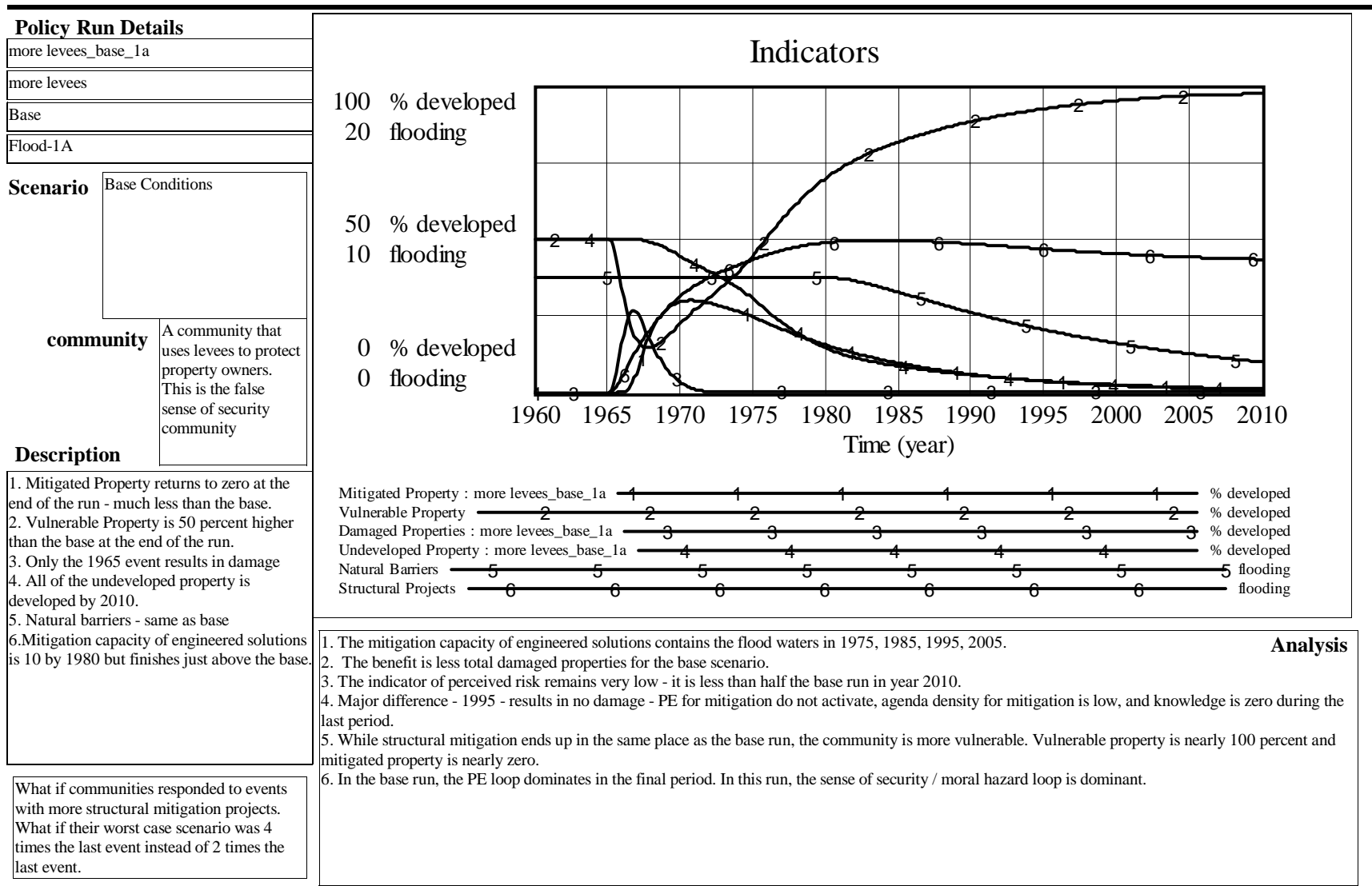
what if incentives prevented PE for relief from staying active in the policy process.

## Indicators



1. Most obvious - stakeholders for protective policies are low and thus agenda density for protective policies is low.
2. Interesting - between 2000 and 2010 agenda density for protective is greater than base.
3. Interesting - a "tipping point" - the agenda density for nonstructural mit builds from an increase to knowledge of vulnerable property. By controlling protective policies, total agenda activity is less.
4. Thus, the "quiet" agenda allows knowledge on vp to become active in a reinforcing loop with mitigation agenda.
5. indicator of risk - increases above initial value from increases to knowledge.
6. 1975 event - perceived problems with structures increases the indicator of perceived risk.
7. Overall - interesting run. Indicator of perceived risk finishes 50% lower than base. Middle of the run looks good 1975 - 1995 is better than base on many variables. Ultimately, stakeholders for land development remain active and dominate the memory of damage fades.
8. conclusion - total damage approx 20% below base - vp is higher and mp and u.p. are lower than base. Despite strong results in the middle years, not an optimal result.

## Analysis



## Policy Run Details

new PE active\_base\_1a

new PE active

Base

Flood-1A

## Scenario

Base Conditions

## community

A community that uses levees to protect property owners. This is the false sense of security community

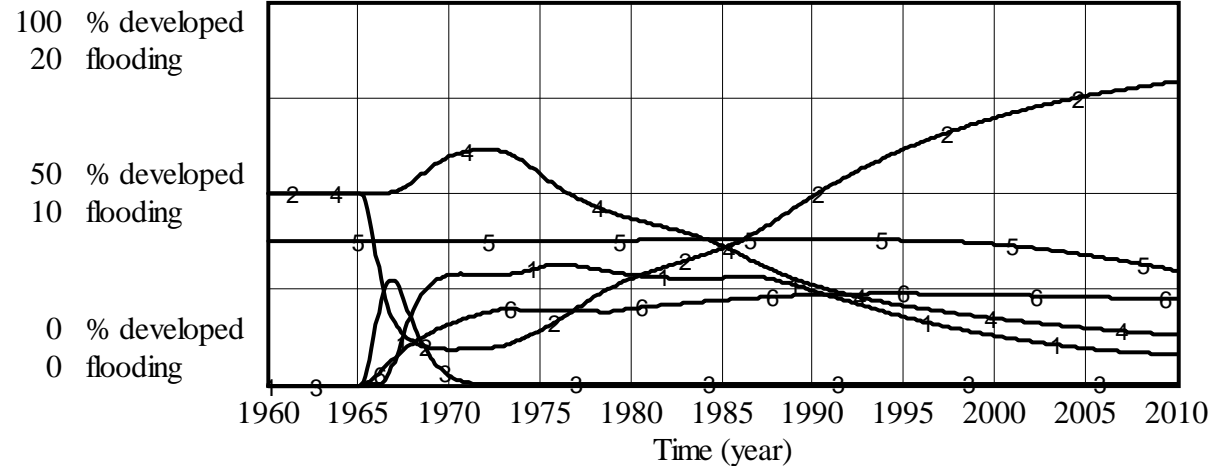
## Description

1. Mitigated property is greater than the base run from 1970 to 1987. Then, it declines at a constant rate, finishing 1/4 the value of the base run in 2010.
2. There is less vulnerable property from 1970 to 1997 but vp increases steadily during this time - finishes 25% greater than the base.
3. no damages in 1995 or 2005
4. after 1965 undeveloped increases - remains above the base from several years but finishes at the same level in 2010.
5. Natural barriers hold until 2000 and slowly decline thereafter - finish more than double the base run.
6. lower than base (1970 - 1993), stabilizes less than 5, 3 less than the base.

What if incentives were given to attract policy entrepreneurs and keep them active in the policy process.

The time to lose interest increases four times the base run and all of the vulnerable property is perceived as vulnerable.

## Indicators



Mitigated Property : new PE active_base_1a	1	1	1	1	1	1	% developed
Vulnerable Property	2	2	2	2	2	2	% developed
Damaged Properties : new PE active_base_1a	3	3	3	3	3	3	% developed
Undeveloped Property : new PE active_base_1a	4	4	4	4	4	4	% developed
Natural Barriers	5	5	5	5	5	5	flooding
Structural Projects	6	6	6	6	6	6	flooding

1. Active PE's rise quickly and stay active for the entire run, which increases agenda density for nonstructural mit and positively affects knowledge of flood risk. Knowledge reaches 80 properties in 2010!
2. Protective policies stakeholders are lower from 1970 to 2000, which keeps the agenda for pp lower than the base until 2005, where both are equal to base.
3. structures do not fail in this run
4. total damage is .5 the base
5. indicator of perceived risk is high after 1965 event and does not fall below .4 - however, it finishes at the same level as the base.
6. Again, stakeholders for land development stay active which explains the steady development.
7. In fact, mitigated property becomes vulnerable - even though "commitment to mit effect on nfip violations" is lower than base - it is only zero briefly in 1970 and again at the end of the run.
8. It appears there is some developing vulnerable after 1965, but more developing with mit - and then violations from 1975 which increases vulnerable property to a level greater than the base.
9. Overall - good run with low damages - very efficient - still results in high v.p, low m.p, and low u.p. community is vulnerable at the end of the run.

## Analysis

Monday, March 26, 2007

## Policy Run Details

regulating recovery\_base\_1a

regulating recovery

Base

Flood-1A

## Scenario

Base Conditions

## community

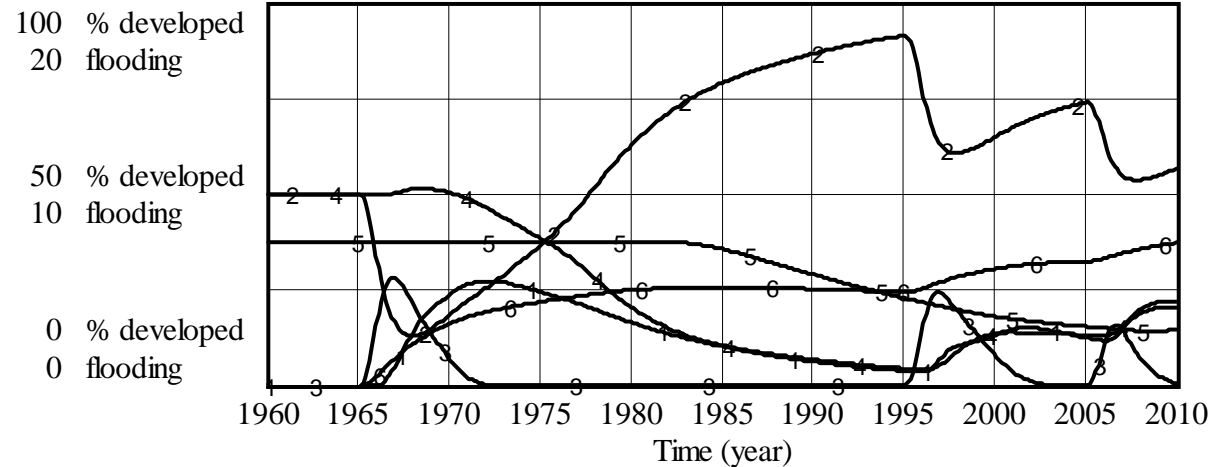
A community that uses levees to protect property owners. This is the false sense of security community

## Description

1. Same behavior as base - after 1995 event, less than base.
2. same behavior as base - slightly higher than base after 1995.
3. same as base
4. Same behavior as bas - more recovery with open space after 1995 and 2005 events.
5. same behavior as base. Slightly higher than base from 2000-2010
6. same behavior as base. Slightly lower than base from 1995-2010.
- 6.

What if every time recovery uses federal resources, locals are forced to create open space.

## Indicators



Mitigated Property : regulating recovery\_base\_1a 1 1 1 1 1 1 1 1 1 1 1 1 % developed  
 Vulnerable Property 2 2 2 2 2 2 2 2 2 2 2 2 % developed  
 Damaged Properties : regulating recovery\_base\_1a 3 3 3 3 3 3 3 3 3 3 3 3 % developed  
 Undeveloped Property : regulating recovery\_base\_1a 4 4 4 4 4 4 4 4 4 4 4 4 % developed  
 Natural Barriers 5 5 5 5 5 5 5 5 5 5 5 5 flooding  
 Structural Projects 6 6 6 6 6 6 6 6 6 6 6 6 flooding

1. This policy is difficult to evaluate since it is not a true "mitigation" policy as discussed in DMA 2000. This is a reactive mitigation measure. Properties become open space only when federal dollars are used in recovery. Federal dollars are used in recovery only when recovery costs exceed "local capability."
2. Recovery with open space reduces mitigated property, which reduces policy entrepreneurs for mitigation.
3. Recovery with open space activates stakeholders for land development.
4. Overall - slightly better than base - more open space, same VP and same total developed properties.

Analysis

## Policy Run Details

research floods\_base\_1a

research floods

Base

Flood-1A

## Scenario

Base Conditions

## community

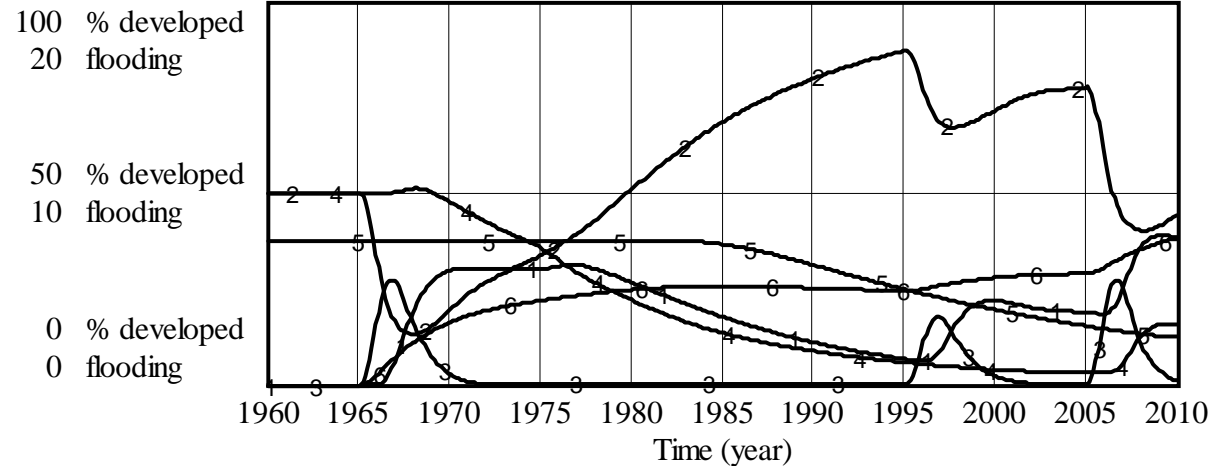
A community that uses levees to protect property owners. This is the false sense of security community

## Description

1. MP stays above the base, at 30, from 1970 to 1978 and steadily declines. MP is lower than base between the 1995 and 2005 events but finishes the run at the base level.
2. VP is similar to MP - lower than base from 1972 2000 - higher than base between 200 and 2005 and finishes at approx base level.
3. damages in 1995 are less but are greater than base damages 2005. Total damages are identical to base in 2010.
4. U.P. Mirrors base until 2007 - finishing slightly higher than base.
5. Natural Barriers follow the same pattern as base, only slightly higher in 2010.
6. Structural Mit is identical until 1995 - then slightly lower and finishes close to base.

what if there were annual vulnerability assessments with or without political commitment

## Indicators



Mitigated Property : research floods_base_1a	1	1	1	1	1	1	% developed
Vulnerable Property	2	2	2	2	2	2	% developed
Damaged Properties : research floods_base_1a	3	3	3	3	3	3	% developed
Undeveloped Property : research floods_base_1a	4	4	4	4	4	4	% developed
Natural Barriers	5	5	5	5	5	5	flooding
Structural Projects	6	6	6	6	6	6	flooding

1. Major difference is the level of knowledge from 1970 to 2000 - rising to 30 properties in 1980 and slowly declining thereafter. The increase in 2000 resembles the base but finishes lower - at 30 properties.
2. Interesting - PE for mit are the same until 1997 but agenda density for nonstructural mit is higher from 1970 to 1990. Thus knowledge is a reinforcing loop helped by active PE.
3. Indicator of perceived risk is higher when knowledge is high. Risk finishes higher than base.
4. Overall - good idea but not optimal - efficient during the middle period but not very effective in the end. Total damages are the same and V.P. is still a problem. Researchers and mappers need help to accomplish their goals.

## Analysis

## Policy Run Details

restore environment\_base\_1a

restore environment

Base

Flood-1A

## Scenario

Base Conditions

## community

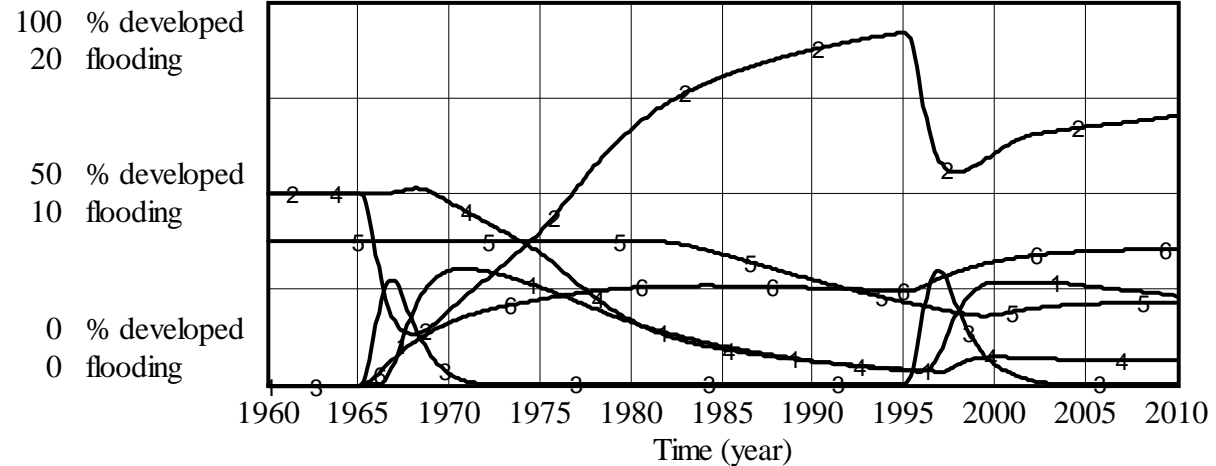
A community that uses levees to protect property owners. This is the false sense of security community

## Description

1. MP same as base until 2000 - ends 50 percent less than base.
2. VP - similar to base run - does not decrease in 2005, and thus, ends 20 properties greater than base.
3. No damage in 2005
4. Open space is almost identical - slightly less at the end.
5. Natural barriers are restored from 2000 to 2010, 1.5 times greater than base at the end of the run.
6. Structural mitigation is the same with a slight deviate in 2005 - just below the base run in 2010.

what if structural mitigation resources are used to replenish natural barriers.

## Indicators



Mitigated Property : restore environment_base_1a	1	1	1	1	1	1	1	1	1	% developed
Vulnerable Property : restore environment_base_1a	2	2	2	2	2	2	2	2	2	% developed
Damaged Properties : restore environment_base_1a	3	3	3	3	3	3	3	3	3	% developed
Undeveloped Property : restore environment_base_1a	4	4	4	4	4	4	4	4	4	% developed
Natural Barriers	5	5	5	5	5	5	5	5	5	flooding
Structural Projects	6	6	6	6	6	6	6	6	6	flooding

1. This policy takes effect late in the run but has important consequences.
2. Very unique policy - uses structural mitigation dollars but requires agenda density from environment, which is nonstructural mitigation.
3. As PE for mitigation increase after 1995 and there is evidence of natural barrier deterioration, the agenda activity for natural barrier restoration builds.
4. the good news - damages are avoided in 1995
5. side effect - perceived risk is lower at the end of the run; VP is greater than base and MP is less than base.
6. Thus, restoring the natural environment creates another sense of security, similar to the "more levees" approach.
7. Overall - this is a band aid approach to mitigation. This policy is effective but might not be efficient. Damages will be lower. The increased development that accompanies beach/wetland restoration creates a reinforcing loop of spending.

## Analysis

## Policy Run Details

restrict LD PE\_base\_1a

restrict LD PE

Base

Flood-1A

## Scenario

Base Conditions

## community

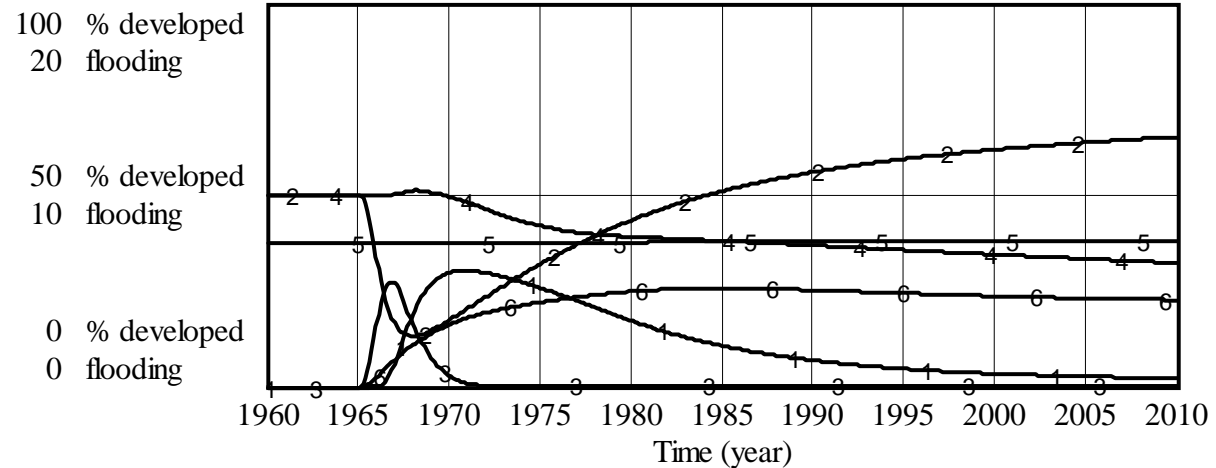
A community that uses levees to protect property owners. This is the false sense of security community

## Description

1. MP is same as base until 1997. MP does not increase in the final period.
2. VP is lower than base from 1970 to 1997. VP is higher than base in 2010.
3. No damages in 1995 or 2005 - total damages are half base.
4. Undeveloped Property never falls below 30 properties - net rate = 0 and is three times greater than the base in 2010.
5. Nat barriers never fall below the initial condition.
6. Structural mit is the same until 1995. Then, MC levels off and is approx 1/2 the base in 2010.

what if incentives lowered LD stakeholders and made them less effective in the policy process

## Indicators



Mitigated Property : restrict LD PE_base_1a	1	1	1	1	1	1	% developed
Vulnerable Property	2	2	2	2	2	2	% developed
Damaged Properties : restrict LD PE_base_1a	3	3	3	3	3	3	% developed
Undeveloped Property : restrict LD PE_base_1a	4	4	4	4	4	4	% developed
Natural Barriers	5	5	5	5	5	5	5 flooding
Structural Projects	6	6	6	6	6	6	6 flooding

1. Intended result - stakeholders for LD never risk above 40 - approx. 1/2 the base run. However, unlike the base run, they never leave.
2. A slower rate of development decreases stakeholders protective policies.
3. Interesting - with less VP to study, the PE for mit and agenda density for nonstructural mit is actually lower than the base from 1980.
4. Knowledge on VP is zero for the entire run.
5. No structural failures - total damages are 1/2 the base.
6. Indicator of perceived risk finishes 50% lower than base.
7. Overall - very effective - but coercive and might not be efficient. Despite low perceived risk, the level of damage is very low. The amount of open space is very high but VP is still high as well. In this policy run, individual mitigation is replaced by zoning and open space. This run might meet political resistance but achieves the long term goal.
8. Problem with this policy - low structural mit - relies on environment. With VP steadily increaing, this community could be in for a disaster if VP continues.

## Analysis

structures fail_base_1a
structures fail
Base
Flood-1A

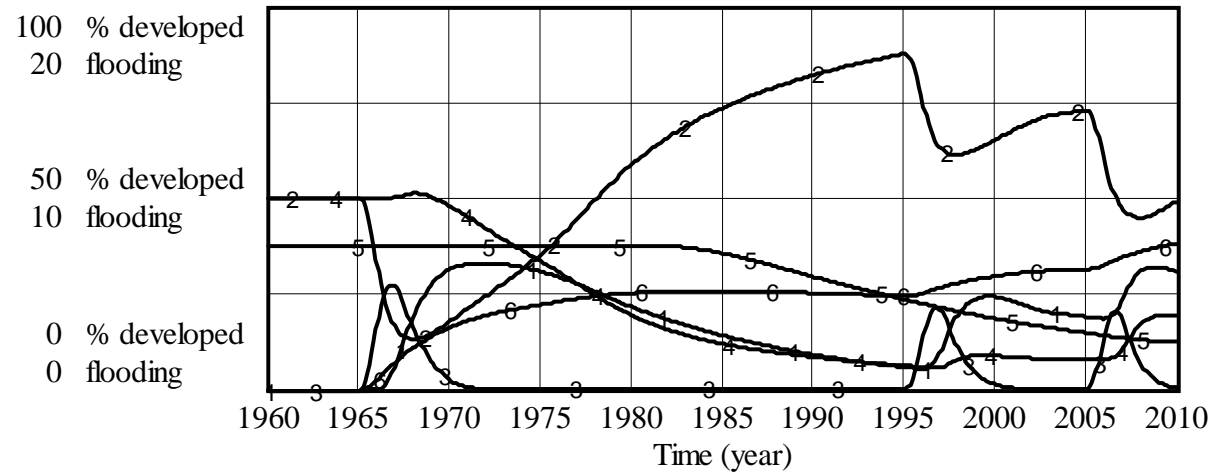
## Base Conditions

A community that  
uses levees to protect  
property owners.  
This is the false  
sense of security  
community

1. MP slightly higher than base from 1970 to 1995. Lower than base in the last period - follows the same behavior.
2. VP - mirrors base run and finishes approx same
3. Damage are less in 1995 and more in 2005 - same events in base result in damage.
4. undeveloped mirrors base - except the 2005 event sparks more open space.
5. natural barriers are the same until 1995 - same pattern but finishes slightly less than base.
6. Environment has same behavior - slightly higher than base in 2010.

what if public information campaigns would increase the memory of levee breaks and play down structural protection.

100 % developed  
20 flooding

[illegible]

<p>1. Important observation - Most of the behavior for the variables in this policy run is similar to the base case.</p> <p>2. Intended result - perceived value of structural projects is higher than base from 1995 to 2005.</p> <p>3. Interesting - playing down structural protection - indicator of perceived risk is higher than base - rising above initial level in 2010.</p> <p>4. Overall - minimal success - structural but not very effective - the increase indicator of perceived risk increases open space during the 2005 recovery. Otherwise, this strategy only works if there are more failures or if it is implemented after the initial indicator or risk is established.</p>	Anal
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