Hazards Planning

ESP 171 Urban and Regional Planning
Professor Susan Handy
5/31/16
Discouraging Growth Outside the Boundaries

Protect wildlands

Protect agricultural Lands

Protecting nature from us!
Cool study from UC Merced:
Percentage of the population that could theoretically be fed within a 50-mile foodshed by population center, based on a typical US diet

Prioritizing Land to be Conserved

Critical Habitat

Critical Farmland

For natural resource protection?
For growth management?
Urban Boundaries

Agriculture

Wildlands

Sharp or fuzzy boundaries?
Boundary Intrusions
Ag-Urban Interface
Boundary Intrusions
“WUI – Wildland-Urban Interface”

Wildlife

Wildfires

Hazards Planning + Disaster Response
HAZARDS PLANNING
i.e. protecting us from nature
Texas Floods - May 2016

Enough rain fell in May to cover entire state 8 inches deep
Texas Floods - May 2015

San Diego Fires - May 2014
Hurricane Sandy - November 2012
“...there have been more than four times as many weather-related disasters in the last 30 years than in the previous 75 years. The United States has experienced more of those disasters than any other country.”

– NYT, 5/31/08
Why are disasters going up?
Why disproportionately in the U.S.?

Natural event + People in way of event = Disaster
Lowest risk: Corvallis, Ore. Small quake and drought risk; little extreme weather.

Highest risk: Dallas
Lots of almost everything but quakes: twisters, hurricane remnants, hail, wind, drought, floods.

Metro areas with lowest risk:
1. Corvallis, Ore.
5. Grand Junction, Colo.
7. Salem, Ore.
8. Seattle

Metro areas with highest risk:
1. Dallas-Plano-Irving, Tex.
2. Jonesboro, Ark.
3. Corpus Christi, Tex.
4. Houston
7. Austin, Tex.
Don’t move to Oklahoma...
Hazards Planning in California

• Fires
• Floods
• Earthquakes
• Others...
Wildfires in San Diego County continue to rage out of control.
The Fires in Southern California

May, 2014

When areas were on fire:
As of 3 p.m. Friday
- 0 to 6 hours earlier
- 6 to 12 hours
- 12 to 24 hours
- 24 hours to 6 days earlier

Population density:
- Low
- High

5 miles
Dryness
May, 2014

An extended drought has left vegetation in California with an unusually low moisture content, leaving vast areas vulnerable to swift conflagration.

Dryness
How much levels of green vegetation vary from the average for the time of year

- Normal
- 30% below normal
- 70% below normal

Based on a “greenness” index that measures the amount of active photosynthesis in vegetation.
IN THE CENTRAL VALLEY Those in the floodplain operate under an old adage: You hope that the other guy’s levee fails first. A levee ruptures on the Cosumnes River near Wilton in January 1997.

Sacramento Bee, May 15, 2011
5/27/16
4.5 in Ferndale

4/19/1892 – 6.6 in Winters

Increase in earthquakes may be tied to groundwater pumping
LA Times 5/14/14

A file photo shows a sign in Parkfield, Calif., advising motorists they are crossing over the San Andreas fault. (Spencer Weiner / Los Angeles Times)

SAN ANDREAS

Move trailer: https://www.youtube.com/watch?v=V_ILwnlUh6E
Others

- Natural: mudslides, heat waves, blizzards, tornadoes, tsunamis, hurricanes, etc.
Others

• Natural: mudslides, heat waves, blizzards, **tornadoes**, tsunamis, hurricanes, etc.

Davis, June 1, 2011

http://ggweather.com/ca_tornado.htm
Others

• Natural: mudslides, heat waves, blizzards, tornadoes, **tsunamis**, hurricanes, etc.

March 2011
Others

• Man-made: industrial accidents, terrorism

Santa Barbara oil spill - 2015
San Bruno explosion - 2010
Others

- Zombie-made...

10 must have items for a zombie invasion
What can we do about all this?
# Roles and Responsibilities

<table>
<thead>
<tr>
<th></th>
<th>Standards and requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Federal</strong></td>
<td></td>
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<tr>
<td><strong>State</strong></td>
<td>Standards and requirements</td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td>Implementation through general plan, zoning, etc.</td>
</tr>
</tbody>
</table>
Federal and State Efforts on Wildfires

• National Wildland Urban Interface Fire Program: mitigate wildfire hazards by education and technical assistance

• California Department of Forestry and Fire Protection: fire safe development regulations, including both avoidance and mitigation strategies
FIRE HAZARD PLANNING

General Plan Technical Advice Series

Governor's Office of Planning and Research

November 2003
<table>
<thead>
<tr>
<th>Elements</th>
<th>Opportunities</th>
</tr>
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<tbody>
<tr>
<td>Land Use</td>
<td>Greenbelts, Fuel Breaks, Fuel Reduction, Buffer Zones, Water Supply Requirements</td>
</tr>
<tr>
<td>Housing</td>
<td>Definition of Hazard Areas and appropriate mitigation for “Affordable Housing”.</td>
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<tr>
<td>Circulation</td>
<td>Strategic Access, Road Design, Helibases, Helispot, Evacuation Routes (ground and air), ingress/egress.</td>
</tr>
<tr>
<td>Conservation</td>
<td>Fuelbreaks, Fuel Reduction Zones, Additional Design Requirements for Development near Commercial Timber Zones (TPZ’s), Air Tanker Base Locations, Helibases and Helispots.</td>
</tr>
<tr>
<td>Open Space</td>
<td>Fuelbreaks, Fuel Reduction Zones, Strategic Access and Water Supplies, Off-Site Linking of Strategic Improvements.</td>
</tr>
<tr>
<td>Safety</td>
<td>Evacuation Routes, Water Supplies, Road Standards, Fuel Reduction Buffer Zones, Air Access, Definition of Hazard Areas and Mitigation Requirements, house and road signage.</td>
</tr>
</tbody>
</table>
Defensible space

- Trees spaced to reduce fire spread
- Trees trimmed at least 10' from chimney
- Lower tree limbs removed to reduce "fire ladder"
- Space plants and shrubs to prevent fire from spreading

Fire resistant materials

See [Builders Wildfire Mitigation Guide](https://www.builderswildfiremitigationguide.com)
CA’s Colby-Alquist Floodplain Management Act

- Prohibit structures in floodway that endanger life or reduce carrying capacity.
- Allow development within “restrictive zone” between floodway and limits of floodplain as long as human life and carrying capacity of floodway are protected.
- Policies and programs should be incorporated into safety element; floodways and floodplain boundaries should be designated in land use element (and map).
State Legislation on Earthquakes

- **Alquist-Priolo Act:** Requires Division of Mines and Geology to *identify areas* where risk of earthquakes is high

- **Seismic Hazards Mapping Act:** Requires State Geologist to *compile maps* identifying seismic hazard zones – susceptible to ground shaking, landslides, or liquifaction.

- **Unreinforced Masonry Law:** Requires local governments to *identify hazardous buildings* and consider regulations to abate through *retrofitting or demolition*
Seismic Hazards Mapping Act

Cities and counties use maps to regulate development – can withhold development permits until geologic or soils investigations conducted and mitigations measures incorporated into development plans

Liquefaction Map

Source: http://gmw.consrv.ca.gov/shmp/html/pdf_maps_no.html
In Local Planning

- General Plan
  - Safety Element of General Plan – must address flood, fire, earthquake
  - Other Elements... e.g. land use
- Zoning Ordinance
- Building Codes
Hierarchy of Strategies

1. **Avoid** the impact (move away altogether)

2. **Lessen** the impact by modifying location on site (move away to lesser impact area)

3. **Lessen** the impact by modifying design (apply engineering or design features)

4. **Offset** the impact (compensate for the impact by monetary relief, reconstruction, or re-creation)

= **Mitigate**

Avoiding the impact means putting things out of harms way, i.e. land use planning
HEAVY DEVELOPMENT DESPITE RISK

Most of Cameron Park sits within areas deemed by the state as highly hazardous for wildfires. Near the Pine Hill Preserve, the fire risk is very high. Nonetheless, the number of housing units in the El Dorado County community of 18,000 increased 30 percent during the last decade, new census figures show.
A Cameron Park neighborhood is an island of development amid lush growth near the Pine Hill Preserve. Created to protect rare and endangered native plants, the preserve and its surrounding area are considered at very high risk for wildfire.

With neighbor Charley Ramirez, right, Bruce and Jill Kunder look over their Happy Valley property, which is free of brush and dotted with well-spaced trees. Ramirez cleared his land of brush and scrub, and installed large water tanks. "We do the best we can to prevent a fire up here," Bruce Kunder said.

Sacramento Bee, May 15, 2011
“...the history of fire and the threat of future fire have not influenced California’s land use planning or growth patterns in any meaningful way.”

- Fulton and Shigley

But see description of Stevenson Ranch in Chapter 23
Sacramento Flood Potential
NATOMAS LEVEE UPGRADES

Sacramento completed 18 miles of levee upgrades in the Natomas basin in 2012 at a cost of $410 million – 30 percent funded by local taxpayers and the rest by state bonds. A House ban on earmark funding had stalled work on the remaining 24 miles, but the House passed a bill Tuesday to fund the project.

The levee upgrades are divided between two government agencies:

- The Sacramento Area Flood Control Agency finished its section, considered among the most at-risk levees, in 2012.
- The U.S. Army Corps of Engineers is responsible for the rest. That project depends on federal funding; a start date is unknown. Estimated cost is $600 million.

Potential Flood Depths

- 0 to 5 feet
- 5 to 10 feet
- More than 10 feet

Source: Sacramento Area Flood Control Agency

A hospital?
West, Texas
Fertilizer Plant blast in 2013

http://i.i.com.com/cnwk.1d/i/tim/2013/04/18/west_texas_fertilizer_plant_blast_map.jpg
Why do we put ourselves in harm’s way even when we know there is great risk...?
But maybe we can fix our mistakes after disasters happen...?
Hierarchy of Strategies

1. **Avoid** the impact (move away altogether)
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Valmeyer, IL moved to top of hill after epic 1993 Mississippi floods
Evacuation Plans

Hurricane Katrina 2005
Hierarchy of Strategies

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“My fear is that the environmental damage from Hurricane Sandy is going to be long-term and will result more from our response than from the storm itself.”
– quoted in NYT, 5/18/13

"'You had to be underground... in order to survive this tornado’.... [but] fewer than one in 10 Oklahomans have access to the basements that stand the best chance of keeping them safe when a ‘monster’... strikes.” - the Atlantic

http://www.youtube.com/watch?v=OL-XExpb3pY
”...it can literally take an act of Congress to rebuild a home destroyed by fire in Natomas, the deep flood basin north of downtown Sacramento... a requirement that new construction in Natomas must be elevated above the expected flood depth... any newly constructed home would have to be perched 20 feet above the ground – a construction feat that is technically feasible but at exorbitant cost...”
– Sacramento Bee, 11/27/12

An additional 1.5 million people and nearly a half-million new houses now line the Florida shoreline a decade after eight hurricanes triggered $33 billion in insurance claims, but experts said the threat of catastrophic damage has not grown with the coastal populations.

Homebuilders operating under Florida's statewide building code are erecting sturdier homes than the ones ravaged during massive storms like 1992's Hurricane Andrew.

Implemented a decade after Andrew in 2002, the code required tough inspections for all new structures, which should be outfitted with shatterproof glass and reinforced connections between the roof and walls.
Hierarchy of Strategies

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*disaster response – relief efforts*
Humanitarian Assistance
Nepal Earthquake – April 25, 2015 – magnitude 7.8
5 Years After Haiti's Earthquake, Where Did The $13.5 Billion Go?
NPR 1/12/15

Haiti Sees Spike In Cholera Cases 4 Years After Outbreak Began
NPR 6/2/15

http://www.npr.org/sections/goatsandsoda/2015/01/12/376138864/5-years-after-haiti-s-earthquake-why-aren-t-things-better;
http://www.npr.org/2015/06/02/411406390/haiti-sees-spike-in-cholera-cases-4-years-after-the-outbreak-began
Is growth management good for disaster preparation...?

What kind of city will do better in a disaster – a sprawling one or a “smart growth” one...?
Climate Change Adaptation

“Many state and local governments are already preparing for the impacts of climate change through ‘adaptation,’ which is planning for the changes that are expected to occur.” – U.S. EPA

http://www.epa.gov/climatechange/impacts-adaptation/
“...there have been more than four times as many weather-related disasters in the last 30 years than in the previous 75 years. The United States has experienced more of those disasters than any other country.”

– NYT, 5/31/08

Events but also gradual changes...
Northeast freezes over in 2015

Niagara Falls

Great Lakes
Record-Setting Heat Across the U.S. in 2012

The average temperature across the contiguous United States in 2012 was 53.3°F (3.2°F above normal). This ranks as the warmest year since records began in 1895.

Source: Accuweather, National Oceanic and Atmospheric Administration

Note: The number of days during which the average temperature was normal are not labeled on the charts.

Source: NYT, 1/8/13
2014 hottest year on record

Rain brings little relief to southern India as heatwave death toll nears 2,200
Temperatures touch 47C as deadly heatwave that has tormented region since mid-April drags on with expected rainstorms providing scant respite
The Guardian, 5/31/15

http://www.theguardian.com/weather/2015/may/31/southern-india-heatwave-death-toll-nears-2200-rain-brings-little-relief
Figure 1. California Historical & Projected July Temperature Increase 1961-2099

Source: Dan Cayan et al. 2009.

http://www.carpwithoutcars.org/climate-change-impacts-2-water-supplies/
California historical and projected decrease in April snowpack, 1961-2099 (Source: Cayan et al 2006).

Historical Average (1961–1990)

- 100% remaining

2070–2099

- Lower Warming Range
  - Drier Climate
  - 40% remaining

- Medium Warming Range
  - Drier Climate
  - 20% remaining

April 1 snow water equivalent (inches)

Impact of 25 foot sea level rise

Sacramento – 62% flooded
San Francisco – 19% flooded

“Whether in 50 or 100 or 200 years, there is a good chance New York City will sink beneath the sea.”

New York Times
11/25/12

http://www.nytimes.com/2012/11/25/opinion/sunday/is-this-the-end.html?pagewanted=all
Shanghai, with its current population of more than 20 million, would be completely underwater if all of the ice melts, and ocean water would reach miles up the Yangtze river.
Mitigation

Reduce GHG emissions or enhance GHG sinks

Adaptation

Moderate harm or exploit beneficial opportunities

http://trca.on.ca/understand/climate-change-dev/addressing-climate-change/index.dot
Strategies for climate change

- Mitigation and adaptation: Different objectives

Mitigation: To reduce emissions or enhance sinks

Climate change

Impacts

Responses

Adaptation: To moderate harm or exploit beneficial opportunities

Greenhouse gas concentrations
Adaptation elsewhere in the world

Thames flood barrier, England

Maeslant surge barrier, the Netherlands

A Dutch city makes room for its river — and a new identity

“Jakarta sinks an average of three inches a year... In an attempt to halt the damage, authorities are building a gigantic wall off the coast, measuring 25 miles (40 kilometers) long and 80 feet (24 meters) high... To fund the $40 billion and 30-year-long project, the city will also create 17 artificial islands, on which developers can build luxury homes, offices, and shopping malls. Though it’s expensive, the seawall is expected to ultimately be cheaper than the cost of flooding.”
Trump wants to build another wall --
to keep out rising seas
Greenwire, 5/24/16

“Presumptive GOP presidential nominee
Donald Trump has proposed yet another wall;
this one would keep out the rising seas that
threaten to swamp his luxury golf resort in
Ireland.

“Trump has called climate change a ‘con job’
and a ‘hoax’ but this month filed an
application in County Clare for a permit to
build a nearly 2-mile-long stone wall. The
beachfront of the golf course has been
receding about a yard each year.

“The application cites local rules pertaining to
‘rising sea levels and increased storm
frequency and wave energy associated with
global warming.’”

http://www.eenews.net/greenwire/2016/05/24/stories/106003776
“Resiliency”

HURRICANE SANDY ON BIKES IN NYC

http://vimeo.com/52640864
http://www.youtube.com/watch?v=whl_vY7BuAs
“‘But we’re now at a point with the science where climate change is now a foreseeable risk.’ That would make local governments liable, in theory, for not upgrading their stormwater-management systems to account for that risk.” – NPR, 5/14/14

Warming has created a hot new job in America's coastal cities

On the job just six months as the chief resilience officer in Florida's largest county, Jim Murley has gotten pretty good at his climate change 101 speech. It's out of necessity. "We're on a peninsula surrounded by water," Murley said. "That defines the very issue that we have to deal with as we think about sea-level rise and climate change."
San Francisco’s health vulnerability index
flooding and extreme storms

“Climate gentrification”

http://www.eenews.net/climatewire/2016/04/26/stories/1060036242
“It is human nature, if not the American way, to look potential disaster in the face and prefer to see a bright and shining lie. The ‘taming’ of this continent, in five centuries and change, required a mighty mustering of cognitive dissonance. As a result, most of us live with the danger of wildfire, earthquake, tornado, flooding, drought, hurricane or yet-to-be-defined and climate-change-influenced superstorm. A legacy of settlement is the delusion that large-scale manipulation of the natural world can be done without consequence.”
A summer reading tip...

John McPhee
“The Control of Nature”
Another summer reading tip...

Alan Weisman

“The World Without Us”

“This is one of the grandest thought experiments of our time, a tremendous feat of imaginative reporting!” — Bill McKibben
Coming up

• Wednesday: Review for final in section
  – Papers due via DropBox at 11:59 pm!!!

• Thursday: preparation for final, wrap-up, evaluations...
  – Bring hardcopy of paper!!!

• Saturday, 6/4, 8am: Final exam!
The Final

• Where and when!
  – Friday at 9 am in room TBA
    • *If you RSVP NOW*
  – Saturday at 8:00 am HERE

• Bring a ScanTron card!
  – Multiple choice questions
  – A few matching questions
  – A few questions with T/F options
  – 2 short essay questions