Assessing Human Impacts

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Presentation

- Human impacts:
  - Public health
  - Socioeconomic
  - Equity

- Using the five-step process to assess human impacts
  - Exposure
  - Sensitivity—People impacted
  - Potential impacts—Public health, socioeconomic and equity impacts
  - Adaptive capacity
  - Risk and onset

- Conclusions
Public Health, Socioeconomic, and Equity Impacts

This sector consists of the public health and socioeconomic impacts and related equity issues associated with climate change impacts. Public health impacts include the short-term effects of climate-related hazards—heat events, intense rainstorms and flooding, wildfires, and high tide and storm surges—and long-term impacts such as cardio-respiratory morbidity and mortality, food-, water- and vector-borne diseases, food insecurity, and water contamination (Malibach et al., 2011). Because public health agencies currently address related health impacts, they can provide community planners and emergency responders with resources (such as databases of vulnerable populations), guidance (such as health-related policies for inclusion in climate action plans and general plans), and literature on the co-benefits of climate action planning on public health and health-related policies (CDPH, 2012).

Recent literature on the economic impacts of climate change covers potential effects on California’s economic growth (Sanstad et al., 2009; CEC, 2009) and on specific industries within the state, such as agriculture (Medillín-Azuara et al., 2011; Deschenes and Kolstad, 2011) and tourism (Pendleton et al., 2011). While this literature does not always directly address impacts on individuals or groups, it provides a context for assessing local populations that may be vulnerable because they rely on industries affected by climate change. In addition,
Step 2: Sensitivity

What aspects of a community will be affected? (functions, structures, populations)

Populations Impacted
Populations Impacted

- Geographic location
- Condition of built environment
- Lacking material resources
- Lacking information, knowledge, familiarity
- Physical conditions/dependence on others
Populations Impacted (Cont’d)

- Lacking basic lifelines
- Occupation/Activities
- Equity concerns/Existing exposure/Disenfranchisement
- Fitting into more than one of the above categories
Why does equity (social vulnerability) matter?

- 1957: Hurricane Audrey strikes the Louisiana coast. Deaths eight times higher among blacks than among whites.

- 1983 Study: white households have $2,370 less of a financial burden following a disaster than other racial groups.

- 2006: One year after Hurricane Katrina, only 43% of New Orleans black population has returned to the city; compared to 64% of whites.
### Sensitivity Checklist

Communities can use the following checklists to evaluate those functions, structures, and populations potentially affected by the exposure identified in Step 1.

#### Functions
- Government continuity
- Water/sewer/solid waste
- Energy delivery
- Emergency services
- Public safety
- Public health
- Emotional and mental health
- Business continuity
- Housing access
- Employment and job access
- Food security
- Mobility/transportation/access
- Quality of life
- Social services
- Ecological function
- Tourism
- Recreation
- Agriculture, forest, and fishery productivity
- Industrial operations

#### Structures
- Residential
- Commercial
- Industrial
- Government
- Institutional (schools, churches, hospitals, prisons, etc.)
- Parks and open space
- Recreational facilities
- Transportation facilities and infrastructure
- Marine facilities
- Communication infrastructure
- Dikes and levees
- Water treatment plant and delivery infrastructure
- Wastewater treatment plant and collection infrastructure

#### Populations
- Seniors
- Children
- Individuals with disabilities
- Individuals with compromised immune systems
- Individuals who are chronically ill
- Individuals without access lifelines (e.g. car or transit, telephones)
- Non-white communities
- Low-income, unemployed, or underemployed communities
- Individuals with limited English skills
- Renters
- Students
- Seasonal residents
- Individuals uncertain about available resources because of citizenship status
Central Coast Community

• Exposure:
  + 43 - 69 inch sea level rise
  • Coastal flooding
  • Extreme high tide
  • Coastal erosion and storms
Sensitivity Example

• Points of Sensitivity
  • Facilities
    • Wastewater treatment plant
    • A local power plant
  • Roadways in and out of community
  • Downtown commercial businesses
Sensitivity Example

• Populations:
  • Residents
  • Seniors
  • Children
  • Individuals without access lifelines (cars, transit, telephones)
Step 3: Potential Impacts

+ How will climate change affect the points of sensitivity? (functions, structures, populations)

Public Health, Socioeconomic, and Equity Impacts
Acute/Immediate Impacts

- Number, duration, and severity of heat waves
  - Public health impacts
    - Premature death
    - Cardiovascular stress and failure
    - Heat-related illnesses
  - Equity
    - Urban dwellers are disproportionately low-income communities and communities of color
    - Seniors and children
What does this mean?

This chart displays a count of the number of days (along the y-axis) that the selected area on the map is above a certain temperature threshold. The number of extreme heat days is shown for each year from 1950 to 2099, with the historical average indicated by a horizontal line. The chart includes an emissions scenario that assumes low carbon emissions in the future.
TEMPERATURE: EXTREME HEAT TOOL

Number of Extreme Heat Days by Year

What does this mean?
Acute/Immediate Impacts

- Intense Rainstorms and Flooding/Impacts on Water Quality
  - Public health impacts
    - Water- and food-borne diseases
  - Socioeconomic
    - Evacuation and temporary displacement
- Equity
  - Low-income communities without resources for treatment/relocation
  - Populations dependent on others
Acute/Immediate Impacts

- Wildfires/Erosion/Landslides
  - Public health impacts
    - Injury and death
    - COPD and other cardiovascular and respiratory diseases
  - Socioeconomic
    - Evacuation and temporary displacement
    - Property loss
- Equity
  - Low-income communities without resources for treatment/relocation
  - Seniors and children
Acute/Immediate Impacts

- Extreme High Tide/Storm Surges
  - Public health impacts
  - Injury and drowning
  - Exposure to contamination (compromise of nuclear power plants)

- Socioeconomic
  - Evacuation and temporary displacement
  - Property loss

- Equity
  - Populations lacking lifelines
  - Populations dependent on others
Long-term Impacts

- Change in Average Temperatures/Change in Air Quality/Ozone/Particulate Matter
  - Public health impacts
    - Cardiovascular and respiratory illnesses
    - Increased cancer rates
  - Equity
    - Low-income communities and communities of color in urban areas already exposed to poor air quality
    - Seniors and children
Long-term Impacts

- Change in Temperature/Precipitation
  - Public health impacts
    - Food-, water-, vector-borne diseases
    - Food insecurity
  - Socioeconomic Impacts
    - Change/loss in crops/jobs
    - Change/loss of tourism/jobs
- Equity
  - Seniors and children
  - Low-income communities without resources for treatment/increased food costs
Long-term Impacts

- Rainstorms and Fires/Erosion and Land Slippage
- Sea-level Rise/Inundation/Changes in Mean High Tide Level
  - Socioeconomic Impacts
    - Permanent damage or loss of property
    - Costs associated with treatment or abandonment of fresh water
    - Costs of replacement of critical facilities
  - Equity
    - Low-income communities without resources
Points of Sensitivity

Functions and Facilities
- Administrative offices
- Public restrooms
- Classrooms for lifeguards
- Emergency warning systems and response equipment

Populations
- 2.5 million beach visitors
- Injured beachgoers
- Public employees
- 650 students

Potential Impacts Example

Marine Safety Building,
San Clemente, California
Potential Human Impacts

- **Public health**
  - Injury and drowning associated with loss of early warning system and lifeguard facilities

- **Socioeconomic impacts**
  - Loss of tourism jobs
  - Cost of replacement of facilities could result in loss of other community services
Potential Impacts Example:

Central Valley Community

- **Exposure**
  - 7 degree F increase
  - 10 heat waves

- **Points of Sensitivity**
  - Functions and Facilities
    - Crops
  - Populations
    - Agricultural workers
    - Lower-income community
    - 47% Hispanic
    - Seniors
    - Children
Potential Impacts Example:
Central Valley Community

- **Potential Impacts**
  - Public Health
    - Cardiovascular stress
    - Heat stroke
    - Allergies
    - Cardiovascular and respiratory diseases
  - **Socioeconomic**
    - Loss of crops/jobs
  - **Equity**
    - Populations that are in several categories of impacted groups
Step 4: Adaptive Capacity

+ What is or can be currently done to address the impacts?
Adaptive Capacity

- Collaboration
- Community-wide involvement
- Education
- Use of other agencies information
- Strategies to address specific impacts:
  - Heat events
  - Air quality
  - Wildfires
  - Flooding
- Incorporation into existing planning documents
Adaptive Capacity

**Plans**
- General Plan
- Climate Action Plan
- Climate Adaptation Plan
- Area and Specific Plans
- Local Hazard Mitigation Plans
- Local Coastal Plans
- Urban Water Management Plan
- Downtown Plan
- Transit Plan
- Sustainable Community Plans (SB375)
- Regional Transportation Plans
- Integrated Regional Water Management

**Standards, Ordinance, and Programs**
- Capital Improvement Program
- Zoning Code
- Building Code
- Fire Code
- Tree Ordinance
- Floodplain Ordinance
- Stormwater Management Program
Adaptive Capacity Example: Central Valley Community

- Have agencies and organizations been contacted that can identify and reach vulnerable populations and provide them with information on what they need to know about the risks of climate change and what can be done to address them?

- Are early warning systems in place for extreme heat events?
Adaptive Capacity Example:

Central Valley Community

- Are cooling centers readily accessible and located in familiar places, both in terms of locale and transportation options, for vulnerable populations?

- Are there vulnerable members of the community without air conditioning? Are there programs available to provide air conditioning units?
Adaptive Capacity Example:

Central Valley Community

- Do plans require or promote additional open space, green space, shade cover, urban forests, community gardens, parks, and trees and other vegetation that address the impacts of heat islands and heat events upon agricultural and tourism workers?
Step 5: Risk and Onset

How likely are the impacts and how quickly will they occur?
## Risk and Onset

### Table 3. Probability based on global models

<table>
<thead>
<tr>
<th>DRIVER</th>
<th>% PROBABILITY (IPCC)</th>
<th>CERTAINTY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature change</td>
<td>&gt; 90% probability</td>
<td>High</td>
</tr>
<tr>
<td>Precipitation change</td>
<td>&gt; 66% probability</td>
<td>Medium</td>
</tr>
<tr>
<td>Sea level rise</td>
<td>&gt; 90% probability</td>
<td>High</td>
</tr>
<tr>
<td>Snow season and depth change</td>
<td>&gt; 90% probability</td>
<td>High</td>
</tr>
</tbody>
</table>

## Risk and Onset

Table 4. Secondary impact associations.

<table>
<thead>
<tr>
<th>PRIMARY IMPACT</th>
<th>ASSOCIATED SECONDARY IMPACTS</th>
<th>CERTAINTY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea level rise</td>
<td>Inundation or long-term waterline change</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Extreme high tide</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Coastal erosion</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Saltwater intrusion</td>
<td>High</td>
</tr>
<tr>
<td>Changed temperature and/or precipitation patterns</td>
<td>Changed seasonal patterns</td>
<td>Medium</td>
</tr>
<tr>
<td>Increased temperature</td>
<td>Heat wave</td>
<td>High</td>
</tr>
<tr>
<td>Increased temperature and/or changed precipitation</td>
<td>Intense rainstorms</td>
<td>Medium</td>
</tr>
<tr>
<td>Wildfire and/or increased precipitation</td>
<td>Landslide</td>
<td>Medium</td>
</tr>
<tr>
<td>Increased temperature and/or reduced precipitation</td>
<td>Drought</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Wildfire</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Reduced snowpack</td>
<td>High</td>
</tr>
</tbody>
</table>

Estimated based on most conservative driver from Table 3
Making the Steps Work for You
### Example of Assessment Process

**Marine Safety Building, San Clemente, CA**

<table>
<thead>
<tr>
<th>POTENTIAL IMPACTS</th>
<th>SENSITIVITY</th>
<th>TEMPORAL EXTENT</th>
<th>SPATIAL EXTENT</th>
<th>RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water damage and destruction of marine safety building</td>
<td>Marine safety building</td>
<td>4 years+</td>
<td>One area (MS)</td>
<td>high</td>
</tr>
<tr>
<td>Service level impacts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of on-site offices—staff less available to respond to public emergencies</td>
<td>Potential impact on any of 2.5 million annual visitors to beach</td>
<td>4 years+</td>
<td>Entire beach</td>
<td>high</td>
</tr>
<tr>
<td>Loss of on-site supervision and reduced oversight</td>
<td>Potential impact on any of 2.5 million annual visitors to beach</td>
<td>4 years+</td>
<td>Entire beach</td>
<td>high</td>
</tr>
<tr>
<td>Loss of advanced first aid facilities for public</td>
<td>Impact on injured citizens</td>
<td>4 years+</td>
<td>One area (MS)</td>
<td>high</td>
</tr>
<tr>
<td>Loss of hot showers for hypothermic patients and lifeguards</td>
<td>Impact on public and employees</td>
<td>4 years+</td>
<td>One area (MS)</td>
<td>high</td>
</tr>
</tbody>
</table>
Conclusions

- Even though there is not absolute certainty about impacts, it is important to evaluate and act.

- The importance of quantitative AND qualitative assessments.

For now, decisions are upon us and we cannot afford delay...We must act. We must act knowing that our work will be imperfect.

President Obama, January 21, 2013
Conclusions

- Build relationships with other community agencies and groups that can help you understand the impacts to local people.
- Combine assessment with other efforts.
- Use/build upon efforts already in place.