Resiliency in an Uncertain Future

THE HARD SELL
Planning and investing in a distant future

The story of the Oroville Dam

Oroville Dam constructed as the tallest dam in the country in 1968

Total capacity is 3,500,000 acre feet
In 2005, Friends of the River, Sierra Club and the South Yuba River Citizen’s League charged that the emergency spillway at the Oroville Dam wasn’t properly built and posed serious risks.

They sued.

The state of California denied their claims as overblown and unfounded.

The state won.
100,000 cubic feet/second

But the rain kept coming
California awards $275 million contract to repair Oroville Dam spillway

Not really
$650 million and still climbing

How concerned are you that future extreme weather events will negatively impact your community water provider’s ability to provide safe, healthy drinking water?

Water Research Foundation, 2014

Climate change will have a significant impact on extreme weather events, causing changes in the severity of droughts, hurricanes, rainstorms, and heat waves

When planning for the future, how much attention do you think your water utility should give the following issues?

Climate Change

- Strongly and somewhat agree: 75%
- Neither agree or disagree: 25%
- Somewhat or strongly disagree: 0%
- Strongly disagree: 0%

Extreme Weather Events

- Strongly and somewhat agree: 86%
- Neither agree or disagree: 14%
- Somewhat or strongly disagree: 0%
- Strongly disagree: 0%

Should your community water utility play a role in helping the community prepare for climate impacts?

- Yes: 92%
- No: 8%
Less **COLD**

More **HEAT**

More **PRECIPITATION**

2% - 13% Increase in precipitation: mostly in winter
Drier Summers/Fall

Some Impacts

- Longer growing season = higher water demand
- Increased stream flows: late winter/early spring

Impact on Infrastructure

<table>
<thead>
<tr>
<th>Category</th>
<th>Sensitivity to Climate Change</th>
<th>Population Served</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Withdrawal from large water bodies</td>
<td>Low</td>
<td>2,000,000</td>
</tr>
<tr>
<td>2. New York City system</td>
<td>Moderate</td>
<td>9,300,000</td>
</tr>
<tr>
<td>3. Other reservoir systems</td>
<td>Moderate</td>
<td>1,300,000</td>
</tr>
<tr>
<td>4. Run-of-the-river on small drainage</td>
<td>High</td>
<td>92,000</td>
</tr>
<tr>
<td>5. Long island groundwater</td>
<td>Moderate</td>
<td>3,200,000</td>
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<tr>
<td>6. Other primary aquifers</td>
<td>Moderate</td>
<td>850,000</td>
</tr>
<tr>
<td>7. Homeowner well water</td>
<td>Moderate to high</td>
<td>1,800,000</td>
</tr>
<tr>
<td>8. Other small water supply systems</td>
<td>Moderate to High</td>
<td>800,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>19,012,000</strong></td>
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</table>
Warmer lakes and rivers
- Algae blooms
- Stressed species
- Greater pathogen survivability

Reduced snowfall
Few eastern ski resorts will be economically viable beyond the next century

Higher temperatures
- Heat stress
- Cardiovascular failure

Air quality/asthma
Water-borne diseases
Vector-borne diseases

Impacts on Ecosystems / Wildlife
Emerald Ash Borer
Warming Adirondack lakes threaten trout survival

Impacts on local economies

Impact on Agriculture

Reduced milk production

Increased weed growth

Reduced fruit quality

Summer blackout/brownouts
Resiliency

The ability of an organization to grow, resist, absorb, respond and/or recover in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.

Step #1

Identifying & Prioritizing Assets

What Assets/Resources/Stakeholders Make Your Community - YOUR Community

Work Individually
PESTEL

Political Assets

Economic Assets

Social Assets

Environmental Assets

Technological Assets
Legal/Regulatory Assets

But it could also be...

Youth

Grandparents/Elders/Family

Hola

Language

Small Business
Local Towns

Prioritize Critical Assets/Resources

Work as a Team

Report Out

Step #2
Probe for Resiliency Against Future Scenarios

Develop Future Scenarios

Political

Environmental

SOCIAL

Technological
Use **PESTEL** to Develop Resiliency Planning Scenarios

**P** State legislature allows privatization of lakes

**E** 5-year drought hits region

**S** 30% increase in population from NYC and PR

**T** Internet/wifi is down for one month

**E** New company re-locates - 100,000 new jobs coming

**L** All government services are privatized
Team Activity

Step #3

Prioritize Your Headline Scenarios

- High Impact Low Probability
  - Think about it “just to be sure”
- Low Impact Low Probability
  - Think about it “just to be sure”
- High Impact High Probability
  - Take active steps
- Low Impact High Probability
  - Have a plan

Step #4

Vulnerability Assessment
How Do
Less **COLD**
More **HEAT**
More **PRECIPITATION**
And other futures
**Impact your community?**

<table>
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<th>Wind Tunnel Future Scenarios</th>
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**Built Environment**

**Utilities**

**Transportation**
What does your community look like under various futures?

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| **Natural Environment** | Lake temperatures up 10 degrees  
Trout dying |
| **Pest infestations due to warmer weather** |
| **Economic** | Recreational businesses losing money |
| **Ski resorts remain closed**  
**Summer tourist season lasts longer** |
### Wind Tunnel Climate Scenarios

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*Your assets*