City Planning for Our Energy and Climate Future

ESIP
July 11, 2013
Scott Shuford
Planning for a New Energy and Climate Future

- PAS Report – Collaborative effort
- Funding support from Surdna & George Gund Foundations, ENRE Division, & NOAA
- Help planners incorporate energy and climate change considerations into their work
- Assist communities and regions to
  - Reduce energy use & GHG emissions
  - Adapt to a changing climate
  - Transition to renewable energy
Outline

- Why are cities important to the issues of climate change and energy?
- What are some of those issues and what are cities doing about them?
- What cities are leading the way?
World GHG Emissions Flow Chart

Sector

Transportation 13.5%

Electricity & Heat 24.6%

Other Fuel Combustion 9.0%

Industry 10.4%

Fugitive Emissions 3.9%

Industrial Processes 3.4%

Land Use Change 18.2%

Agriculture 15.5%

Waste 3.6%

End Use/Activity

Road 9.5%

Rail, Ship, & Other Transport 2.3%

Residential Buildings 9.5%

Commercial Buildings 5.4%

Unallocated Fuel Combustion 3.8%

Iron & Steel 3.2%

Non-Cement Industrial Gases 1.4%

Wastes 1.2%

Electricity 1.2%

Chemicals 4.8%

Cement 3.6%

Other Industry 5.0%

S & D Losses 1.9%

Refining & Processing 6.3%

Deforestation 18.3%

Afforestation -1.5%

Reforestation -0.5%

Hannock/Management 2.1%

Other 0.2%

Agriculture Soils 6.0%

Livestock & Manure 5.1%

Fertilizer 1.5%

Livestock 0.9%

Wastewater, Other Waste 1.6%

Gas

Carbon Dioxide (CO2) 77%

HFCs, PFCs, SF6 1%

Methane (CH4) 14%

Nitrous Oxide (N2O) 8%

Sources & Notes: All data is for 2000. All calculations are based on CO2 equivalents, using 100-year global warming potentials from the IPCC (1996), based on a total global estimate of 41,755 MTCO2 equivalent. Land use change includes both emissions and absorptions; see Chapter 16. See Appendix A for a detailed description of sector and end use/activity definitions, as well as data sources. Contact authors for a more detailed understanding of the data and its implications.
The graphic shows where electricity is used in the US.

By the year 2035, three quarters of the built environment in the U.S. will be either new or renovated.

The AIA has a carbon neutral goal by 2030.

Source: American Institute of Architects (AIA)
It Will Be Hotter in Cities

Source: Lawrence B. Livermore National Laboratory, Berkeley, California
Greensburg, Kansas

An EF-5 tornado hit Greensburg, Kansas in May 2007. Despite near total devastation, the community was determined to re-build but in a new way:

- Public buildings – LEED-Platinum
- Electricity will come from ten 1.25 MW wind-turbines

http://www.greensburggreentown.org/
## Private Governance: Mitigation
### The Behavioral Wedge


<table>
<thead>
<tr>
<th>Behavior Change</th>
<th>Category</th>
<th>Potential Emissions Reduction (MTC)</th>
<th>Behavioral Plasticity</th>
<th>RAER (MTC)</th>
<th>RAER (%I/H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weatherization</td>
<td>W</td>
<td>25.2</td>
<td>90%</td>
<td>21.2</td>
<td>3.39%</td>
</tr>
<tr>
<td>HVAC Equipment</td>
<td>W</td>
<td>12.2</td>
<td>80%</td>
<td>10.7</td>
<td>1.72%</td>
</tr>
<tr>
<td>Low-flow showerheads</td>
<td>E</td>
<td>1.4</td>
<td>80%</td>
<td>1.1</td>
<td>0.18%</td>
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<tr>
<td>Efficient water heater</td>
<td>E</td>
<td>6.7</td>
<td>80%</td>
<td>5.4</td>
<td>0.86%</td>
</tr>
<tr>
<td>Appliances</td>
<td>E</td>
<td>14.7</td>
<td>80%</td>
<td>11.7</td>
<td>1.87%</td>
</tr>
<tr>
<td>LRR tires</td>
<td>E</td>
<td>7.4</td>
<td>80%</td>
<td>6.5</td>
<td>1.05%</td>
</tr>
<tr>
<td>Fuel-efficient vehicle</td>
<td>E</td>
<td>56.3</td>
<td>50%</td>
<td>31.4</td>
<td>5.02%</td>
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<tr>
<td>Change HVAC air filters</td>
<td>M</td>
<td>8.7</td>
<td>30%</td>
<td>3.7</td>
<td>0.59%</td>
</tr>
<tr>
<td>Tune up AC</td>
<td>M</td>
<td>3.0</td>
<td>30%</td>
<td>1.4</td>
<td>0.22%</td>
</tr>
<tr>
<td>Routine Auto Maintenance</td>
<td>M</td>
<td>8.6</td>
<td>30%</td>
<td>4.1</td>
<td>0.66%</td>
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<tr>
<td>Laundry temperature</td>
<td>A</td>
<td>0.5</td>
<td>35%</td>
<td>0.2</td>
<td>0.04%</td>
</tr>
<tr>
<td>Water heater temperature</td>
<td>A</td>
<td>2.9</td>
<td>35%</td>
<td>1.0</td>
<td>0.17%</td>
</tr>
<tr>
<td>Standby electricity</td>
<td>D</td>
<td>9.2</td>
<td>35%</td>
<td>3.2</td>
<td>0.52%</td>
</tr>
<tr>
<td>Thermostat setbacks</td>
<td>D</td>
<td>10.1</td>
<td>35%</td>
<td>4.5</td>
<td>0.71%</td>
</tr>
<tr>
<td>Line drying</td>
<td>D</td>
<td>6.0</td>
<td>35%</td>
<td>2.2</td>
<td>0.35%</td>
</tr>
<tr>
<td>Driving behavior</td>
<td>D</td>
<td>24.1</td>
<td>25%</td>
<td>7.7</td>
<td>1.23%</td>
</tr>
<tr>
<td>Carpooling &amp; Trip-chaining</td>
<td>D</td>
<td>36.1</td>
<td>15%</td>
<td>6.4</td>
<td>1.02%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td><strong>233</strong></td>
<td></td>
<td><strong>123</strong></td>
<td><strong>20%</strong></td>
</tr>
</tbody>
</table>
As Extreme Weather Events Become More Common, We Will All Have An Extreme Weather Story or Two
City Issues and Responses

- Wildfires
- Heat and Heat Waves
- Flooding
- Drought
Community Wildfire Protection Plan

✔ Step One: Convene Decisionmakers
✔ Step Two: Involve Federal Agencies (USFS and BLM)
✔ Step Three: Engage Interested Parties
✔ Step Four: Establish a Community Base Map
✔ Step Five: Develop a Community Risk Assessment
✔ Step Six: Establish Community Priorities and Recommendations
✔ Step Seven: Develop an Action Plan and Assessment Strategy
✔ Step Eight: Finalize Community Wildfire Protection Plan
Firewise Communities
www.ncfirewise.org
Heat Waves

Excessive Heat Events Guidebook; EPA; 2006
Design for Heat

Image by www.hopeplantation.org/
Buildings and Sites: Energy Smart Design

Source: SolarEnergyWorks
Heat Effects
Heat Effects – Defense Industry

Heat Effects

• Training
• Equipment
• Air Operations and Infrastructure
• Energy Use
• Ecosystem Management
### Tourist Economies

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Northern VA</th>
<th>NH</th>
<th>Central NC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average July High</td>
<td>88°</td>
<td>82°</td>
<td>88°</td>
</tr>
<tr>
<td>Average July Low</td>
<td>64°</td>
<td>56°</td>
<td>69°</td>
</tr>
<tr>
<td>Average Jan. High</td>
<td>42°</td>
<td>28°</td>
<td>48°</td>
</tr>
<tr>
<td>Average Jan. Low</td>
<td>22°</td>
<td>7°</td>
<td>29°</td>
</tr>
<tr>
<td>Population</td>
<td>Heat Waves</td>
<td>Storms</td>
<td>Floods</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Persons over 65 (the elderly)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Persons 14 &amp; under</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Persons with disabilities or chronic illnesses</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Linguistically isolated persons (non-English speaking or English as a second language - ESL)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Socially isolated persons, including the homeless</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Single adults with children</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Transportation-challenged (no car or transit) persons</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Persons residing in high crime areas</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Persons residing in mobile homes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Persons with below median incomes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Persons residing in substandard housing</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Persons residing in multifamily structures</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

- ✓: Affect
- ⊗: Not Affect
Flooding
A Walkable Place . . .

Biltmore Village, Asheville, NC
. . . Can Become Swimmable.

Photo courtesy of Mark Combs
Design for Flooding
Simple Solutions

New York City Subway Grates
Design with Nature

Green Infrastructure

Images from EPA’s Green Infrastructure Case Studies; 2010
Snowplowing Floodwaters

Source: FHWA
Sometimes Private Governance is a Mixed Bag
Drought

North Carolina Drought Management Advisory Council

www.ncwater.org
Drought - Water Supply Impacts
Nuclear energy - North Carolina’s three systems generate nearly 32 percent of the state’s electricity.
Case Studies

- King County, WA – The “Whole Organization” Approach
- New York City – The “Comprehensive Planning” Approach
- Chicago – The “Strategic Focus” Approach
“It sets the process in motion to embed climate change mitigation and adaptation as critical factors in the cost-benefit evaluations of all decisions made by King County.”
King County, Washington

How is climate change likely to affect your natural or built resource?

Do you know of, or can you identify, potential economic impacts from climate change?

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**Questionnaire for King County Departments and Divisions on Climate Change Impacts**

This questionnaire has been used for:

- Assessing the potential impacts of climate change on King County’s natural and built resources
- Understanding the depth and limitations of our knowledge about the impacts
- Assessing our capacity to adapt to climate change
- Understanding how other activities will affect adaptation strategies in a given area

We ask that you take some time to provide some preliminary answers to this questionnaire, and then there will be a follow up interview about your responses. If there is additional information that you believe is important to include, please take the time to provide any relevant information in the last section, "Additional Information."

**General Information**

1. Name(s) of person(s), title(s) and division/department completing this survey:

2. What is the natural or built resource that is the focus of this questionnaire response? Please use above sector name:

**Assessing Sensitivity**

3. How is your natural or built resource sensitive to present day climate variability?

4. How is climate change likely to affect your natural or built resource? Of these impacts, which present the greatest concern and why?

5. What additional information about climate impacts would help further your ability to manage climate change impacts?

6. Do you know of, or can you identify, potential economic impacts from climate change? Please state what the potential or expected impacts are and why they may occur.
In 2008, Mayor Bloomberg created a Climate Change Adaptation Task Force with these key tasks:

- Inventory existing at-risk infrastructure;
- Develop coordinated adaptation plans to secure these assets based on climate change projections;
- Draft design guidelines for new infrastructure that account for anticipated climate change impacts; and
- Identify adaptation strategies for further study that are beyond the scope of individual stakeholders.
NPCC Report 2010
Climate Change Adaptation in New York City: Building a Risk Management Response

Report Structure
1 – New York City Adaptation in Context
2 – Adopting a Risk-Based Approach
3 – Climate Observations and Projections
4 – Infrastructure Impacts and Adaptation Challenges
5 – Law and Regulation
6 – Insurance Industry
7 – Indicators and Monitoring

Workbooks
Climate Risk Information
Adaptation Assessment Guidebook
Climate Protection Levels

New York City Panel on Climate Change
Design Adaptation Process

1. Identify current and future climate hazards
2. Conduct inventory of infrastructure and assets and begin to identify vulnerabilities
3. Characterize risk
4. Develop initial list of strategies
5. Prioritize strategies
6. Prepare and implement Adaptation Plans
7. Monitor and reassess
Chicago

- Adopted in 2008
- Private Governance: $800 Savings Challenge
- Focuses Adaptive Efforts on Two Key Impacts:
  - Heat
  - Precipitation
Adaptation Strategies

1. Manage Heat
2. Pursue Innovative Cooling
3. Protect Air Quality
4. Manage Stormwater
5. Implement Green Urban Design
6. Preserve Our Plants and Trees
7. Engage the Public
8. Engage Businesses
9. Plan for the Future
Sustainable Backyards
Chicago Conservation Corps (C3)
Urban Heat Island
Extreme Weather Operations
Stormwater Ordinance
Green Alleys
City Planning for Our Energy and Climate Future

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