What Does Economics Have to Do With Weather Forecasting?

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NA THORPEX SERA meeting, Boulder, CO, August 14-16, 2006
Economics and Social Science is Essential to:

1. Set priorities and allocate resources
2. Understand user needs and identify effective ways of meeting those needs
3. Raise program performance
4. Maximize societal benefits through recognizing system as well as individual impacts
5. Prepare for and adapt to changing conditions and needs
6. Demonstrate the value of programs to stakeholders
What Is Economics?

• Formal definition:
  – Economics deals with the allocation of scarce resources among various and competing ends

• How:
  – By providing concepts and tools for measurement and analysis
  – As a behavioral science, considering incentives and responses to them
What Can Economics Contribute?

• Understanding markets and customer behavior
  – Demand analysis
  – Information theory

• Measuring benefits and costs of weather information and services
  – Cost analysis
  – Benefit analysis
  – Distribution of benefits and costs

• Micro vs. macro analysis
Demand Analysis

- Information as a factor of production
  - Business demand derived from demand for the products of the business
- Consumer demand for management of personal business and lifestyles
- Government demand based on interest in commerce, population needs and health and safety
Information Theory

• The rate of return to investment in acquiring information depends on the direct cost of the information to the user and the costs and time involved in search for more or better information.

• Network economies are multiplied benefits that become possible when participants interact.
  – Benefits increase exponentially with the number of participants in a network (Metcalf’s Law).
Cost Analysis

- Average and marginal (incremental) cost
- Economies of scale *and* scope
  - Program cooperation and integration
- Use of resources vs. budgeted numbers
Benefit Analysis

- Forms of benefits include value of time and value of life and health
- Understanding the value chain
- Private and societal benefits and costs
- Present discounted values of benefits and costs
  - Benefit/cost ratios and net present values
  - Risk and sensitivity analysis
Learning from What We Do

- "The Number" vs. analysis for decision-making
- Revealed preference – what people and organizations actually do
- It may be possible to standardize some components
  - Value of life and health; value of time
  - Risk perception
- Need for expected outputs and outcomes against which results can be evaluated
  - Comparisons over time and across programs
  - Relating results to changes in programs, technology, distribution, etc. to see what is working
- Institutionalizing analytic process
Focusing on New Frontiers

• Geographic detail and special models

• More types of weather, water and climate phenomena and their interactions

• International

• Climate change
  – Winners and losers
  – Macro and micro
Some Local Impact and Valuation Measures

<table>
<thead>
<tr>
<th>Subject</th>
<th>Possible Indicator</th>
<th>Value Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic delays</td>
<td>Number of vehicles affected</td>
<td>Economic value of time lost from work and non-work</td>
</tr>
<tr>
<td></td>
<td>Average length of delay</td>
<td></td>
</tr>
<tr>
<td>School closings</td>
<td>Number of schools closed</td>
<td>Cost per pupil per day</td>
</tr>
<tr>
<td></td>
<td>Number of students</td>
<td></td>
</tr>
<tr>
<td>Accidents</td>
<td>Number of accidents</td>
<td>Cost of medical care</td>
</tr>
<tr>
<td></td>
<td>Number of deaths</td>
<td>Lost income and tax revenue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic value of a lost life</td>
</tr>
<tr>
<td>Business interruption</td>
<td>Number and duration of closings</td>
<td>Loss of sales</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Labor and other costs</td>
</tr>
<tr>
<td>Property damage</td>
<td>Number of buildings damaged</td>
<td>Cost of replacement or repair</td>
</tr>
<tr>
<td></td>
<td>Extent of damage</td>
<td></td>
</tr>
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</table>
# Employment Status of Katrina Evacuees after One Year (nos. in thous.)

<table>
<thead>
<tr>
<th>Employment status in July 2006</th>
<th>Total of next 2 columns</th>
<th>Residence in July 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Same as Aug. 2005</td>
</tr>
<tr>
<td>Civilian noninstitutional population age 16 &amp; over (P)</td>
<td>1,149</td>
<td>673</td>
</tr>
<tr>
<td>Civilian labor force (LF)</td>
<td>682</td>
<td>403</td>
</tr>
<tr>
<td>participation rate (LF/P)</td>
<td>59.3%</td>
<td>59.9%</td>
</tr>
<tr>
<td>Employed (E)</td>
<td>600</td>
<td>386</td>
</tr>
<tr>
<td>employment rate (E/P)</td>
<td>52.2</td>
<td>57.3</td>
</tr>
<tr>
<td>Unemployed (U)</td>
<td>81</td>
<td>17</td>
</tr>
<tr>
<td>unemployment rate (U/LF)</td>
<td>11.9%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Not in labor force (P-LF)</td>
<td>468</td>
<td>270</td>
</tr>
</tbody>
</table>
The Sterling Warning Area High Impact Weather Study: Rationale

- Studies of impacts of weather on the economy and society typically have dealt with particular types of weather with uncoordinated geographic and sector coverage.

- With many decisions occurring locally, there is a need for more systematic efforts to determine community and regional impacts and ways of improving outcomes.
  - Such efforts can document the contribution of improved weather forecasts to reducing adverse impacts and help assess the kinds of improvements in forecasts and dissemination that would be most beneficial.
  - If studies can be done on a comparable basis for a number of localities, there are likely to be increased opportunities for one community to learn from the experience of others.
The Sterling Warning Area High Impact Weather Study: Features

• Societal impacts of high impact weather events and their relationship to forecast performance
  – In the 50 county Sterling Warning Area that covers Washington, DC, Virginia and part of Baltimore over the last 5 years

• The study examines:
  – Links between weather events and societal costs for community sectors
    • To be based on data from a survey of first responders and participants in the local warning network
    • Along with information on weather characteristics
  – NWS performance during high impact events

• Recommendations will be developed for NWS improvements to minimize effects of high impact weather events in the area
NOAA Sources of Economic Studies


- [www.economics.noaa.gov](http://www.economics.noaa.gov) See Library for many downloadable studies

  
  - Pages 103-144 contain a summary of benefit estimates
  
  - Available as background paper for THOPRPEX meeting [http://www.sip.ucar.edu/thorpex/pdf/presentations/Leveson.pdf](http://www.sip.ucar.edu/thorpex/pdf/presentations/Leveson.pdf)
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