Societal Impacts and Economic Benefits of Weather Information (Collaborative Program)

Jeffrey K. Lazo

Societal Impacts Program

National Center for Atmospheric Research

Boulder, Colorado, USA

Task Force on Social and Economic Applications of Public Weather Services

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Outline

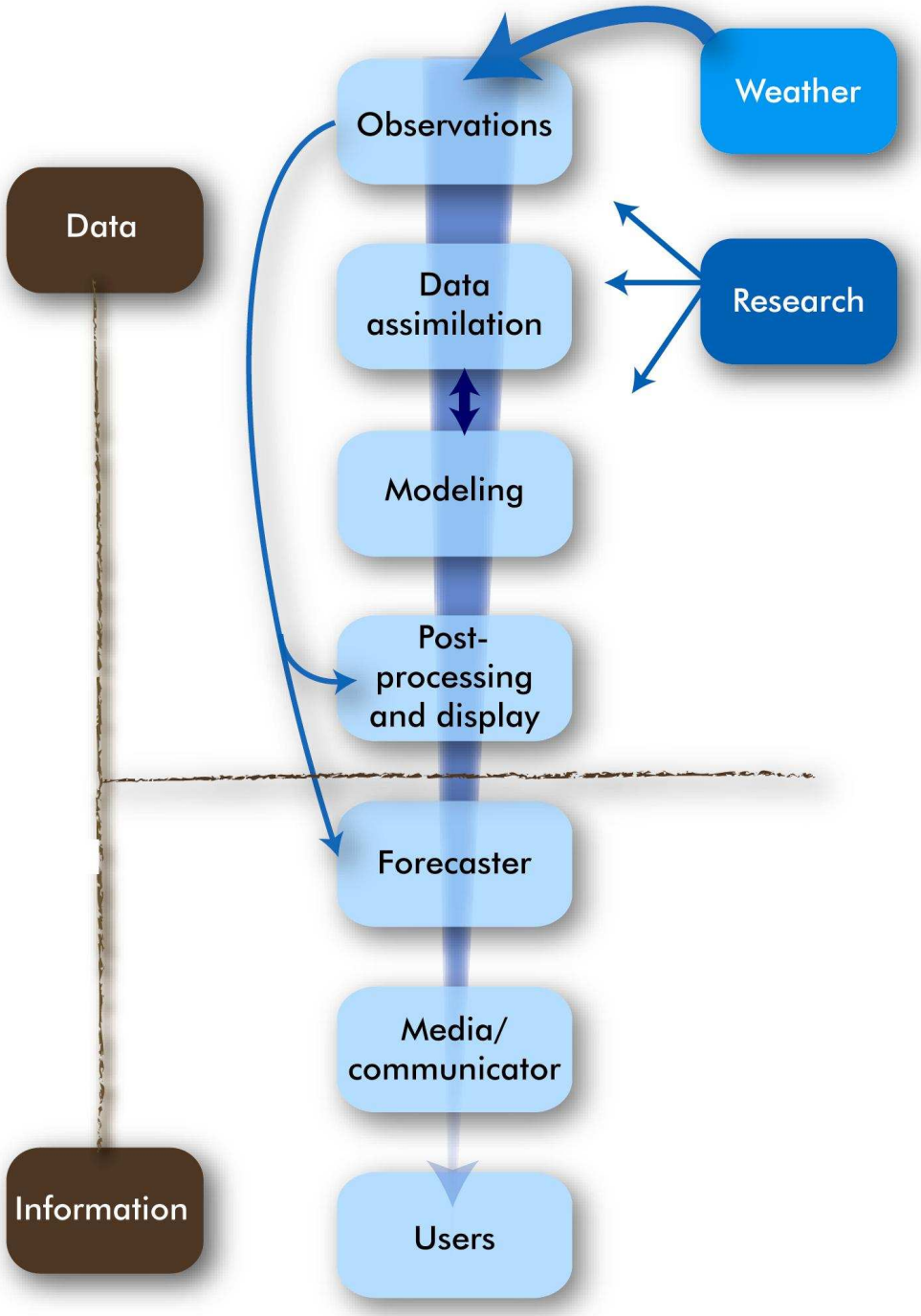
- Assessing communication, perception, use, and value of weather forecasts
- US Sector Sensitivity Assessment
- Household Valuation Study
- WAS*IS
- SIP Information Resources
- Research Topics

Value of Weather Forecasts

value chain

data → information

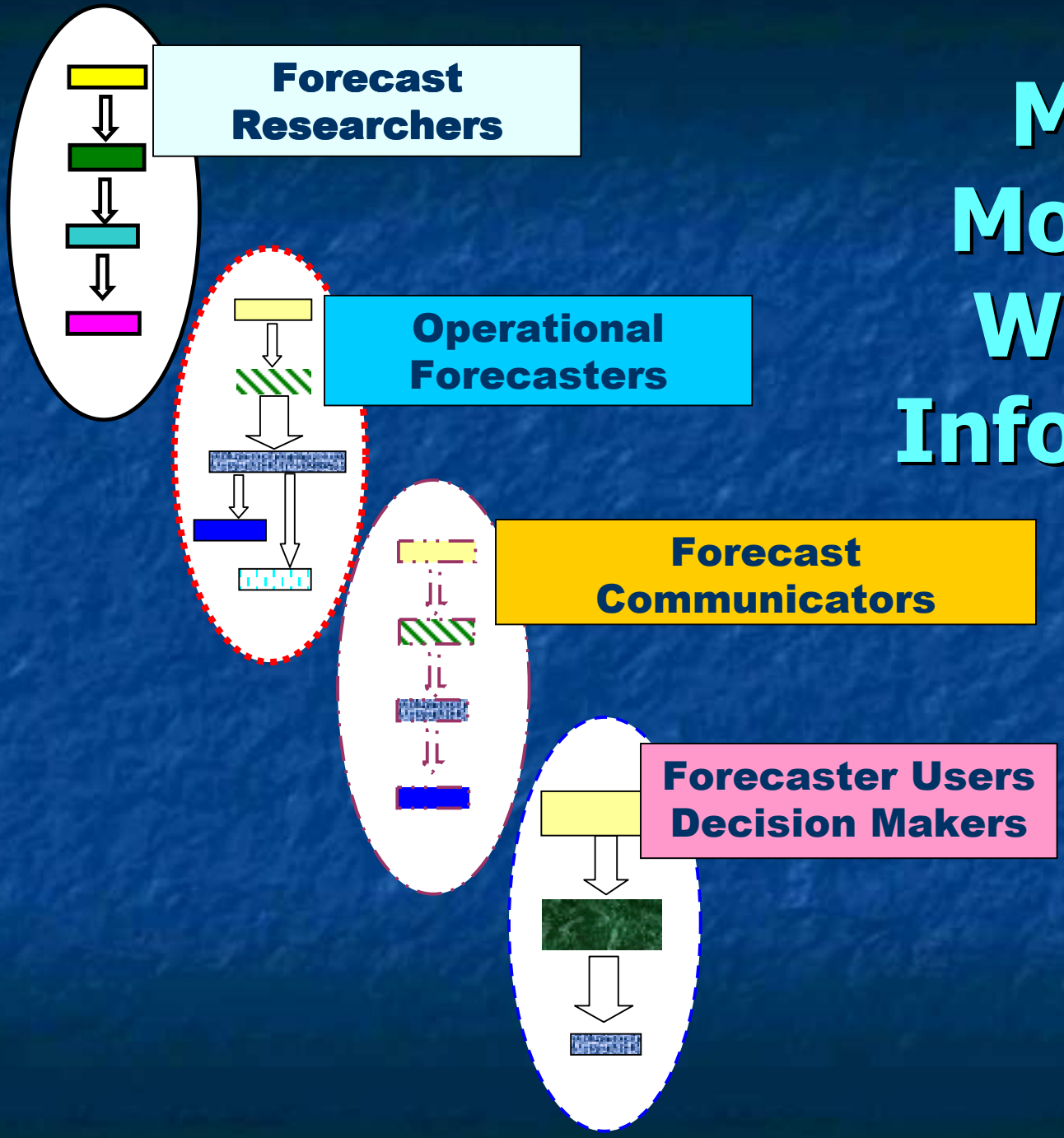
value of information



Characteristics of Weather Information

- temporal
- spatial
- information content
- public goods?
  - rival – my use keeps you from using it?
  - exclusion – possible to prevent you using it without paying for it?
- challenge - to provide optimal information "optimally"
  - structure of information provision

Mental Models of Weather Information

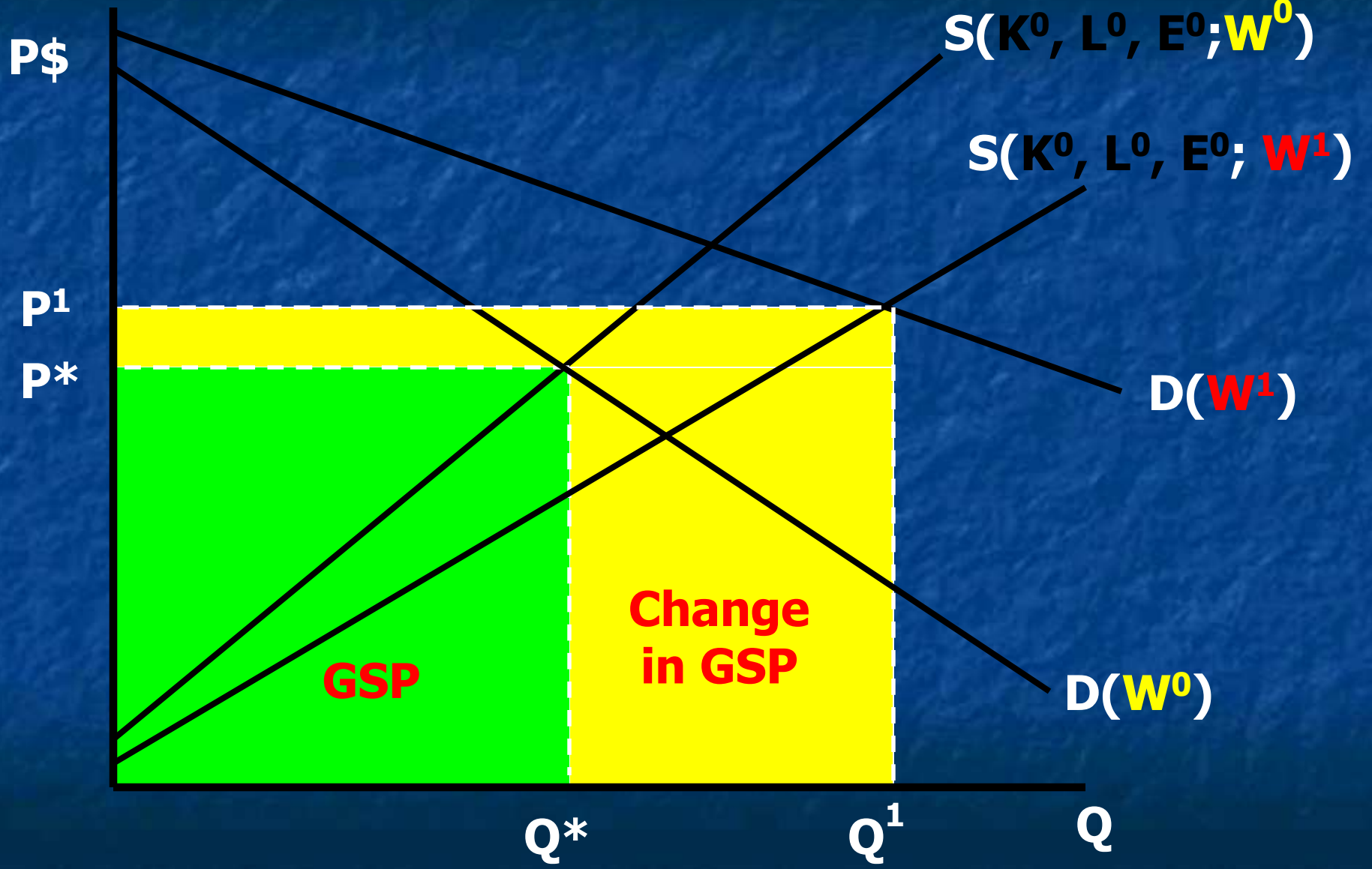


Value of Weather

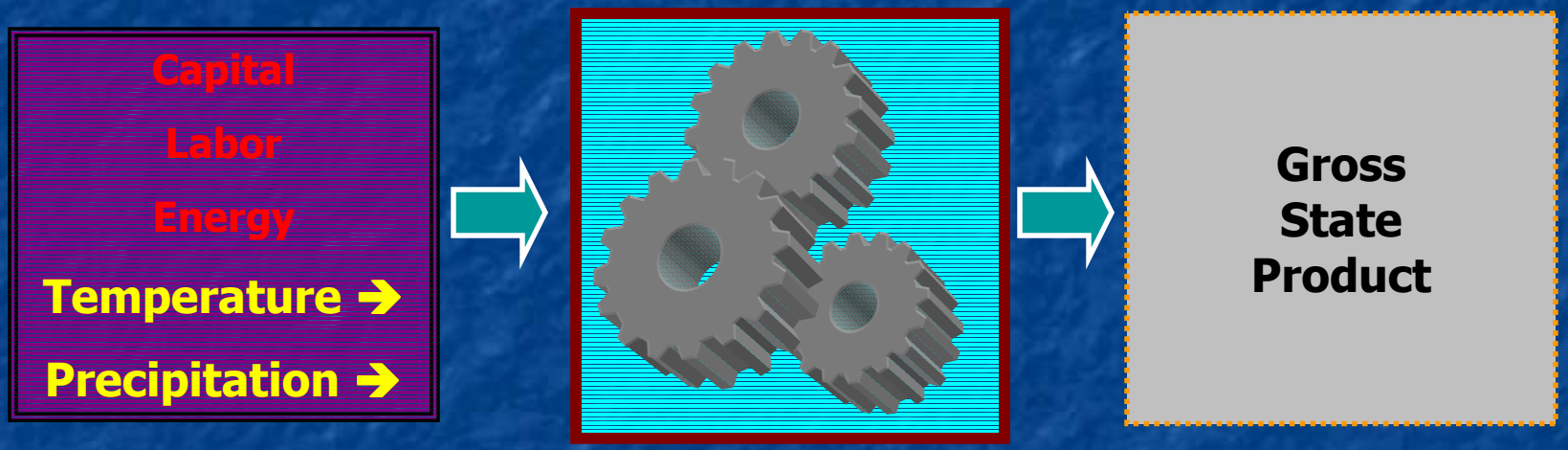
- value of weather impacts
- value of weather forecasts
- value of improved weather forecasts

US Sector Sensitivity Assessment

What is Weather Sensitivity?



Conceptual Approach



Sensitivity Analysis: Using econometric models, we hold economic inputs constant, and use 70 years of weather data to see how economic output varies as a result of variation in weather

National Sensitivity

(Billions $2000)

Sector	GDP	Range	%Range
Agriculture	127.6	15.4	12.09%
Wholesale trade	601.5	13.3	2.20%
Retail trade	761.5	17.3	2.27%
Finance, Insurance, Real Estate	1,639.3	132.5	8.08%
Communications	237.3	11.1	4.68%
Utilities	212.9	14.9	6.98%
Transportation	276.1	9.8	3.53%
Manufacturing	1,524.8	125.1	8.20%
Construction	374.5	17.7	4.71%
Mining	102.0	14.7	14.38%
Services	1,834.9	60.5	3.30%
Total National	7,692.4	258.7	3.36%

Household Valuation Study

Perceptions - Importance of Weather Forecast Characteristics

Characteristic	Mean	SD	Kruskal-Wallis Test, χ^2 (prob H_o)
Chance of rain, snow, or hail	4.30	0.82	12.44 (0.13)
Amount of rain, snow, or hail	4.02	0.96	21.73 (0.01)
High temperature	3.85	1.01	9.77 (0.28)
Low temperature	3.74	1.06	10.69 (0.22)
How windy it will be	3.28	1.08	7.60 (0.47)
How cloudy it will be	2.74	1.08	14.38 (0.07)
Air pressure	2.21	1.13	10.81 (0.21)

Household Valuation Study

non-market valuation

survey based valuation

"ordinary" weather

17 **If you had to choose, would you prefer Program A or Program B?** *Check one box at the bottom.*

	Program A ▼	Program B ▼
FREQUENCY OF UPDATES (Currently 4 times a day)	9 times a day	12 times a day
ACCURACY OF ONE-DAY FORECASTS (Currently correct about 80% of the time)	correct 90% of the time	correct 85% of the time
ACCURACY OF MULTIDAY FORECASTS (Currently accurate up to 5 days into the future)	accurate up to 14 days in the future	accurate up to 14 days in the future
GEOGRAPHIC DETAIL (Currently to 30 by 30 miles)	to 7 by 7 miles	to 30 by 30 miles
ADDED YEARLY COST TO YOUR HOUSEHOLD	$15 more	$8 more
Check (✔) the box for the program you prefer ➔	❑	❑

18 **Would you rather the NWS continue with current weather forecast technologies at current budget levels or would you rather have the program you chose above (A or B)?** *Circle the number indicating your preference.*

1. I would rather have no change in weather forecasting and no increase in costs to my household than have the program that I chose above.

2. Make the improvements in the program I that chose above and pay the amount indicated.

Household Valuation Study

Preliminary Results

Sample = 381

Willingness to pay for maximum improvement
$15.27 / household /yr

Tobit Model on WTP	
Intercept	-2.601
Age (Years)	0.152 ***
Income	0.000 ***
Education (Years)	-0.493 ***
Gender	-0.390
Ethnicity	0.059
% Work Outside	-0.006
% Leisure Outside	0.036 **
Discretionary Use	2.087 ***
Non-discretionary Use	-1.873 ***
Weather Variability	1.640 ***
Frequency	-0.022
One Day	0.437 ***
Multiday	-0.013
Geographic	-0.137 ***

WAS*IS

- workshops to integrate weather and social science
  - WAS*IS I – Nov/Mar 2005/6 - 23 participants
  - WAS*IS Norman - 40 participants.
  - Summer 2006 WAS*IS - 35 participants.
- empower practitioners, researchers, and stakeholders to forge new relationships and use new tools for more effective socioeconomic applications and evaluations of weather products

WAS*IS Topics

Challenges for integrating weather and social science

Communicating and collaborating with users and decision-makers

Communicating with the media

Decision analysis

Economics

GIS (Geographic Information Systems)

Lessons from Hurricane Katrina

Public education and outreach

Qualitative research methods

Survey research methods

Warnings and false alarms

SIP Information Resources

- SIP Home page *www.sip.ucar.edu*
- Digital Library
- Societal Aspects Web page
- Extreme Weather Sourcebook
- Society and Weather Newsletter
- Society and Weather Newsgroup

THORPEX SERA

Societal and Economic Research and Applications

Research

- Communicating uncertainty
  - Decision analysis
  - Risk analysis
- User relevant verification
  - Development of verification methods for ensembles
  - Survey instruments
- Marginal benefits of high impact forecasts
- Societal impacts (cost-benefit) of THORPEX forecast improvements
- International equity & GIFS
- Cost of THORPEX programmes
- Develop protocol for user engagement
- User requirements / engagement (trust)
- Beta-test products
- Use of current products

Applications

Capacity Building

- Database weather impacts / forecasts
- Developing country training

Some Issues

- quantitative precipitation forecasts
- communicating uncertainty
- non-linear warning systems
- improving forecasts not same as improving value of forecasts
  - communication
  - perception (understanding)
  - use (behavioral response)