

THORPEX Societal and Economic
Applications:

International Plans &
Ideas for U.S. Implementation

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What is Societal and Economic Applications?



(From: THORPEX International Science Plan)

What is Societal and Economic Applications?

International Science Plan, Mission Statement:

THORPEX is an international research programme to accelerate improvements in the accuracy of **1-day to 2-week high-impact weather forecasts**. These improvements will lead to **exceptional benefits for humanity**, as we respond to the **weather related challenges of the 21st century**. ... solutions will be accelerated through international **collaboration** between academic institutions, operational forecast centers, and **users of forecast products**.

International THORPEX Science Plan: Major SEA Themes

- Identify high-impact weather forecasts
- Assess the impact of improved forecasts
- Develop advanced forecast verification measures
- Estimate costs and benefits of improved forecast systems
- Develop new user-specific weather products
- Facilitate transfer of THORPEX advances to forecast centres throughout the world

International THORPEX Science Plan: Major SEA Themes

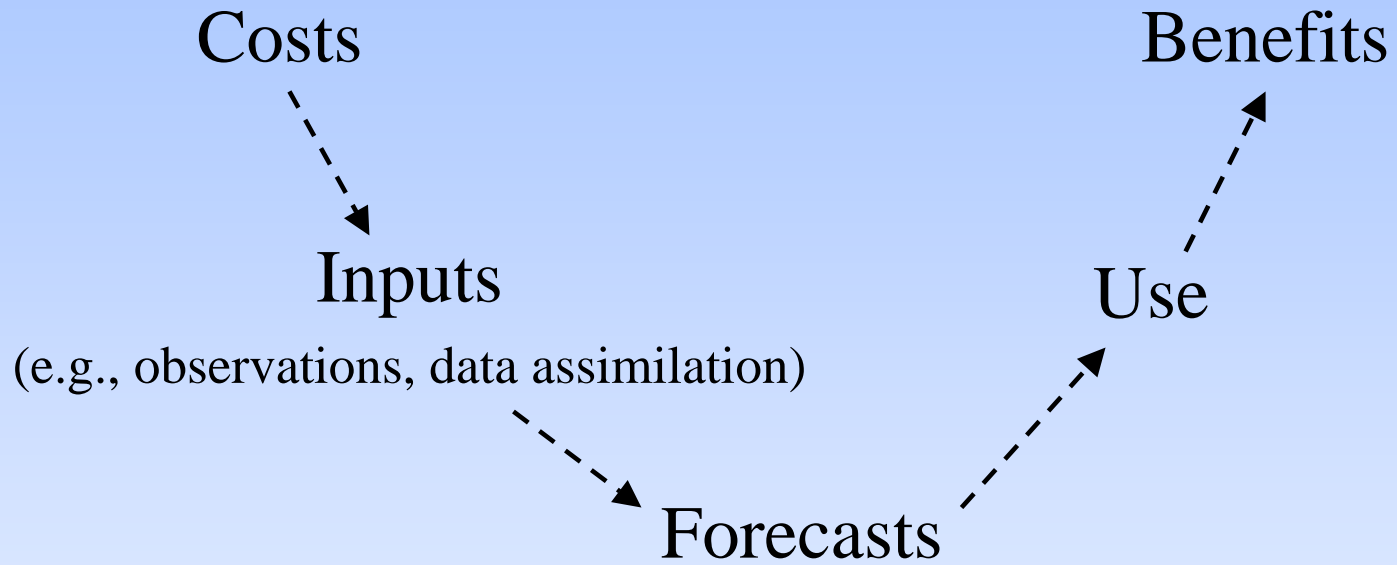
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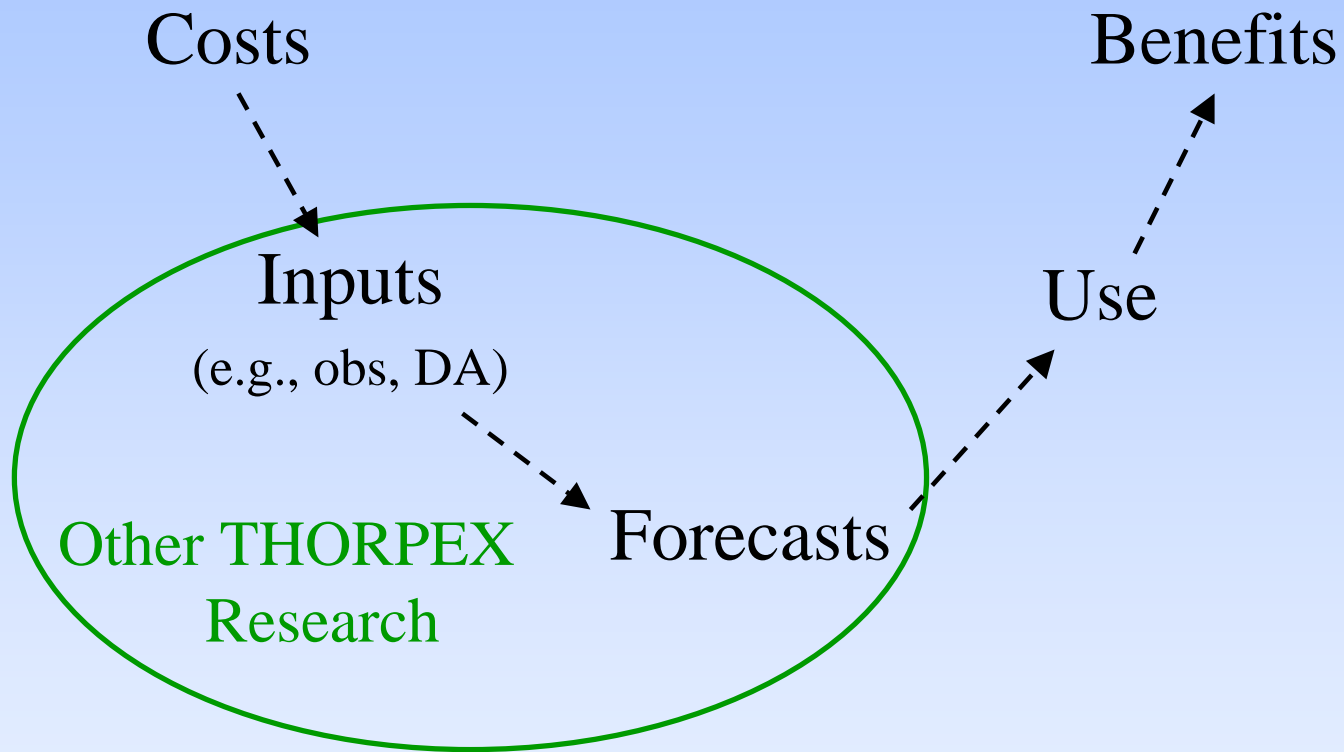
Identify High-Impact Weather Forecasts

- “High-impact weather forecasts are defined by their effect on society, the economy, and the natural environment”
- More specific definition required to prioritize
 - Which forecasts to improve
 - Which impacts to assess
 - Which products to develop
- Collect and synthesize information about use and value of forecasts of “extreme” and “routine” weather, for different user groups, regions, and lead times

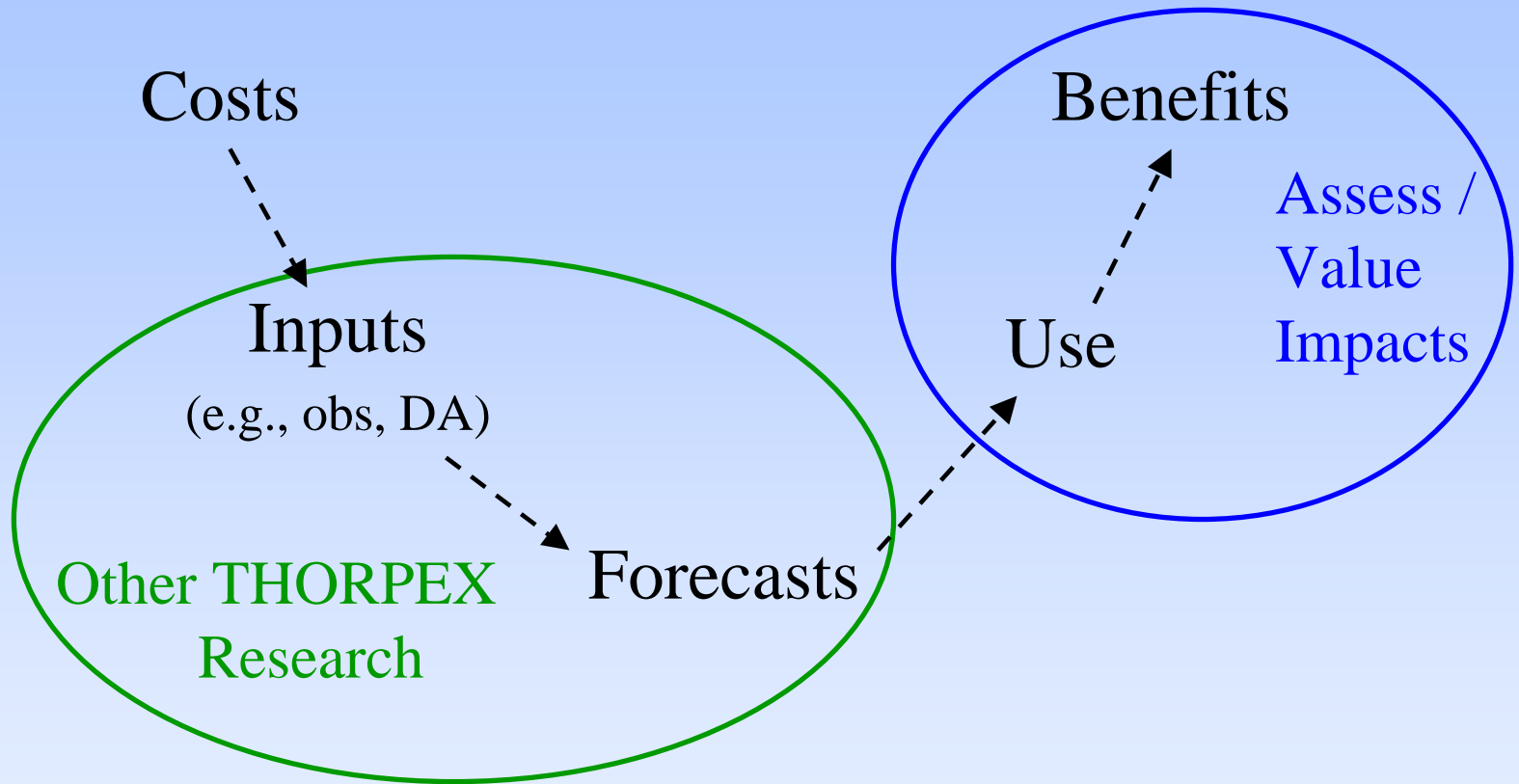
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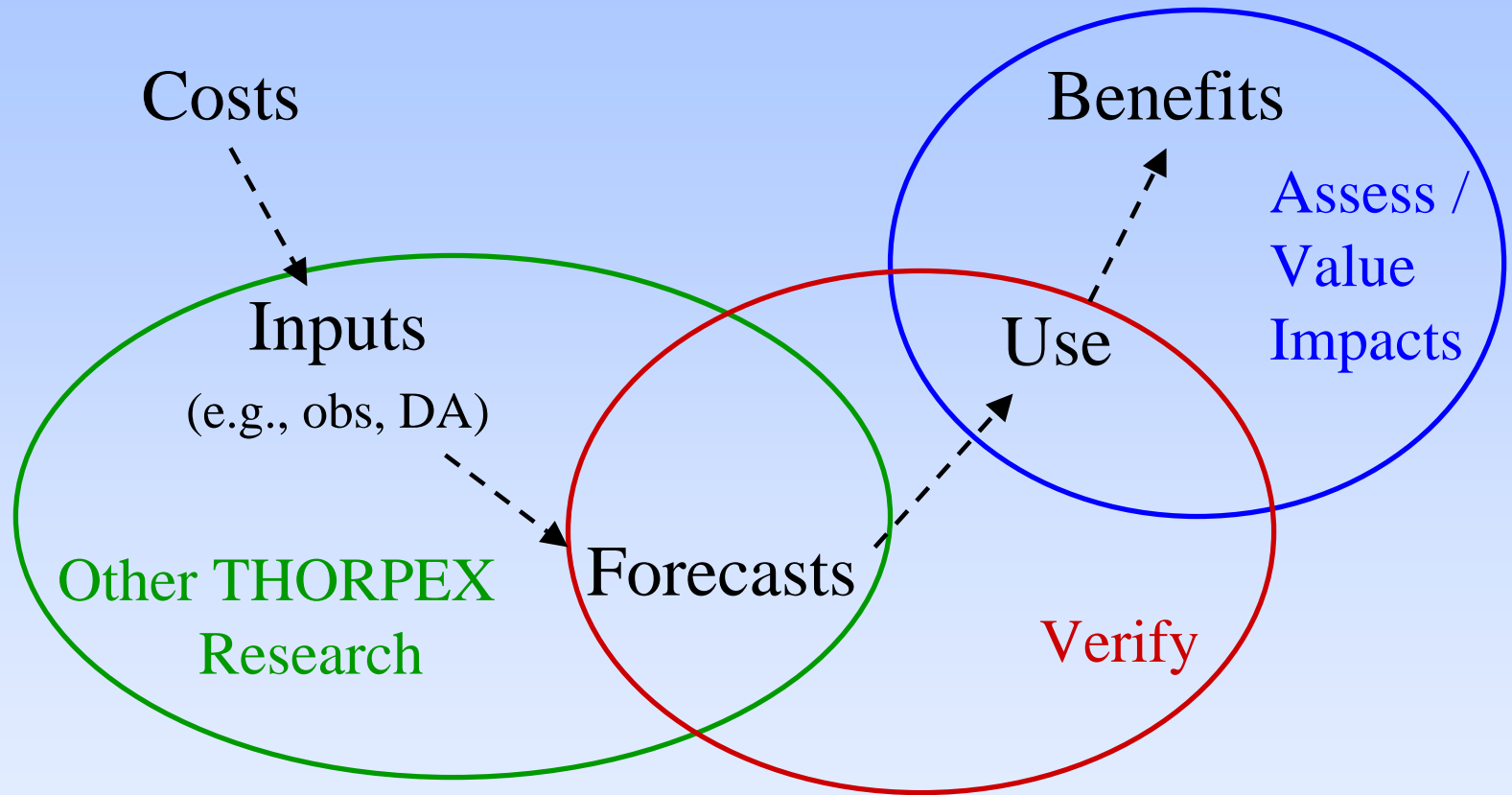




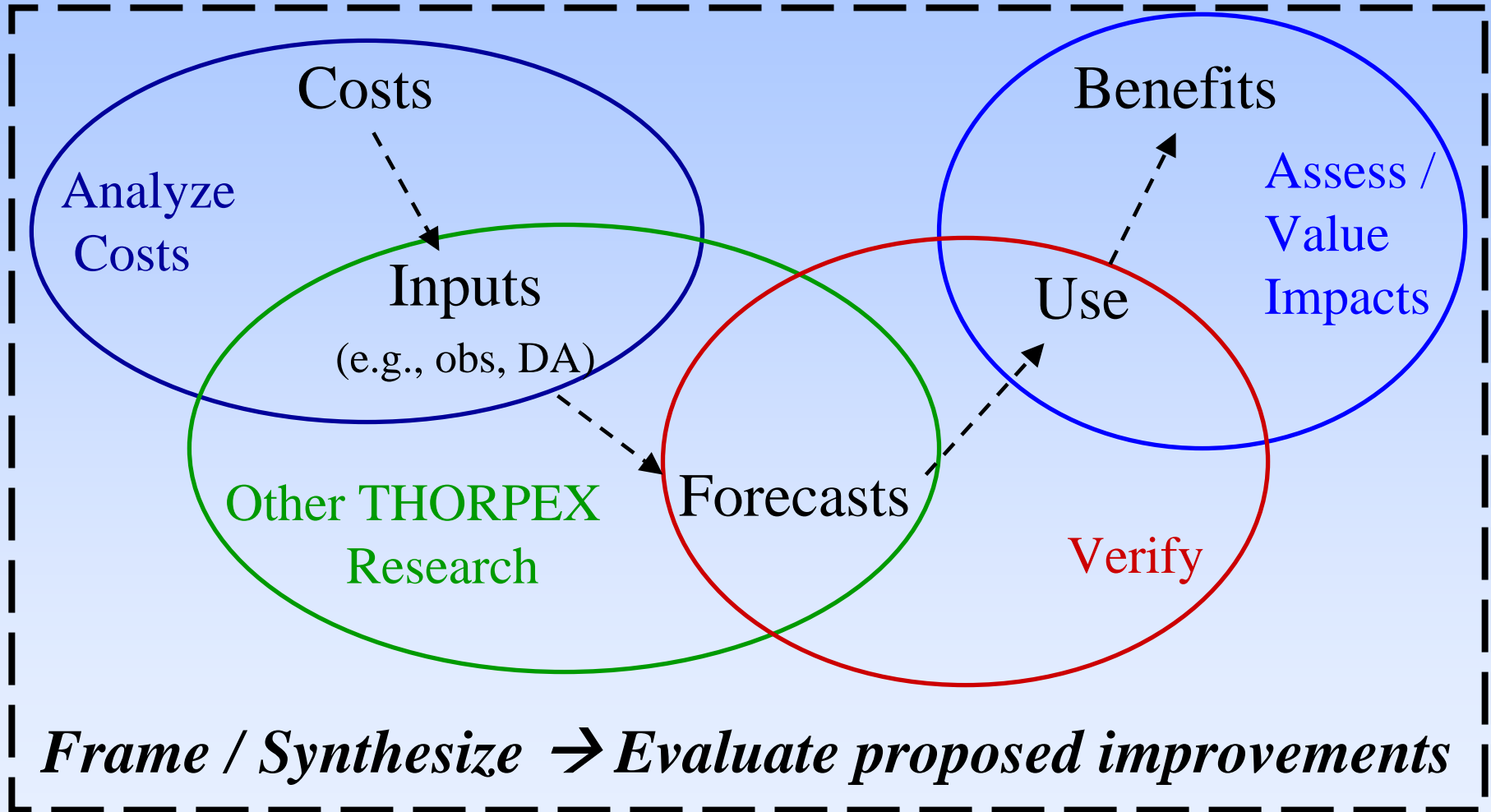
Assess impacts of improved forecasts



Develop verification measures



Evaluate costs and benefits



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- **Develop new user-specific weather products**
- Facilitate transfer of THORPEX advances to forecast centres throughout the world

Develop New Weather Products

- Collaborate with a *range of public and private sector* users to develop new weather products that provide useful information:
 - At user-relevant space and time scales
 - About non-traditional variables, for new and currently under-served user groups
 - At longer lead times
 - About user-relevant risk and uncertainty
- Through NWP and post-processing techniques, decision support tools

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Facilitate Transfer to Forecast Centres Throughout the World

- Transfer THORPEX findings and methods
 - Internationally, to forecast providers and users
 - With a special emphasis on developing countries
- Build partnerships
 - Through and with WMO
 - Based on regional and local needs

U.S. Implementation

“Infrastructure development”

- Identify high-impact weather forecasts
- Assess impact of improved forecasts
- Develop advanced forecast verification measures
- Estimate costs and benefits of improved forecast systems
- Develop new weather products
- SEA projects associated with field campaigns & THORPEX integrating activities
- Transfer internationally, to developing countries

“Demonstration projects”

NASA: Socioeconomic Benefits of Earth Science Applications Program

Figure 1.2



(From: NASA Earth Science Enterprise Applications Plan)

Collaborative Program on the Societal and Economic Benefits of Weather Information

(at NCAR, funded by NOAA/USWRP/NSF)

- Digital Library on Societal Impacts
 - “One-stop shopping” for SEA-related information
- Conduct research to fill fundamental gaps in knowledge
- Coordinate community workshops
- Facilitate/promote SEA research community development

National Study of the Economic Value of Current and Improved Weather Forecasts in the U.S. Household Sector

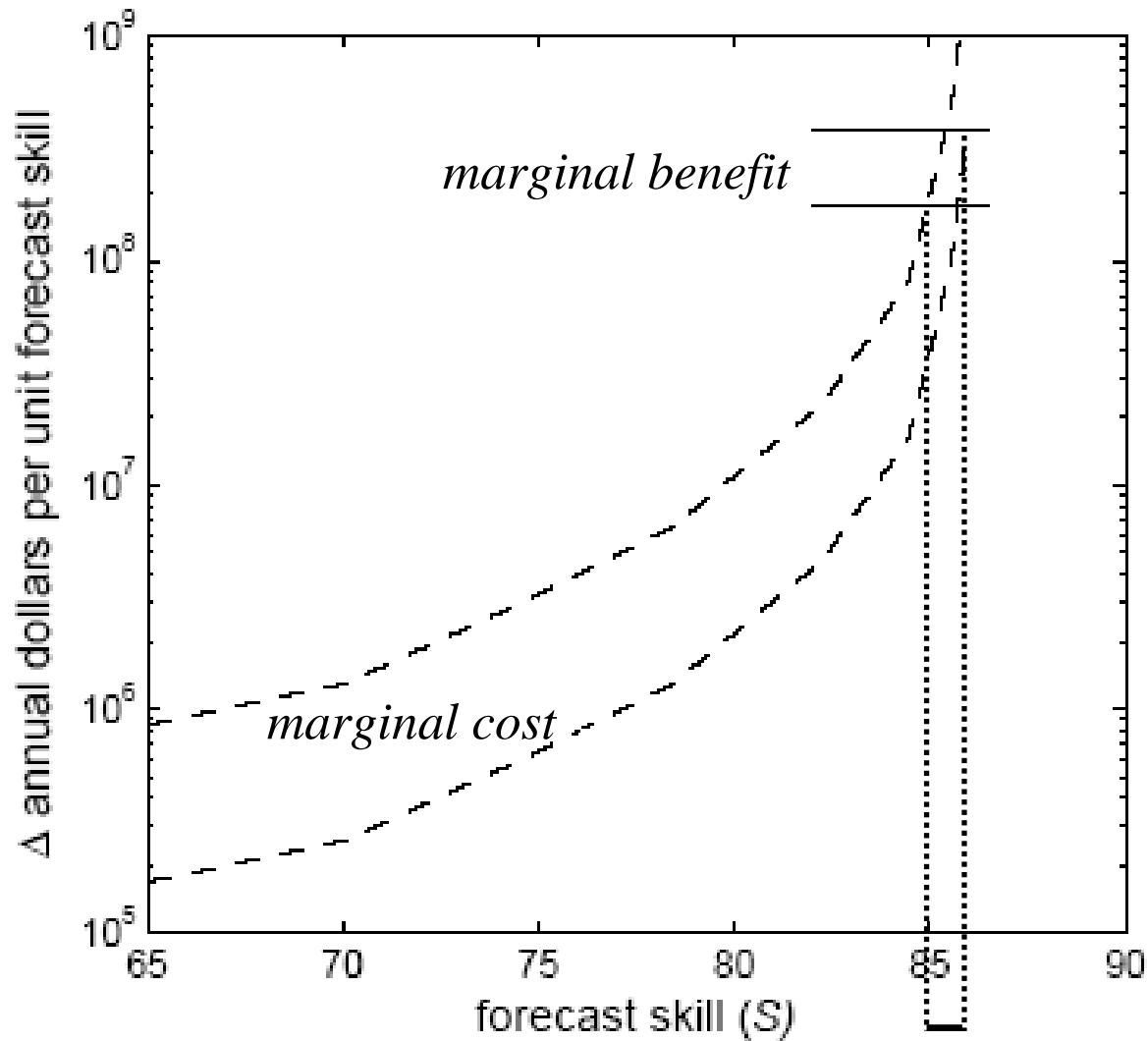
(by Stratus Consulting, funded through 2003 NOAA THORPEX Announcement of Opportunity)

(follow-on to previously funded NOAA project)

- Estimate value of current and improved daily weather forecasts to the general public

Evaluating economic costs and benefits of improved forecast systems

- Basic economic framework developed at NCAR, building on Zillman and Freebairn (2001, 2002)



Economically optimal range of forecast skill
 \Rightarrow Economically optimal number of observations

Evaluating economic costs and benefits of improved forecast systems

- Basic economic framework developed at NCAR, building on Zillman and Freebairn (2001, 2002)
- Illustrated for changes in number of observations, using results from idealized OSSEs

But can be applied / extended to

- analyze other components of forecast system
- using results from THORPEX OSSEs and field campaigns

Developing new weather products

(by numerous research and applications groups)

- Proposed, developing, and ongoing collaborations with various sectors, including:
 - Water resources / flood protection (e.g., California)
 - Surface transportation
 - Energy (generation, transmission, transportation)
 - Health (e.g., heat waves, air quality)
 - Disaster mitigation and management
- Links to climate applications
- Includes user-specific product development and general method development (e.g., post-processing ensemble output for probabilistic forecasts)

Demonstration projects in conjunction with THORPEX-related field programs

- International Polar Year (IPY), 2007-8
 - Transportation and energy production in Alaska
 - Indigenous populations
- African Monsoon Multidisciplinary Analysis (AMMA), 2005-7
 - Health, water resources, and food security in West African and American nations
- Conduct SEA demonstration projects with each major THORPEX field campaign

Demonstration projects in conjunction with THORPEX integrating activities

- THORPEX Interactive Grand Global Ensemble (TIGGE)
 - Will provide global and regional probabilistic weather forecasts for use in decision-making
 - Test system for developing feedback between user needs and forecast system configuration
- Develop integrated (general) use-relevant verification measures
 - For evaluating forecast skill in operational and research centers around the globe

Plan for transfer to developing countries (through collaboration and partnerships)

(currently being developed by J. Cahir with NCAR and other collaborators, NOAA support)

- Phase I: Identify major THORPEX-related needs and potential partnerships in different WMO regions
- Phase II: Demonstration projects and case studies, with workshops to share knowledge
- Phase III: Develop results of Phase II into education and outreach materials, to assist other users and regions

Upcoming Meetings

- **First International THORPEX Science Symposium**
6-10 December 2004, Montreal
Abstract deadline: 1 September
- **THORPEX International Conference on Decision Making and Decision Support in the Era of Probabilistic Weather Forecasting**
April 2005, Paris

<http://www.wmo.int/thorpex/meetings.html>

Questions

- Missing topics of interest?
- Areas that the U.S. community wishes to emphasize or deemphasize?
- Additional ideas for demonstration projects?
- Who should/will do the work (different types of expertise required)?
- How will the work be funded?
- How to coordinate interaction between SEA and other components of THORPEX?