



INFRASTRUCTURE, SAFETY,
AND ENVIRONMENT

***Political Aspects of Forecasting:
Explaining and Controlling “Optimism Bias”
in Transportation Forecasts***

**Presented at USDOT Workshop for Transportation
Forecasters, September 2009**

**Martin Wachs, Director
Transportation, Space & Technology
The RAND Corporation**



Boston Central Artery: The “Big Dig”

- **Original cost forecast: \$2.6 billion**
- **Actual Cost to Complete: \$16 billion - \$17 billion**
- **Original completion date: 1998**
- **Actual completion date: 2007 - 2008**



San Francisco Bay Bridge

- **Replacing eastern span because of seismic problems revealed by Loma Prieta Earthquake**
- **Cost forecast of \$1.6 billion in 2001 for the largest component contract**
- **Bids opened in 2004; a single bid was received for \$5.4 billion**



Miami Subway

- **Forecast daily riders:** 202,000
- **Actual daily riders:** 36,700
- **Forecast capital cost:** \$1.1 b
- **Actual capital cost:** \$1.3 b
- **Forecast annual oper cost:** \$29.4 m
- **Actual annual oper cost:** \$37.9 m

All costs in 1988 dollars

Miami Subway - Continued

- **Forecast total cost per passenger: \$2.41**
- **Actual total cost per passenger: \$16.73**
- **Actual nearly SEVEN TIMES estimate**
- **Forecast subsidy per rider @ \$1.50 fare: \$0.91**
- **Actual subsidy per rider @ \$1.50 fare: \$15.23**

Amazing but True

- **Consulting firm that did the forecasts for Miami was later hired to do them for Los Angeles subway because of a “track record of success”**
- **What is the measure of success?**
 - **In the political world of competition for resources getting the project built may be a better measure than getting the forecast right**

***Washington Public Power Supply (WPPS)
illustrates this is not only a transportation problem***

- **Forecasts of large power demand growth**
- **Largest default of a public utility in 1984**
- **Built several nuclear power plants; four under construction**
- **Conservation reduced demand for power**
- **Failed to pay \$2.5 billion in bonds**

Not Isolated Cases

- Found to happen all over the world (Flyvbjerg, Bruzelius & Rothengatter studied 200 projects)
- 86% had substantial cost overruns – averaging 28%
- Cost underestimation in 20 countries
- Record steady over 70 years despite modern forecasting methods
- Channel Tunnel recent example

Explanations for “Optimism Bias”

- **Technical shortcomings – usually as accounted for by “auditors” – inadequate data, errors in estimating certain critical quantities**
- **Political explanations related to “institutional settings” in which the forecasts are made – including “strategic misrepresentation”**



Forecasts Needed to . . .

- . . . allow systematic comparison of alternatives:
benefit/cost analysis based on forecasts**
- . . . support financial planning: bonds, loans**
- . . . guide public policymaking**

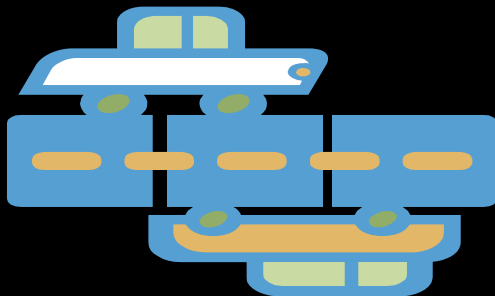
***There is reason to think that some
purposes are being served by forecasts
that are overly optimistic***

Cannot Happen by Accident

- **Of 35 public transit projects I have studied in the U.S., 33 overestimated patronage and 28 underestimated costs**
- **Random errors or honest mistakes would be more evenly distributed . . . there would be more underestimates of patronage and more overestimates of cost**

Difference Between Highways and Transit in the USA

- Highway funds distributed by formula
- Transit funds discretionary or prescribed by Congress
- Highway cost overruns less frequent and less dramatic
- Forecasting models are same for both modes



Forecasts Have Salience but Cannot be Verified

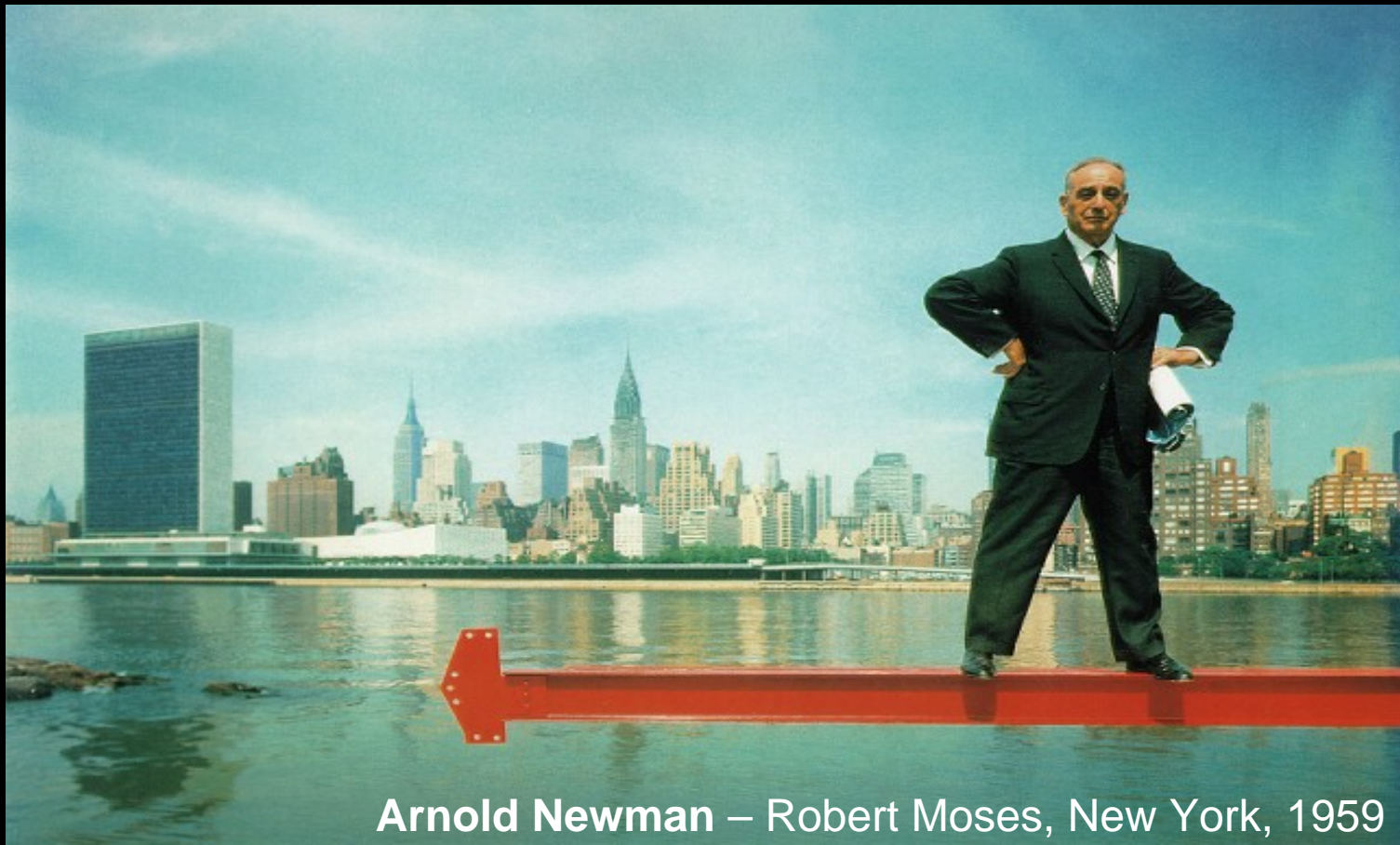
- **Forecast cannot be verified if project is not built**
- **If purpose of forecast is to justify the project the cost overrun or patronage result is irrelevant because it happens AFTER the project is built**
- **Forecasts needed to justify actions undertaken for political reasons**
- **The issue of “many hands” absolves any individual of “responsibility”**

Assumptions Critical to All Forecasts

- **Ascher quotation....**
- **As methods improve, assumptions are still needed**
- **We teach methods in universities, but cannot teach students how to make wise assumptions**
- **It is difficult or impossible to hold someone liable for making assumptions that in retrospect seem to have been incorrect**

Robert Moses Was the Master

- Master builder & master politician
- Quotation from Robert Caro's biography, **THE POWER BROKER**



Arnold Newman – Robert Moses, New York, 1959

Cases from My Own Research

- **Scott in large southern city**
- **Rebecca in smaller western city**
- **President of consulting firm**



Can anything be done?

- **Only if there is a political consensus that something SHOULD be done; in many cases political leaders are well aware of the problem and use forecasts as political levers**
- **Peer review of forecasts is now done in quite a few countries**
- **Independent audits**
- **Require publication and discussion of assumptions**
- **Hold forecasters accountable: penalties?
Much more difficult**

Dramatic Progress in Last Decade

- **Federal Transit Administration requires publication of assumptions and reviews and critiques them; makes public their critique of an applicant's forecasts; examines accuracy of previous forecasts made by same agency and consultants**
- **Reference Class Forecasting is being used to an increasing extent by lending institutions**

Is there anything that can be done to recognize the reality that BCA is done in a political context

- **We could stop trying to “optimize” the choice of public policy alternatives**
- **It might be more helpful to help politicians by finding “robust” choices . . . defined as courses of action that are resilient under a wide range of different assumptions**
- **Can run BCA models many times over to isolate most critical assumptions**

Traditional planning methods can illuminate trees rather than forest

- Traditional analytic methods characterize uncertainties as a context for assessing alternative decisions



- Some choices confront decisionmakers with **deep uncertainty**, where
 - They do not know, and/or key parties to the decision do not agree on, the system model, prior probabilities, and/or “cost” function
- Decisions **can go awry** if decisionmakers assume risks are well-characterized when they are not
 - Uncertainties are **underestimated**
 - Competing analyses can contribute to **gridlock**
 - Misplaced concreteness can blind decision-makers to **surprise**

Robust Decision Making (RDM) helps make plans robust over multiple views of the future

Key Robust Decision Making Concepts:

- **Construct ensemble of long-term scenarios that highlight key tradeoffs among near-term policy choices**
- **Consider near-term choices as one step in a sequence of decisions that evolve over time**
- **Use robustness criteria to compare alternative strategies**
 - **A robust strategy performs well compared to the alternatives over a wide range of plausible futures**



New Technology Allows Computer to Serve As “Prosthesis for the Imagination”

- **Robust Decision Making (RDM) is a quantitative decision analytic approach that**
 - **Characterizes uncertainty with multiple, rather than single, views of the future**
 - **Evaluates alternative decision options with a robustness, rather than optimality, criterion**
 - **Iteratively identifies vulnerabilities of plans and evaluates potential responses**

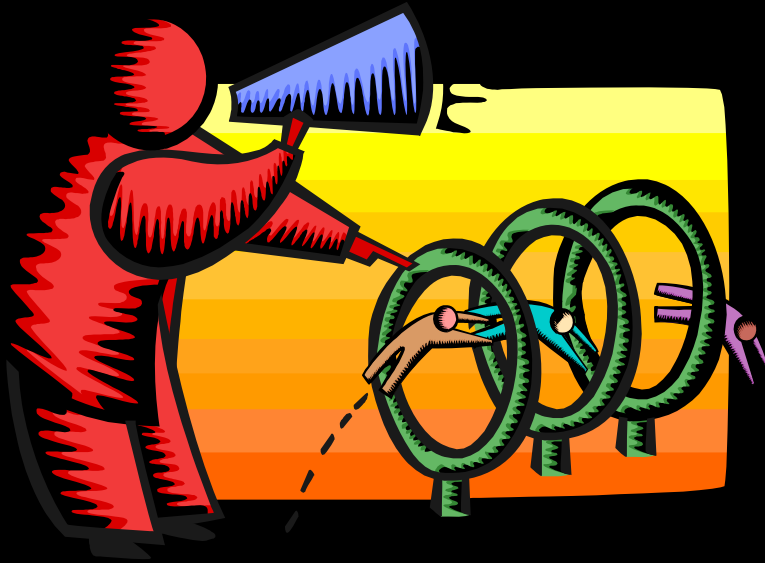


- **RDM combines key advantages of scenario planning and quantitative decision analysis in ways that**
 - **Decision makers find credible**
 - **Contribute usefully to contentious debates**

RDM Enables Effective Planning Based on Multiple Views of Future

- **Use many scenarios to imagine the future**
 - **Not a single forecast**
 - **Seek robust strategies that do well across many scenarios assessed according to several values**
 - **Not optimal strategies**
- **Employ strategies that evolve over time in response to changing conditions**
 - **Not "fixed" strategies**
- **Use computer as “prosthesis for the imagination”**

Thank you!



Now it's time for your
comments, questions,
and opinions . . .



INFRASTRUCTURE, SAFETY,
AND ENVIRONMENT