Presentation Outline

1. Motivation for risk analysis on Canal Expansion
2. The project risk management approach
3. Lessons learned

Expansion Background

• ACP formally proposed project with public referendum in 2006

• What was the construction market like in 2000-2006?
History of Mega Projects

- Tren Urbano Rail, Puerto Rico\(^1\)
  - 1996 Estimated $1.25 billion
  - 2002 Estimated $2.25 billion
- The Big Dig, Boston\(^2\)
  - 1985 Estimated $2.5 billion
  - 2002 Estimated $14.6 billion
- Flyvbjerg Study (2002)
  - 256 public project over 70 years
  - 8 of 10 project had cost overruns

\(^1\) Federal Transit Administration Inspector General 2004
\(^2\) National Academy of Sciences 2003

History of Mega Projects

- New cost estimating and cost management methods research

New Cost Estimating Methods

- 18 primary cost escalation factors
- 8 strategies to address cost escalation factors
- 30 implementation methods
- 90 tool applications
New Cost Estimating Methods

- Risk Strategy
  Identify risks, quantify their impact on cost, and take actions to mitigate the impact of risks as the project scope is developed.

Canal Expansion – A risky project?

New Locks: Water-Saving Basins and Rolling Gates

Bottom- or side-filling?
Risk-Based Models for Project Planning

Edited per 1/15/08 Meeting

Las Vegas Executives Association
Presentation

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Project Baseline Cost

<table>
<thead>
<tr>
<th>Project Development Process</th>
<th>Baseline</th>
<th>Unrecognized Costs (Known/Unknown)</th>
<th>Known but not Quantifiable Costs (Known/Unknowns)</th>
<th>Conservative Estimate with allowance at any point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Plan and Concept</td>
<td>30%</td>
<td>Design</td>
<td>100%</td>
<td>Construction Completion</td>
</tr>
</tbody>
</table>

Financial Risk Model

- Consultants Guidance
- Input from Other Units
- Program Development Office - Risk identification - Coordination
- Engineering - Design - Cost Estimate
- Finance - Risk variables - Others

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Major Risk Factors for Risk Modeling

Factors for Risk Modeling

- Organization Risks
  - Lack of Controls
  - Inefficient Planning
  - Inefficient Contracting Process
  - Extreme Bad Weather
  - Local Labor Strikes
- Changes in Design and Quantities
- Insufficient Revenues
- Owner Driven Changes
- Referendum Delays
- Inadequate Claims Administration
- Inefficient Contracting

Risk Factor Categorization

- Insufficient revenues
- Material, equip. & labor cost increases
- Poor claims administration
- Inflation

- Organization risks
- Inefficient planning
- Lack of controls
- Local labor strikes
- Extreme bad weather
- Referendum delays
- Inefficient contracting

- Overruns
- Lack of skilled and local labor
- Changes in design & quantities
- Owner driven changes

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Risk-Based Models for Project Planning
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Risk Model Results
Example Total Cost
Distribution for Investment + Delay & Overrun

Risk Model Results
Example Total Cost
Distribution for Commissioning Year

Risk Model Results
Tornado Diagram
Factors with the greatest impact on total cost variation

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Risk Mitigation Options

Risk Resolution

Lessons Learned

- Impact of project on country
  - Referendum
  - Communications
- Benefits of bottom-up contingency
- Use of risk analysis and management
- ACP’s willingness to innovate

January 30, 2008

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Thank you!