

# MITIGATING RISKS AND COMMUNICATING UNCERTAINTY IN LONG-TERM FORECASTING OF REVENUES AND EXPENDITURES

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# TODAY'S AGENDA

## ■ Purpose:

- Understand risks in long-term forecasting.
- Develop approach for identifying and assessing risks.
- Understand ethical pressures when communicating risks.

# TODAY'S AGENDA

## ■ Discussion Items

- Set scenario: Organizations forecast revenues and/or expenditures

- Develop simple framework to assess risk.

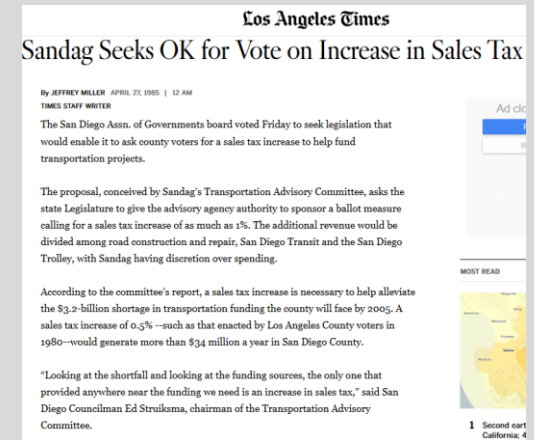


- Apply framework:

- Case study: Long-term capital projects funded through sales tax measures.

# THE SCENARIO: A CAPITAL PROGRAM EMERGES

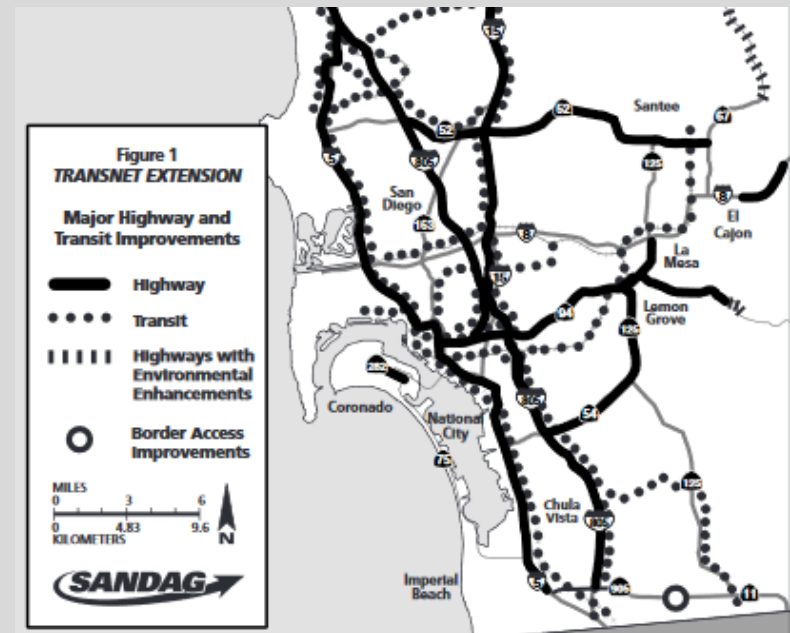
- Organization identifies significant capital need
- Seek approval from voters and make long-term commitments



# THE SCENARIO: A CAPITAL PROGRAM EMERGES

- As part of process, organization forecasts “long-term” revenues and expenditures

- SANDAG: estimates that it will collect roughly \$39.0 Billion over 40 years



- Portland Public Schools estimates that it will cost \$790 million to build/modernize schools

# THE SCENARIO: A CAPITAL PROGRAM EMERGES

- Forecasts are used to make significant decisions about the capital program
  - Set initial and future bond amounts
  - Investment of funds/cash flow
  - Project priority/sequence
  - Leveraging of other funding
  - Additional borrowing to advance projects



# THE SCENARIO: A CAPITAL PROGRAM EMERGES

- The forecasting process can carry significant risk
- Situation can introduce ethical pressures

## GOVERNMENT

**SANDAG's New Forecast Makes it Clear: Transnet, Measure A Estimates Were Way Off**

## GOVERNMENT

**'OMG,' 'WTF': Emails Show SANDAG Knew Forecasts Were Wrong, Went to Voters With False Promise Anyway**

## GOVERNMENT

**'A New Day at SANDAG' as Agency Admits it Must Cut Promised Projects**

# THE SCENARIO: THE AUDIT ENGAGEMENT

- **GOOD NEWS!:** The “promise” made to the public typically includes a performance audit clause
- **Audits might include:**
  - Project and program level expenditure controls
  - Procurement policies, procedures, and processes

## **Strong Safeguards**

These commitments are underscored by a set of strong taxpayer safeguards to ensure that promises made in the Plan are kept. They include an **annual independent audit and report to the taxpayers**; ongoing monitoring and review of spending by an independent Taxpayer Oversight Committee; requirement for full public review and update of the Plan every ten years; voter approval for any major changes to the Plan; strong penalties for any misuse of funds and a strict limit of no more than one percent for administrative expenses.



# THE SCENARIO: THE AUDIT ENGAGEMENT

- But, there is also this question of risk related to forecasting
- Especially as we project further into the future



*“How can we address this risk in a manner that uses audit resources efficiently?”*

# A SIMPLE ASSESSMENT FRAMEWORK

## Underlying Assumptions

- Plans and decisions informed by long-term forecasts carry some inherent risk
- Risks can be:
  - Shared or transferred
  - Mitigated
  - Communicated
- Communicating risk is difficult
- Should have a plan of action for when risks materialize

# A SIMPLE ASSESSMENT FRAMEWORK

## 5 Main Steps in Evaluation Framework

1. Capture program elements being forecasted or estimated
2. Identify decisions or activities informed by or based on element forecasted
  - Use to assess **IMPACT** on the program and define **scope** for workplan

# A SIMPLE ASSESSMENT FRAMEWORK

## 5 Main Steps in Evaluation Framework

3. For each element forecasted, identify potential risk areas by asking:

❖ **Who is doing forecasting?**

**Risk: Unable to produce a forecast that is free from errors**

**Risk: Lack of expertise / oversight**

❖ **What is methodology used?**

**Risk: Methodology isn't appropriate or model is poorly specified**

# A SIMPLE ASSESSMENT FRAMEWORK

## 5 Main Steps in Evaluation Framework

### 3. More risk questions to ask:

- ❖ **What are the “inputs” and data sources?**

**Risk: Data is inaccurate or contains errors**

- ❖ **What is the “output” and how should we interpret it?**

**Risk: Output doesn't capture range of likely outcomes**

**Risk: Output is interpreted incorrectly**

- ❖ **How often is process revisited?**

**Risk: Performance can decay over time; errors introduced and carried forward**

# A SIMPLE ASSESSMENT FRAMEWORK

## 5 Main Steps in Evaluation Framework

Assess Controls and Organization's ability to respond when risk materializes by:

4. Determining how each risk area is mitigated, shared, or communicated
5. Understanding how the organization will respond

# A SIMPLE ASSESSMENT FRAMEWORK

## Quick Snapshot of 5 Steps in Evaluation Framework

1. Capture program elements forecasted
2. Identify decisions using forecasted elements
3. Ask questions to identify risk:
  - ❖ Who forecasting?
  - ❖ What methodology used?
  - ❖ What are “inputs” and data sources?
  - ❖ What is “output” and how interpreted?
  - ❖ How often is the process revisited?
4. Determine how risks mitigated and communicated
5. Understand how organization will respond

# A SIMPLE ASSESSMENT FRAMEWORK

## Transportation Capital Program

- 10 to 40-year programs
- Revenue and expenditure components
- Complexity of Methods: High

## School Capital Construction

- 7-10 year programs (may have multiple phases)
- Expenditures
- Complexity of Methods: low to medium



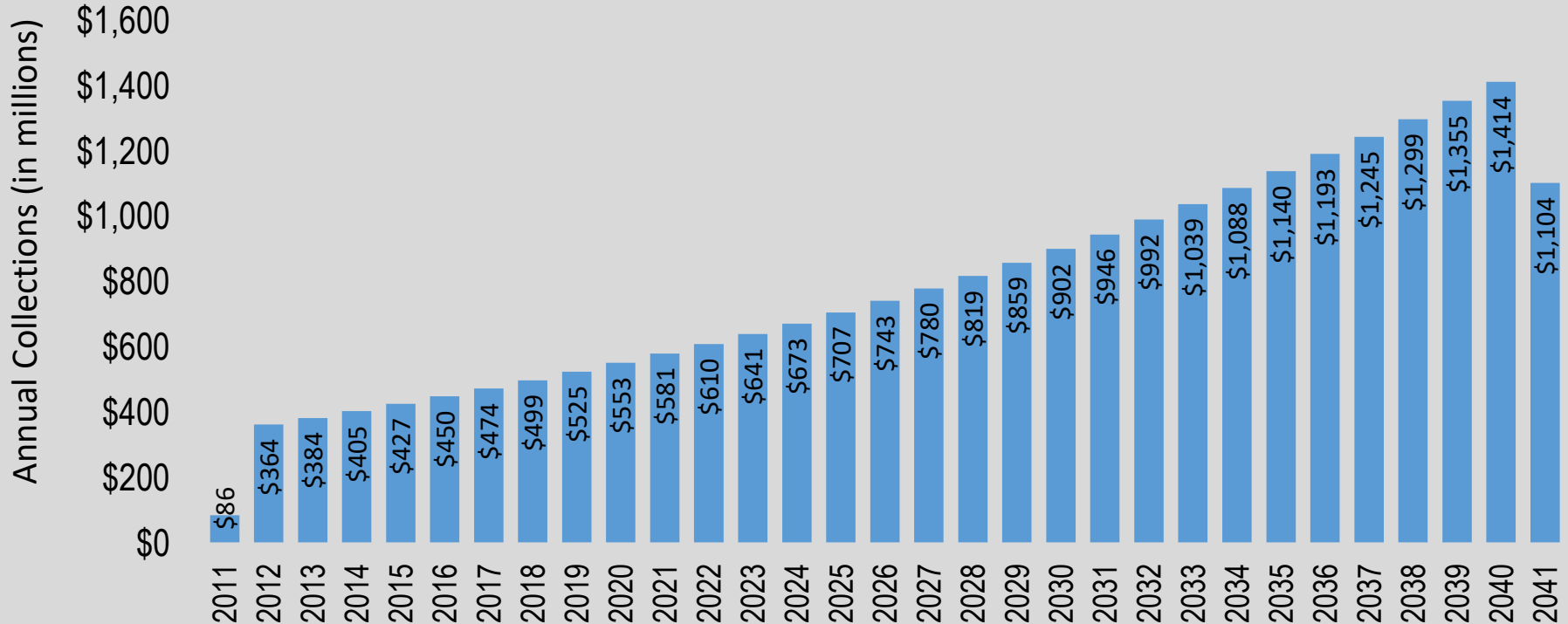
# CASE STUDY: SALES TAX REVENUE FORECASTS

- Capital Construction Programs funded through voter-approved ½ cent sales tax measures

Organization	Forecast Made	Duration	Initial Forecast Amount
Maricopa (AZ) Association of Governments (MAG)	2004	20 Years	\$14.3 Billion
San Diego Association of Governments (SANDAG)	2004	40 Years	\$39.0 Billion
Orange County Transportation Authority (OCTA)	2006	30 Years	\$24.3 Billion

- Forecasts based on liner regression/econometric models projecting annual sales tax collections over the life of the measure

# CASE STUDY: SALES TAX REVENUE FORECASTS



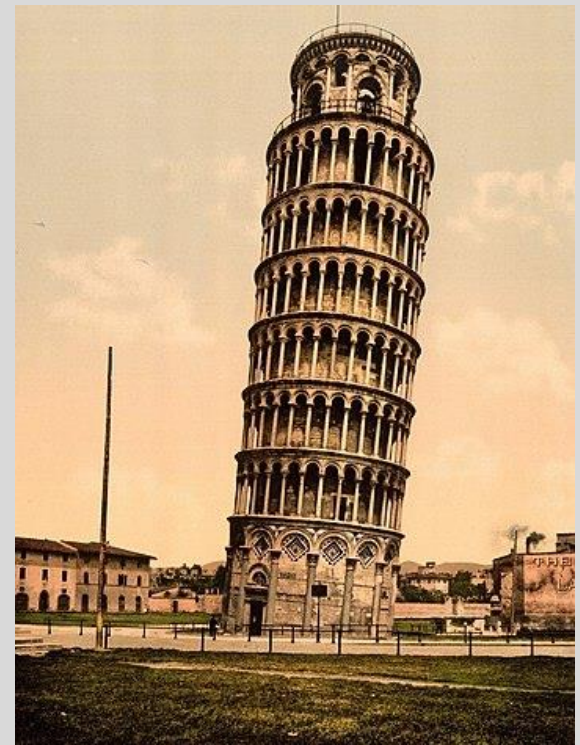
*Taxable Retail Sales<sub>y</sub>*

$$= \text{Taxable Sales}_{y-1} + \text{CPI} + \text{pop. growth} + (\text{Taxable Sales}_{y-1} * \text{pop. growth})$$

# CASE STUDY: SALES TAX REVENUE FORECASTS

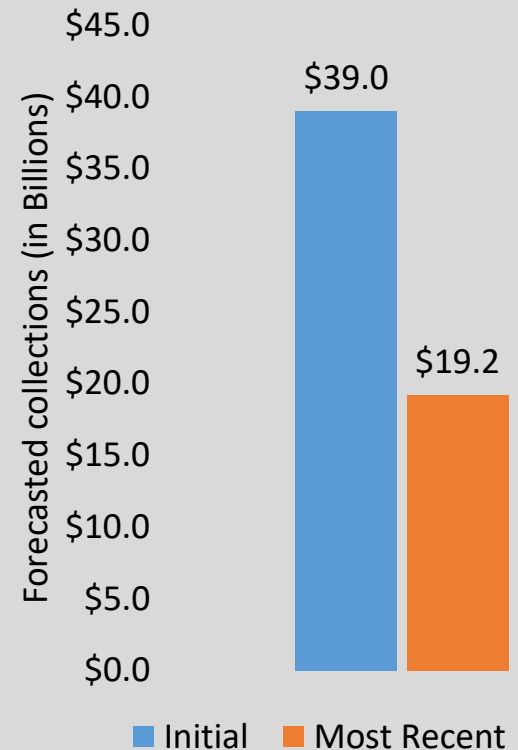
Based on initial forecasts:

- Organization made “promises” to voters
- Projects prioritized/sequenced based on projected revenues
- Invested funds to meet cash flow needs
- Issued bonds “jump start” projects



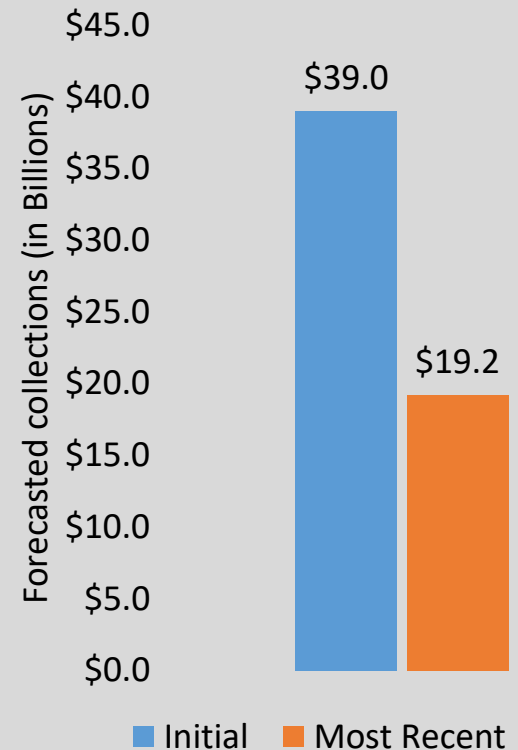
# CASE STUDY: SALES TAX REVENUE FORECASTS

- Early on, *The Great Recession hits!*
- All transportation agencies experience historic and significant drops in sales tax revenue



# CASE STUDY: SALES TAX REVENUE FORECASTS

- Some are better positioned to respond
- For others, decreased forecasts are compounded by control weaknesses
- In one case, those issues lead to a loss of public trust and organizational shake-up



# CASE STUDY: SALES TAX REVENUE FORECASTS

## So, How Do You Audit This?

### Apply the 5 Step Evaluation Framework as Follows

1. Capture program elements forecasted
2. Identify decisions using forecasted elements
3. Ask questions to identify risk:
  - ❖ Who forecasting?
  - ❖ What methodology used?
  - ❖ What are “inputs” and data sources?
  - ❖ What is “output” and how interpreted?
  - ❖ How often is the process revisited?
4. Determine how risks mitigated and communicated
5. Understand how organization will respond

# CASE STUDY: SALES TAX REVENUE FORECASTS

## 1. Capture program elements forecasted

### Organization A

- Forecasting annual sales tax revenue over 40-year period



### Organization B

- Forecasting annual sales tax revenue over 30-year period



# CASE STUDY: SALES TAX REVENUE FORECASTS

## 2. Identify decisions using forecasted elements

### Organization A

- Significant bond funding to advance projects
- Assumptions of external funding

### Organization B

- Bond funding to advance projects
- No assumptions of external funding



# CASE STUDY: SALES TAX REVENUE FORECASTS

## 3. Ask questions to identify risk

### Organization A

#### Who is doing the forecasting?

- Panel of experts

#### What is the methodology used?

- Use four integrated, dynamic models developed in 1970s
- Rely on part-time employee (retiree) to run model

### Organization B

#### Who is doing the forecasting?

- Professional forecasting firms

#### What is the methodology used?

- Model developed in 2006 and updated in 2016

# CASE STUDY: SALES TAX REVENUE FORECASTS

## 3. Ask questions to identify risk

### Organization A

What are the “inputs” and data sources

- Historical taxable retail sales aggregated into industry sectors

What is the “output” and how should we interpret it?

- A single point estimate

### Organization B

What are the “inputs” and data sources

- Historical taxable retail sales

What is the “output” and how should we interpret it?

- Three professional estimates
- A “blended” point estimate

# CASE STUDY: SALES TAX REVENUE FORECASTS

## 3. Ask questions to identify risk

### Organization A

How often is the process revisited?

- Predicted vs actual tracked, but no analysis done
- Model largely unchanged since 1970s (which staff cannot run themselves)

### Organization B

How often is the process revisited?

- Annual in-depth analysis of a risk area
- Predicted vs actual tracked and analyzed
- recently performed a full model review and presented findings to the Board

# CASE STUDY: SALES TAX REVENUE FORECASTS

## 4. Determine how risks mitigated and communicated

### Risk Area

- Sales tax collections lower than forecast (inherent)
- Unable to make a forecast that is free from errors
- Methodology isn't appropriate or model is poorly specified

### Organization A Response

- No process to analyze forecasting risks
- Model unchanged since 1970s
- Lack staff expertise to run / analyze
- Methodology is consistent with peers, but is very complex
- Not analyzing model performance over time

# CASE STUDY: SALES TAX REVENUE FORECASTS

## 4. Determine how risks mitigated and communicated

### Risk Area

- **Input data is inaccurate or contains errors**
- **Output doesn't capture or communicate likely outcomes**
- **Model performance decays over time; errors introduced**

### Organization A Response

- No process to review or check data aggregated in house
- Provide a single point estimate
- No analysis of predicted vs actual

# CASE STUDY: SALES TAX REVENUE FORECASTS

## 4. Determine how risks mitigated and communicated

### Risk Area

- Sales tax collections lower than forecast (inherent)
- Unable to make a forecast that is free from errors

### Organization B Response

- Annual in-depth look at risks,
- Initial promise to voters only assumed sales tax revenues
- Model updated recently as part of formal review
- Staff expertise prepare/run models

# CASE STUDY: SALES TAX REVENUE FORECASTS

## 4. Determine how risks mitigated and communicated

### Risk Area

- Methodology isn't appropriate or model is poorly specified
- Input data is inaccurate or contains errors

### Organization B Response

- Methodology is consistent with peers
- Model specifications reviewed
- Use growth forecasts professional firms
- Blended rate combines three separate growth forecasts

# CASE STUDY: SALES TAX REVENUE FORECASTS

## 4. Determine how risks mitigated and communicated

### Risk Area

- Output doesn't capture or communicate likely outcomes
- Model performance decays over time; errors introduced

### Organization B Response

- Blended forecast and three different growth forecasts
- Analyze predicted vs actual
- Conducted a formal review of methodology



# CASE STUDY: SALES TAX REVENUE FORECASTS

## 5. Understand how organization will respond

### Organization A

- No process for prioritizing projects

### Organization B

- Process for prioritizing projects in the event of funding shortfalls
- Prioritization plan approved by Board
- Did not assume any external funding

# CASE STUDY: SALES TAX REVENUE FORECASTS

## Summarizing our findings:

### Organization A

- High Exposure
- Failure to communicate risks
- Lack of controls to ensure data accuracy
- Lack of staff expertise

### Organization B

- Still high, but less so than Organization A
- Communicate uncertainty through different rates
- Externalized risks across three professional firms

# CASE STUDY: SALES TAX REVENUE FORECASTS

## Summarizing our findings:

### Organization A

- No analyses performance
- No process in place to analyze emerging risks
- No prioritization process in place

### Organization B

- Analyze performance and make adjustments
- Use annual updates analyze a specific risk
- Have developed plans to prioritize projects

# CASE STUDY: SALES TAX REVENUE FORECASTS

## Recommendations, in brief:

### Organization A

- Review methodology
- Ensure staff expertise
- Review model performance over time
- Subject in house data to review
- Better communicate uncertainty
- Use process to examine risks

### Organization B

# CASE STUDY: SALES TAX REVENUE FORECASTS

## Communication and Ethical Pressures:

- Communicating these risks to decision makers is difficult
- Time to do so is often limited
- Pressure to deliver on time, on budget
- Lots of ways to “tweak” elements or assumptions to “make the numbers work”
- Easy to focus on the short-term when program is delivered over a long time period

# WHAT HAPPENED AT SANDAG?

- Although greatly impacted by Great Recession, thought they could still deliver program
- Simultaneously, sought another sales tax measure for additional projects
- Forecast of new sales tax measure seemed high to public, and local reporter begins to ask questions
- Forecasting error discovered, traced back to data aggregation error that also affected sales tax forecasts for initial measure made after Great Recession
- Error and response lead to loss of public trust

GOVERNMENT

## **SANDAG Leader Steps Down Amid Scandal**

# QUESTIONS?

Education | News | Local

## Board Questions Decision To Lower PPS Bond By \$100 Million

by **Elizabeth Miller** [Follow](#) OPB April 16, 2019 12:11 p.m. | Updated: April 16, 2019 4 p.m. | Portland,

Ore.

A recent [audit of Portland Public Schools' 2017 bond](#) found cost estimates provided to the public for the school renovations and health and safety projects were \$100 million less than professional construction estimates circulated internally.

## OCTA to Keep M2 Promises Despite Lower Sales Tax Projections

Tuesday, December 19, 2017



The San Diego Union-Tribune

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After such scandal, SANDAG's road to repair must begin with an outsider