**Cross-Asset Optimization at Colorado Department of Transportation** 

# Developing an Integrated System for Managing Investments in

# Intelligent Transportation Systems, Fleet, Maintenance, Bridge, and Pavement

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9th National Conference on Transportation Asset Management

April 16, 2012



# **Cross-Asset Optimization at Colorado Department of Transportation**

- About Colorado DOT (CDOT)
- Managing Multiple Asset Categories In Development at CDOT
- Beyond Pavement and Bridges:
  - Maintenance Levels of Service
  - Fleet
  - Intelligent Transportation Systems
- Lessons Learned and Next Steps:
  - Know Your Audience Deal with the Black Box
  - Real Estate (Facilities)
  - Safety, Traffic, and Other Assets
  - Integrating with Enterprise Resource Planning (ERP) Software



# **About Colorado**

2010 Census Population: 5,029,196

(17% growth since 2000)

- □ Slightly <2% of US population, GDP, FHWA distributions
- MPOs: 5
- Centerline miles: 88,389
   (9,109 owned by CDOT)
- Colorado DOT
  - □ 6 engineering regions
  - □ 3,000+ employees
  - ~\$1 billion annual budget





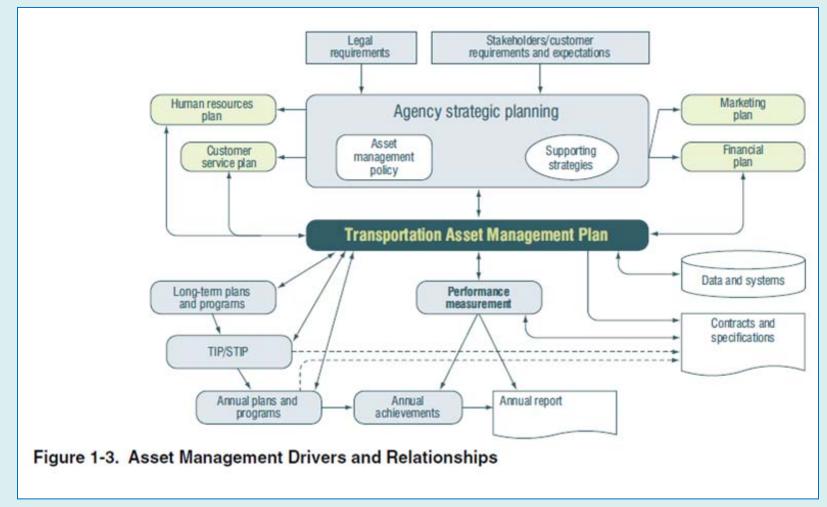
# **Effective Asset Management**

- ✓ Policy-driven
- ✓ Performance-based
- ✓ Analysis of options and tradeoffs
- ✓ Decisions based on quality information
- Monitoring provides clear accountability and feedback

Source: Asset Management for Sustainability, Accountability, and Performance



## **TAM Guide Structure**





#### **Managing Multiple Asset Categories**





### **Managing Multiple Asset Categories**





# **Managing Multiple Asset Categories**

#### **Cross-Asset Optimization**

- coordinates the management of several individual asset categories
- maximize the life and utility of interconnected assets

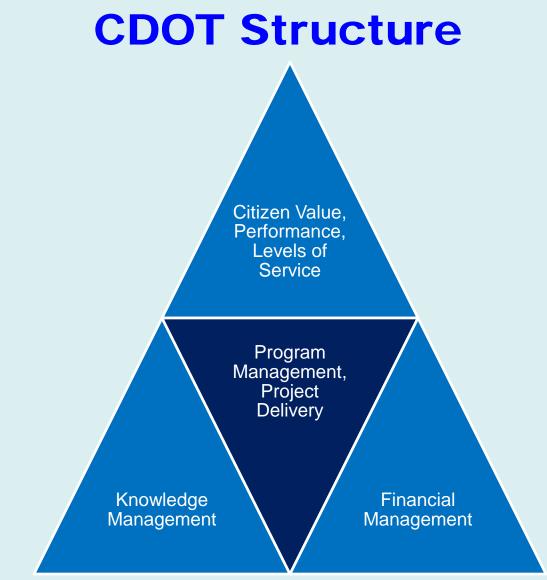
#### At a project level,

- coordinate pavement work on a bridge approach with bridge reconstruction
- cable barrier installation with a variable message sign posted in the median

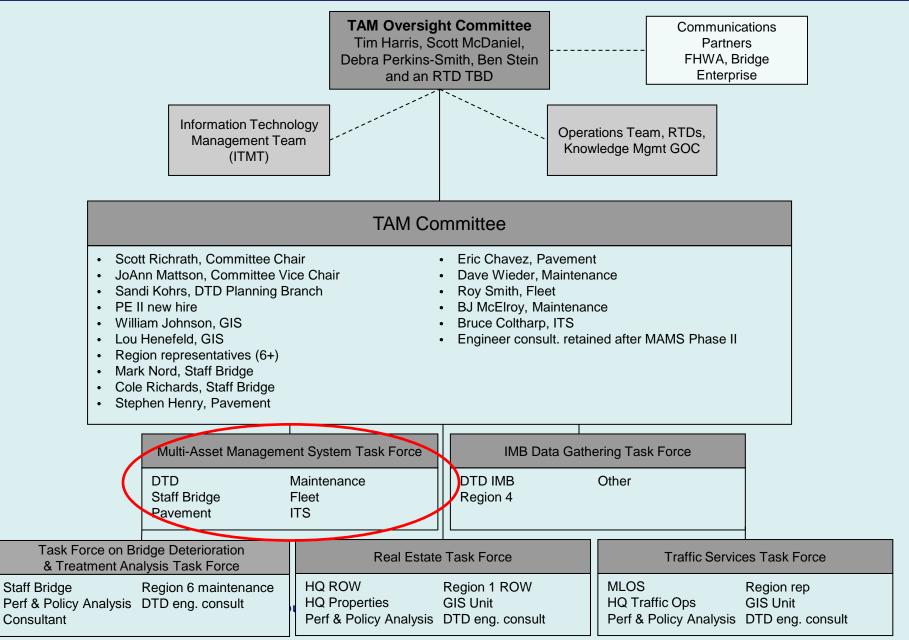
#### At a programmatic level,

- forecast the impact of investment decisions across multiple asset categories
- project asset condition at varying investment levels

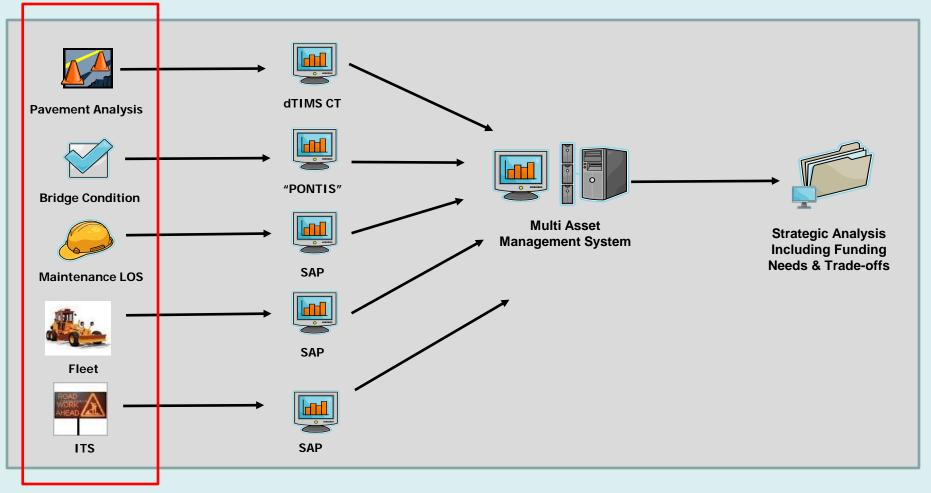








# **Managing Multiple Asset Categories**



About 3,000 assets in each asset category.



## Life Cycle / Deterioration Curves...

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## ...provide Spending-Performance Forecasts

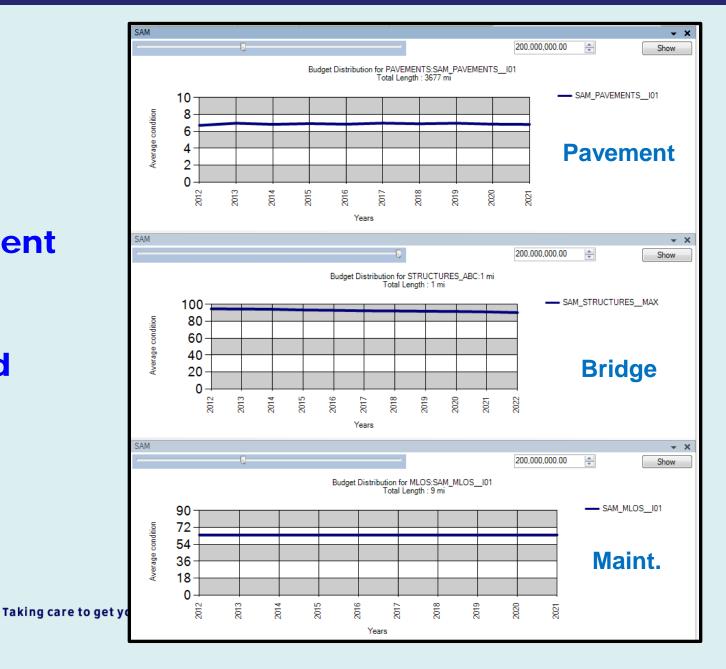
2011 20-Year Good/Fair Projections



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Multi-Asset Management System:

Integrated Analysis





## **Maintenance Levels of Service**

Home System: SAP

Annual Budget: ~\$242,000,000

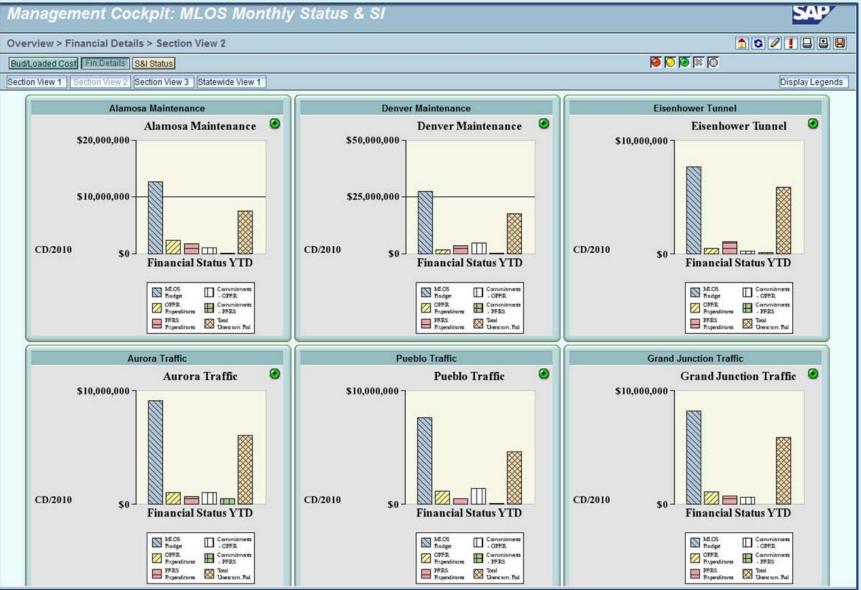
Performance Measure: Letter grade as evaluated by peer crews

MAMS "win:" Provide budget-performance and performance-budget analysis





## **Maintenance Levels of Service**



# Fleet

Home System: SAP Annual Budget: ~\$15,000,000 Performance Measure: % Expected Life per mfr. specs MAMS "win:" Demonstrate benefit of reduced maintenance costs





# **Intelligent Transportation Systems**

Home System: SAP

Annual Budget: ~\$15,000,000

Performance Measure: % Expected Life per mfr. specs

MAMS "win:" Seat at the table for annual budget setting





# **Lessons Learned**

Know your climate and audience

- How do they define "Long Term?"
- View at the statewide level or the neighborhood street?
- Deal with the Black Box



Vs.

#### Performance Measure

- ✓ Average Remaining Service Life
- ✓ Level of Service
- ✓ % Deck Area Good/Fair Condition
- ✓ % Down-Time
- ✓ % Expected Useful Life



# **Next Steps**

- Multi-Asset Management System enhancement
  - Facilities (HQ, maintenance sheds, etc.)



- Public Budget Formulation in ERP
  - Linking spending to asset performance.
- Data Collection for other assets (safety, traffic, maint...)
  - Developing business plan to maintain data.



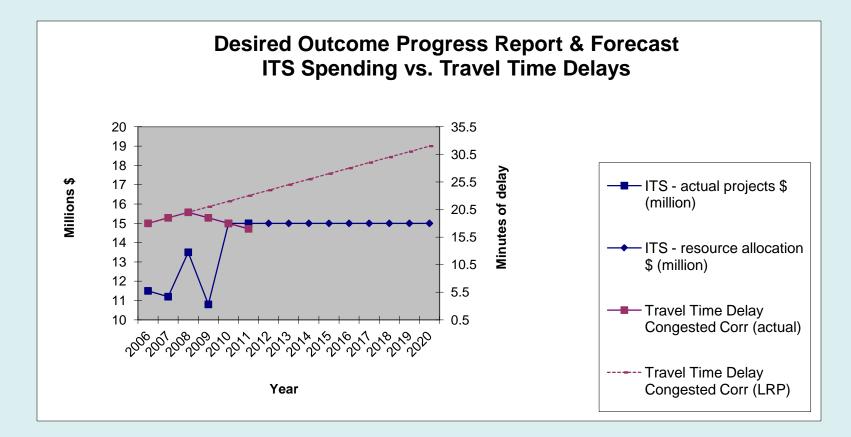
# **Public Budget Formulation in ERP**

	Display Reactive Maintenance 1800047210: Central Header										
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Order REAC 1800047210 Service-John Deere Loader#4323	Order REAC 00047210 Service-John Deere Loader#4323										
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Taking care to get you there

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# **Public Budget Formulation in ERP**



# **Fictitious Data**



# **Data Collection**

#### **Owners / Originators**

- Survey Unit desktop or Document Management System
- Maintenance & Operations ERP ۲
- Environmental desktop •
- **Transportation Development GIS**
- Bridge (culverts) PONTIS, desktop Other Users
- Traffic Safety TS Assessment systems
- Access Management desktop
- Design Engineering CAD, desktop
- Others





# **Data Collection**

#### Lidar



Point Cloud Time of Flight 1.2m PPS 1cm - 10cm 1cm - 5cm Day / Night Photogrammetry



Color Image / Depth Map Triangulation 27m PPS (equiv) 30cm - 1m 2cm - 10cm Day

#### Photo/Video Log



Color Image (Approximate) N/A 10m+ N/A Day



Taking care to get you there

Source: EarthMine

### Lots of Assets. Lots of Data.





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