

Gulf Region ITS (2021)

Applying Real-Time Performance Measures to Optimize our Transportation Systems

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Delivering a better world



Current State of the Practice

Transportation Planning	Ranking, Prioritization
Traffic Engineering	Benefit-Cost Analysis
TMC Operations	Real Time Performance Measures
TMC Operations	Predictive Analytics (Big Data)

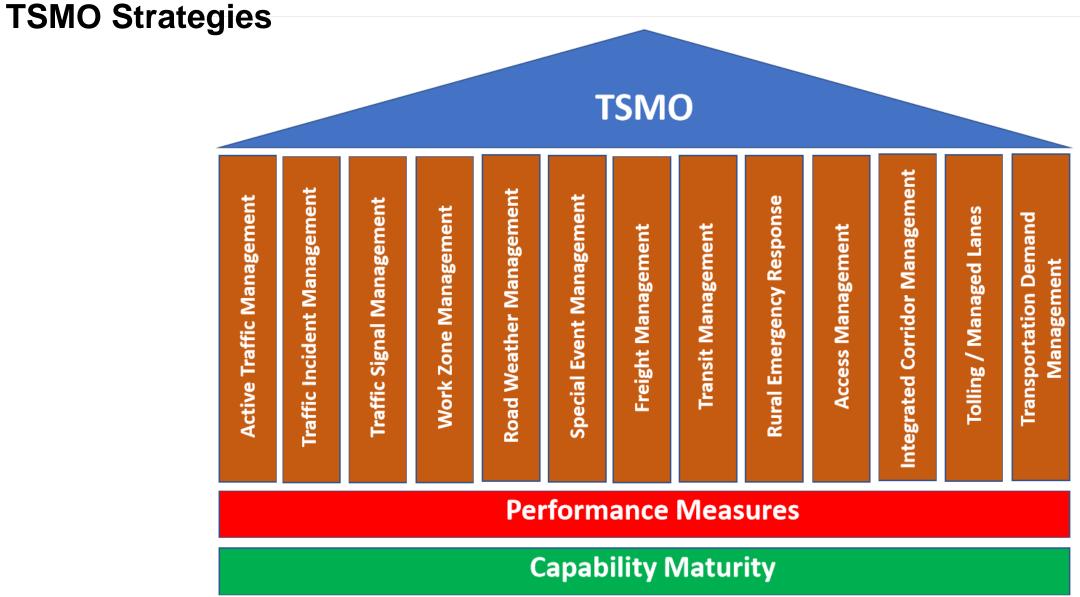
Transportation Systems Management & Operations (TSMO)

Federal Legislation ("MAP-21")

Transportation Systems Management & Operations (TSMO) Definition:

"Integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, crossjurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system."





Emerging Technologies



Connected Vehicles



Mobility on Demand



Automated Vehicles



EV Charging



Road User Charging



Pedestrian-Bike Apps



Smart Mobility Hubs



Smart Signals



Automated Buses



Enterprise Data Mgmt



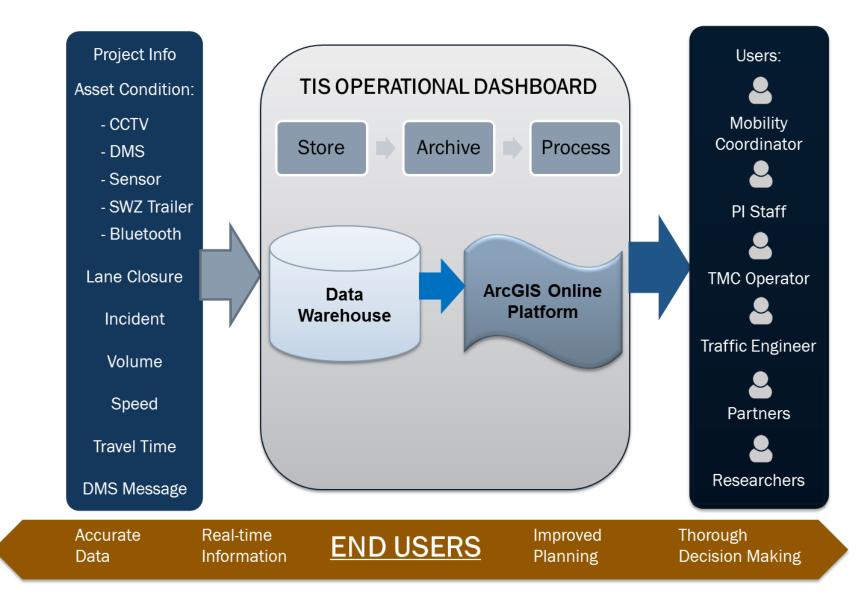
Flex Zones



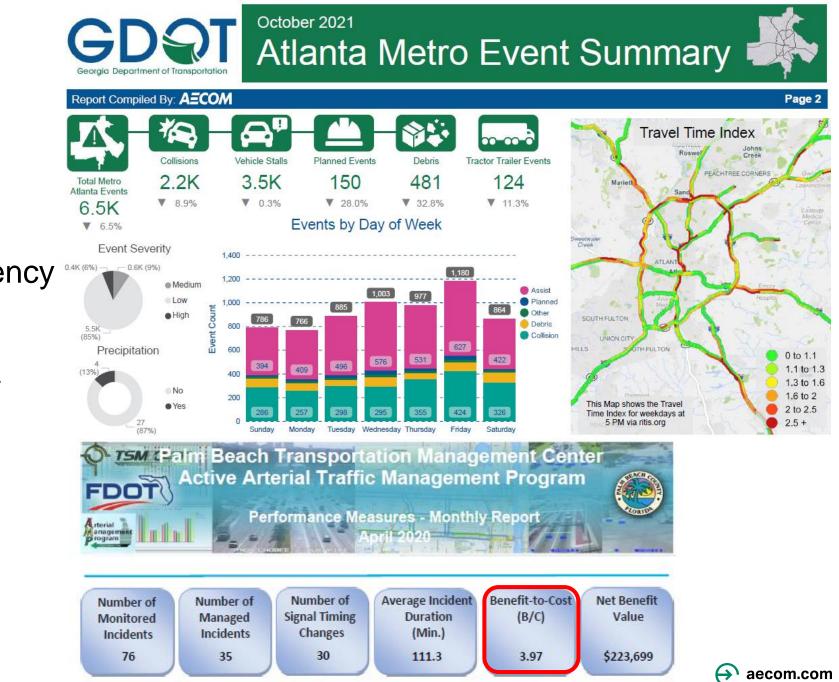
Smart Cities Integration



Big Data



- Type of Events & Frequency **
- Travel Time Reliability
- Asset Uptime Availability
- Emissions Savings
- Benefit-Cost Ratio



- Dashboard Portal
- Notifications & Alerts
- Pattern Identifications
- Predictive Analytics
- "What If" Simulations



Bottleneck Management Active Arterial Management Safety System Availability Work Zone Management Data Collection Asset Management **Multimodal Applications GIS** Layers



Gamification

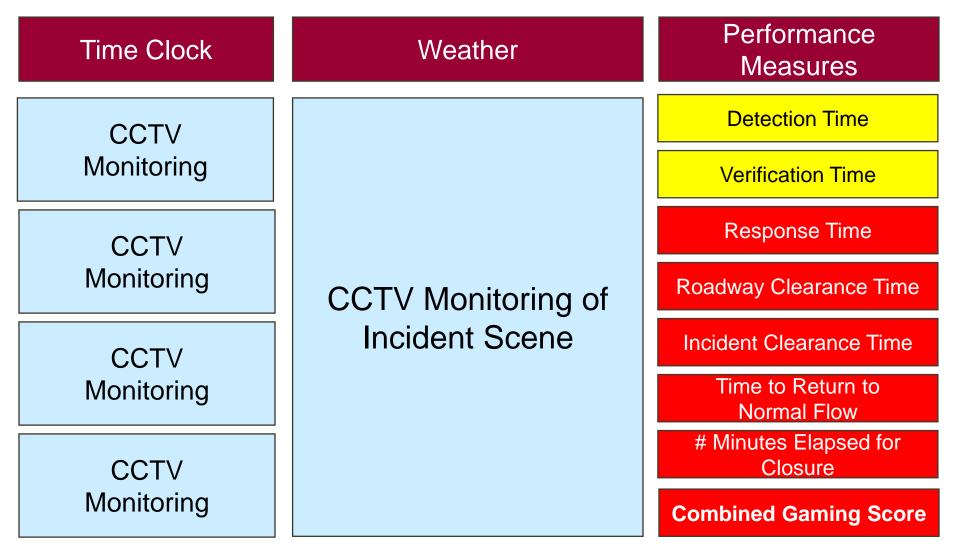
	Summary of Points for RTMC Operators							
	Performance Measure	Max Points	RTI Opera		RTN Opera		RTI Opera	MC ator 3
			Individual Points	Team Points	Individual Points	Team Points	Individual Points	Team Points
ics	Dispatch Time: Service Patrols	15	10		15		10	
Metr	Time to Confirm an Event	15	10		15		10	
Output Metrics	Time to Post DMS Messages	15	10		15		10	
Out	Time to Notify Other Agencies	15	15		10		10	
S	Travel Time Reliability	5		5		5		5
Metrics	Incident Clearance Time	10		10		10		10
	Arterial Travel Time & Delay	10		5		5		5
Outcome	Express Lanes Reliability	10		8		8		8
õ	ITS System Availability	5		5		5		5
	Subtotal	100	7	8	88	3	7	3

Video Wall Management: Normal Operations

Time Clock	Weather	Performance Measures
CCTV		% Incidents Detected by CCTV Cameras
Monitoring		Dispatch Time Service Patrols
CCTV		Time to Post DMS Messages
Monitoring	GIS Network Map	Time to Notify Agencies
CCTV	showing congestion status and bottlenecks	Travel Time Reliability
Monitoring		Incident Clearance Time
CCTV		Travel Time Delays
Monitoring		Combined Gaming Score



Video Wall Management: Incident Management





Video Wall Management: Traffic Analysis

Time Clock	Weather	Performance Measures
CCTV Monitoring	GIS Network Map showing congestion status, bottlenecks, and crash potential	% Freeways Congested % Arterials Congested
CCTV Monitoring		% Express Lanes Free Flow % Ramp Queuing
CCTV Monitoring		Probability of Near Miss Crashes Probability of Secondary Crashes
CCTV Monitoring		Work Zone Delays Combined Gaming Score



Video Wall Management: Active Arterial Management

Time Clock	Weather	Performance Measures	
CCTV		% Arrivals on Green Signal	
Monitoring		% Arterials Congested	
ССТУ	GIS Network Map showing travel time reliability along strategic arterials and safety hot spots	Average Incident Duration	
Monitoring			Travel Time Delays
CCTV		Travel Time Reliability	
Monitoring		Probability of Near Miss Crashes (Vehicles)	
CCTV		Probability of Near Miss Crashes (Peds and Bikes)	
Monitoring		Combined Gaming Score	

Video Wall Management: Asset Management

Time Clock	Weather	Performance Measures
CCTV Monitoring	GIS Network Map showing system and component failures (indicate priority)	ITS Uptime Availability Pavement Condition Scores
CCTV Monitoring		Bridge Condition Scores Asset Maintenance Call Outs
CCTV Monitoring		Asset Maintenance Response Times Critical Safety Failure Response Times
CCTV Monitoring		Quality of Long-Term Temporary Traffic Control Combined Gaming Score

Video Wall Management: Multimodal Operations

Time Clock	Weather	Performance Measures
CCTV		Bus Schedule Adherence
Monitoring		Train Schedule Adherence
CCTV	GIS Network Map showing green, yellow, and red indications of multimodal delays	Freight Operational Delays
Monitoring		Rail Crossing Delays
CCTV		Moveable Bridge Crossing Delays
Monitoring		Transit Ridership
CCTV		Park & Ride Availability
Monitoring		Combined Gaming Score



Video Wall Management: Emergency Management

Time Clock	Weather	Performance Measures
CCTV		% Evacuation Routes Free Flow
Monitoring		% Contraflow Lanes Operational
CCTV	GIS Network Map showing congestion status and bottlenecks	% Emergency Shoulder Use Lanes Operational
Monitoring		% Ramp Queuing
CCTV		% Nearby Shelters with Available Bed Capacity
Monitoring		% Gas Stations with Available Fuel Capacity
CCTV		Travel Time Delays
Monitoring		Combined Gaming Score

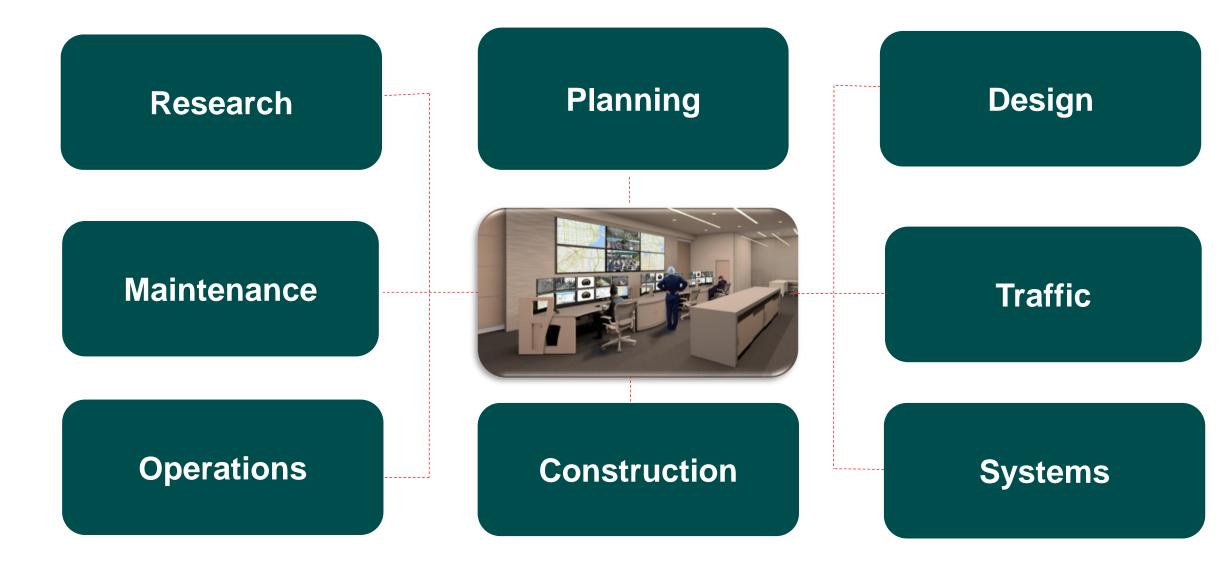


Video Wall Management: High Profile Visitors

Time Clock	Weather	Performance Measures	
CCTV Monitoring	GIS Network Map showing congestion status and bottlenecks		Travel Time Reliability (Freeways) Travel Time Reliability (Arterials)
CCTV Monitoring		Travel Time Reliability (Toll Roads) Bus Schedule Adherence	
CCTV Monitoring		Transit Schedule Adherence Freight Operational Delays	
CCTV Monitoring		Probability of Crashes Combined Gaming Score	



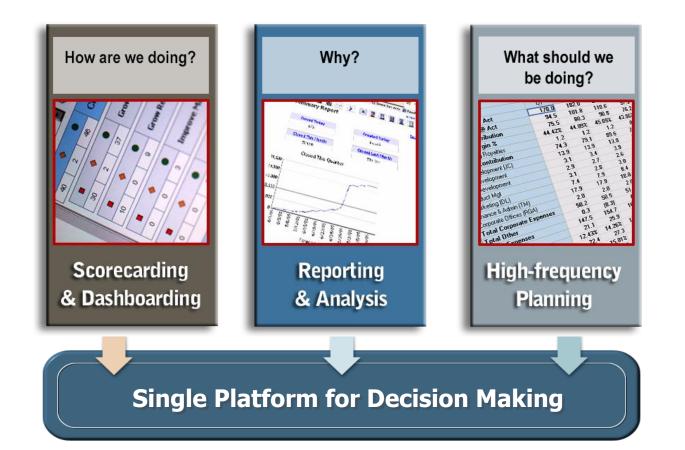
Remote Workstations



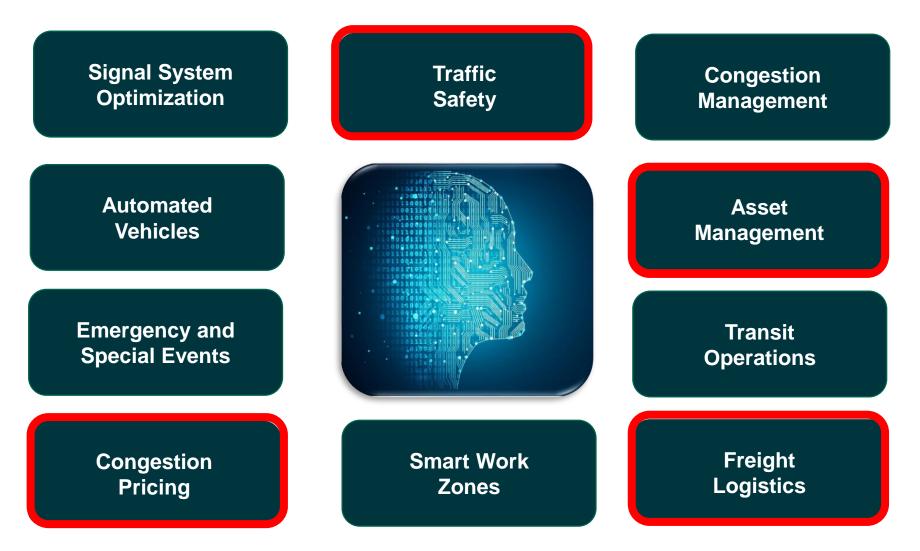
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AI / Machine Learning

- Predictive Analytics
- Performance Targets
- Automated SOPs
- Apply Best Practices
- Digital Twinning



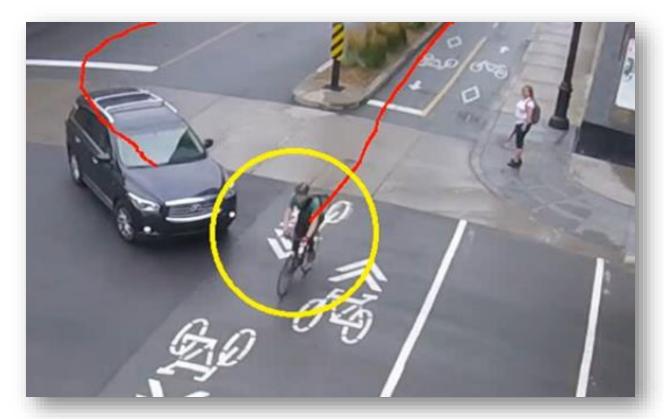
AI / Machine Learning





AI / Machine Learning: Traffic Safety

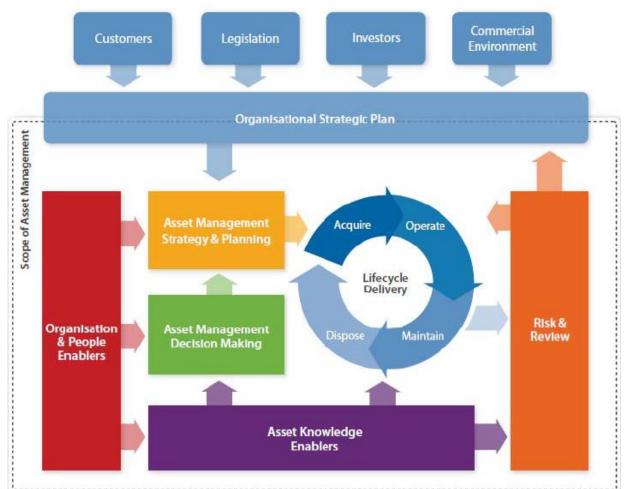
- Near Miss Algorithms
- Predict High Crash Sites
- Dynamic Heat Maps
- Identify Root Causes
- Low-Cost Solutions



DOTs typically analyze historic crash data over the most recent 3-5 years to analyze high crash locations and develop safety recommendations.

AI / Machine Learning: Asset Management

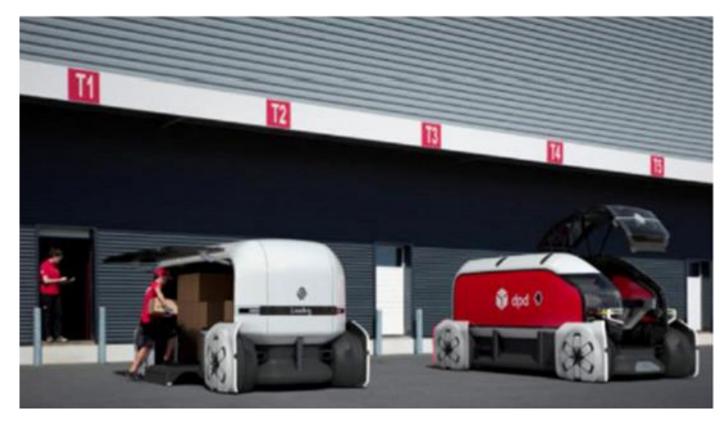
- Data Collection
- Detect Deficiencies
- Prioritize Repairs
- Replacement Programs
- Optimize O&M Budgets



Al/Machine Learning can leverage nanotechnology to collect, analyze and predict pavement and structural cracking.

AI / Machine Learning: Freight Logistics

- Optimize Routes
- Optimize Schedules
- Drayage Operations
- Bundling Pods
- Automation



Ai/Machine Learning has significant potential applications in optimizing freight operations.

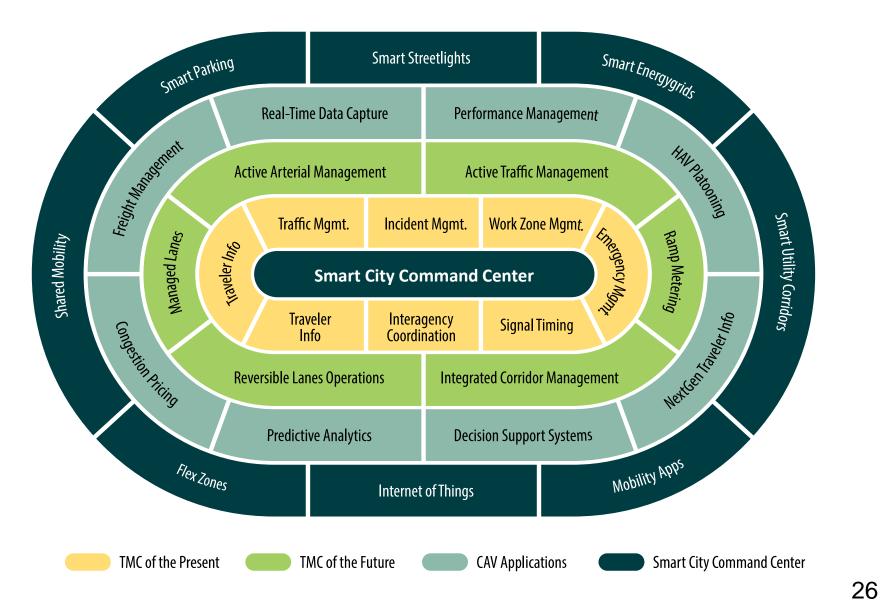
AI / Machine Learning: Congestion Pricing

- Supply & Demand
- Generate Revenue
- Multimodal Strategy
- Infrastructure Lite
- System Optimization



While congestion pricing has been in operations in Singapore, London, and Stockholm for many years, it is beginning to gain traction in certain US cities.

Summary



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