TRANSPORTATION ASSET MANAGEMENT AND EMERGENCY SERVICES

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The Westin San Diego

San Diego, California

Building Blocks

- Key concepts and components
- Emergency Service Management & Transportation Asset Management
- Research for Ph.D. (2010)
- Regional Conference Findings (local to National)
- Delaware DOT example
- Main Remarks

Key Concepts

Emergency Service Management

- Strategic organizational process – protect infrastructure from hazard
- Emergency Planning and Management
  - Active – contingency (emergency mgt) plans
    - E.g. NIMS, evacuation
  - Static – land development controls (codes)
    - Health Safety/Welfare of general public
    - Zoning, subdivision/land development (design & build)

Transportation Asset Management

- business process/decision-making framework
- covers extended time horizon
- economics and engineering
- considers a broad range of assets
- economic assessment (trade-offs) - alternative investment options
- information for cost-effective investment decisions

http://www.fhwa.dot.gov/infrastructure/asstmgmt/assetman.cfm

Key Components

EMERGENCY SERVICES MGT

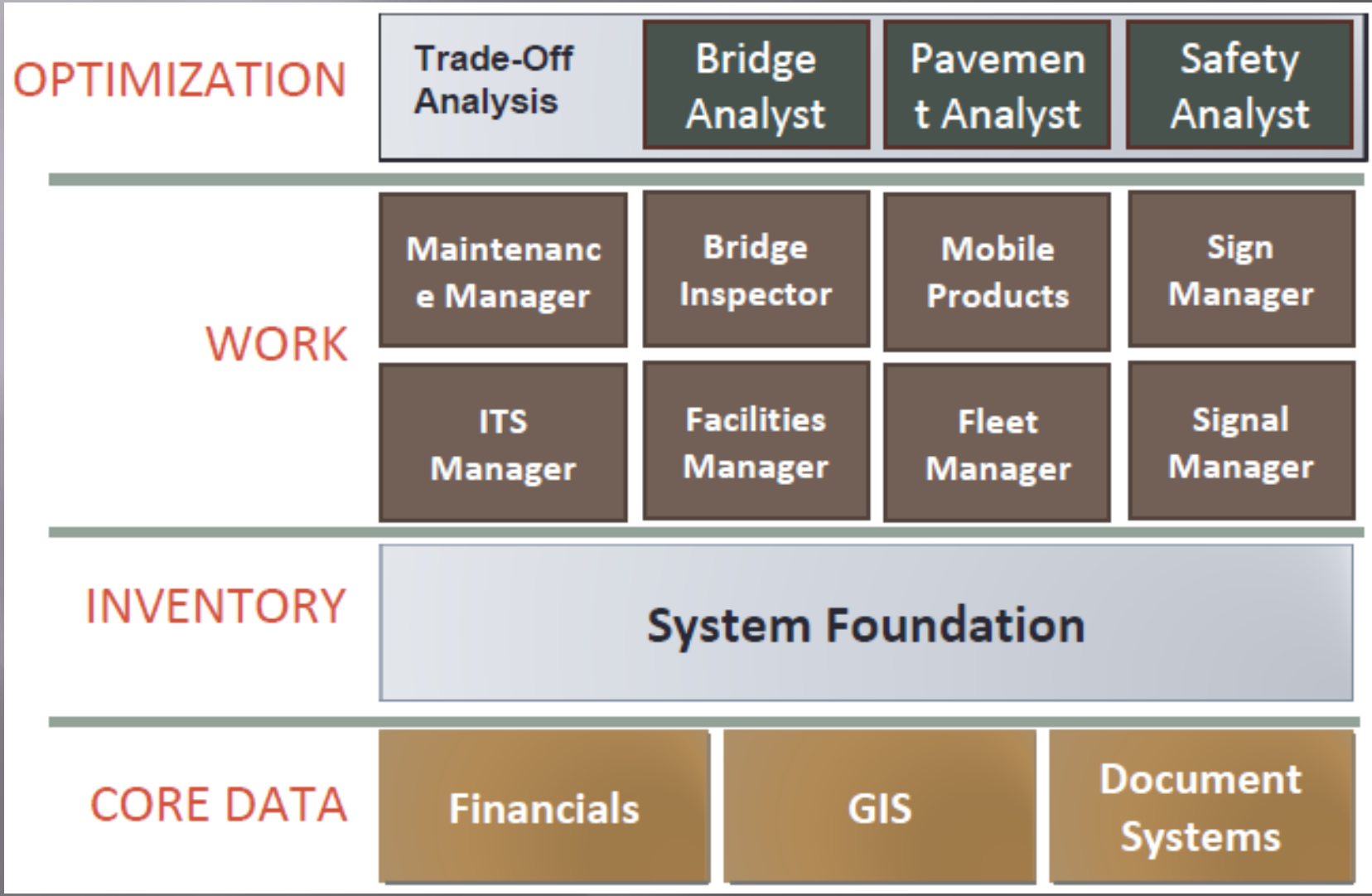
- Long Term (planning)
  - Criticality/Risk-Based Analyses/Optimiztion
  - Response Plans
    - Pre formatted work request (triggered by event)
    - Labor, materials, equipment, contractors
- Short Term (just before storm)
  - Inspect, repair/maintenance based on criticality/risk
  - Review available resources
  - communication

TRANSPORTATION ASSET MGT

- Long Term (CIP)
  - Capital Investment Planning
  - Strategic Agency Investment
  - E.g. Emergency Planning
- Short Term (MMS)
  - Maintenance Mgt Systems
  - Good Asset Practices and build shorter term operational deals

Right information, right people, right format, agency wide (data + application), right time & place

Infrastructure Management Framework and Tools



Impacts on Emergency Response

OPTIMIZATION	• Highest LOS for the least amount of money
WORK	• Where was the work performed? • Who do it, with what equipment and materials, and for how long? • When was it completed?
INVENTORY	• What assets? • What are they worth?
CORE DATA	• Connections to critical data, all accessible in one place

Integration of EMS with TAM

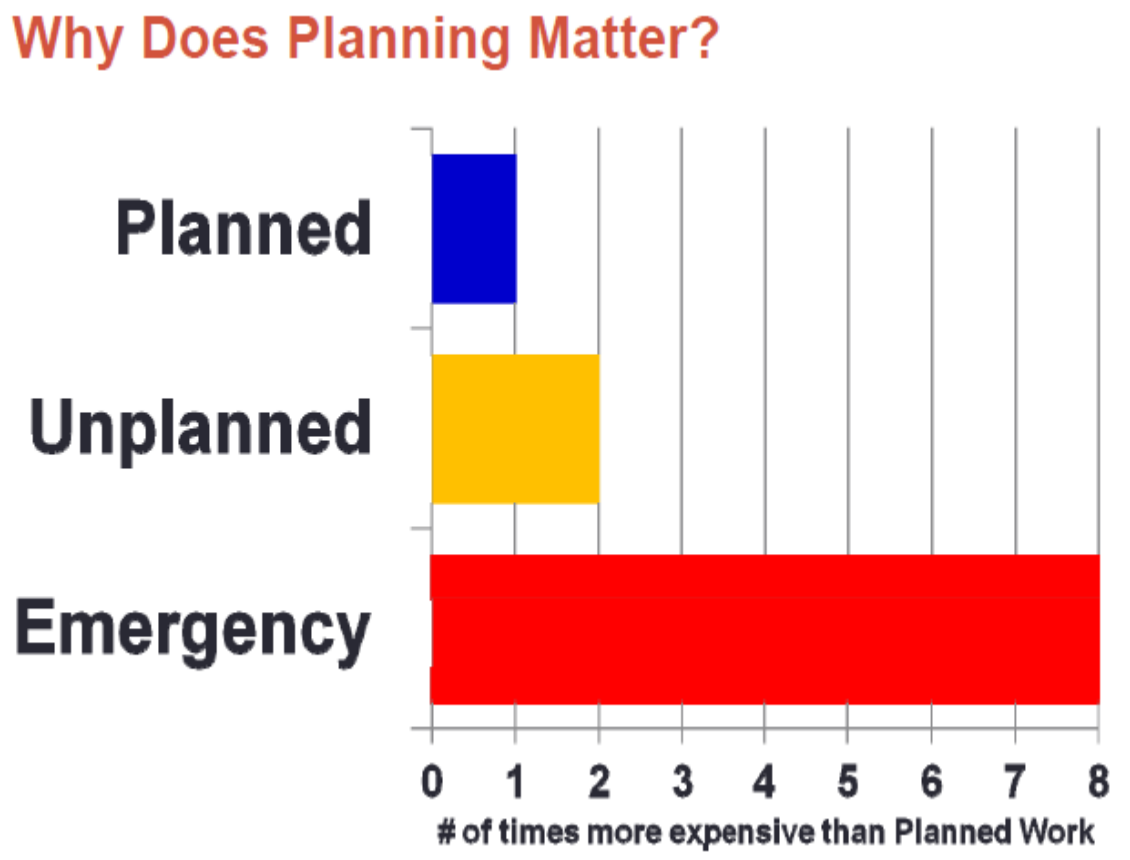
Response (during event)

Work Request/Order

- Schedulling, notifying

BENEFITS

- Optimization of resources (LOS up, costs down)
- Tracking (who, what, where, when)



EMS + TAM : Post Event – Recovery

Short-term tasks

- Clean up/inspection/repairs
- Work Order System (track costs, schedulling)

FEMA

- Before vs. After Conditions
- Tracking Costs

Long-term

- Feedback – review/revise Plan
- Develop long-term CIP (rehab, reconstrct, enhance)

- Data integration – 1 stop & shop
- Tools and systems – users benefit statewide
- Support mgt & operation for whole tansportation system
- Better project schedulling & cost
- ID critical failure points

Ph.D. Research (May 2010)

Title: Managing Critical Civil Infrastructure Systems for Disasters Resilience: A Challenge

Problem Statement

- Critical Infrastructure System challenges:
  - aging processes and disasters
  - constrained budget
  - improvement of C.I.S. resilience
- Importance/Why?
  - support socioeconomic system
  - maintain continuity of services
  - deal with real world complex and dynamic systems
- Investigation of resilience of critical infrastructure systems
  - How? - conceptual framework - Decision Support System (DSS)
  - Why? - system performance and function after disaster (e.g. maintenance, repair, rehabilitation, replacement, serviceability)

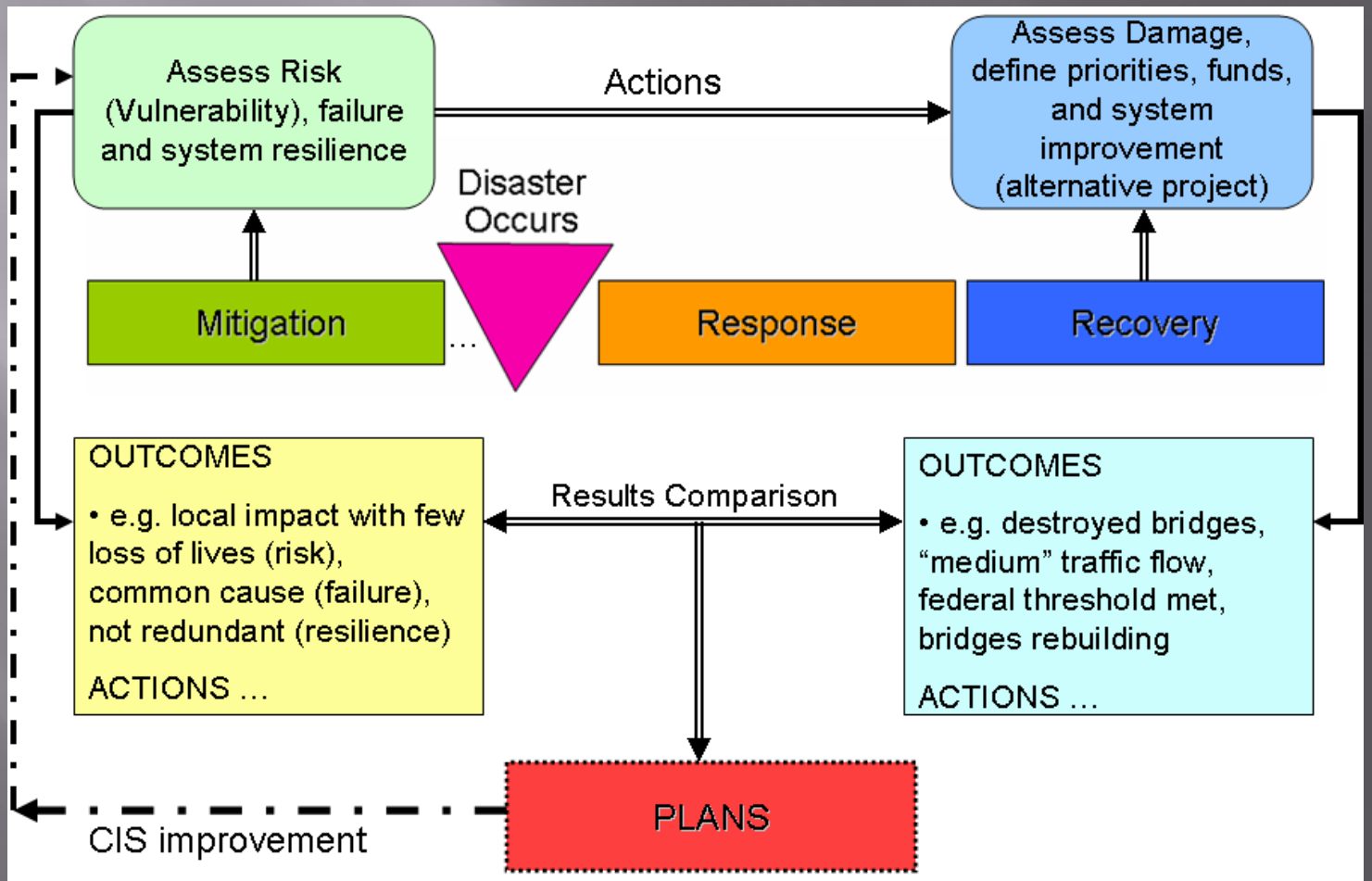
Ph.D. Research Focus

- Research Objective:
  - *To improve the resilience of critical infrastructure system through the development of a Critical Infrastructure Resilience Decision Support System*
- System Resilience Analysis

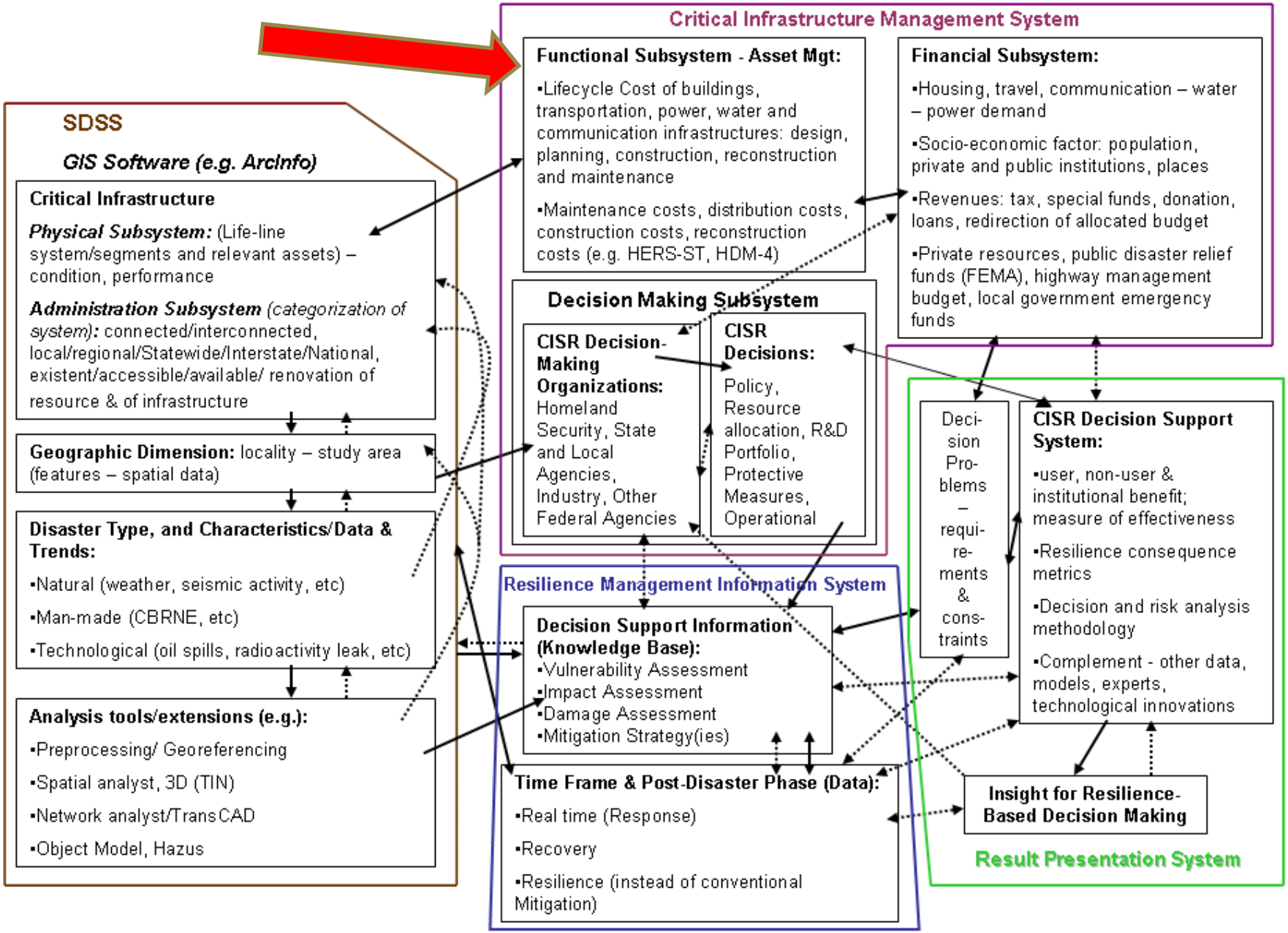
Before Event (diagnosis)	After Event (metrics)
System fulfillment of resilience characteristics: ▪ adaptive ability to restore itself to former conditions (e.g. PCI, LOS, …)	Resilience metrics helps to: ▪ manage CI problems, ▪ develop protection strategies, ▪ ensure continuous system operation (uncertain future)

Research – Key Metrics for TAM

- Resilience metrics
  - performance indicators, safety measures, and/or based in rating systems to capture systems behavior
- CIR-DSS Framework

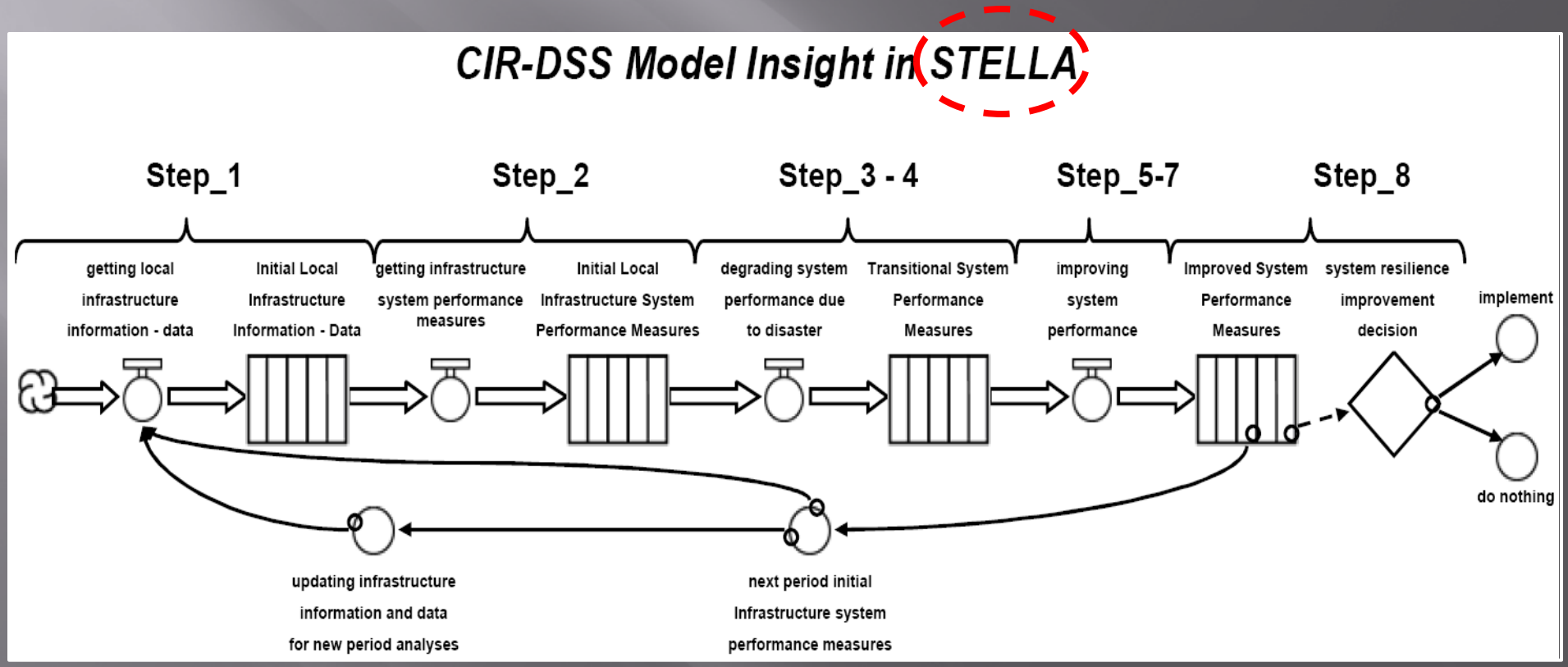


System Dynamics Diagram of Decision Support System for Critical Infrastructure System Resilience (CISR)



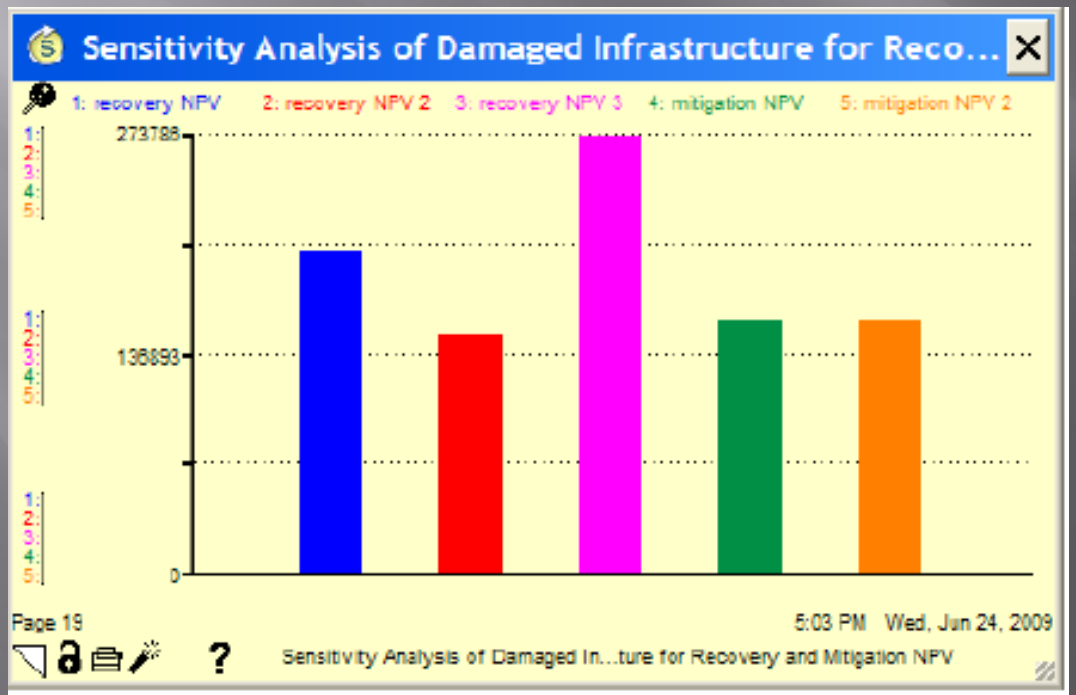
CIR-DSS Model Framework

GIS + **HAZUS-MH**



RESEARCH RESULTS

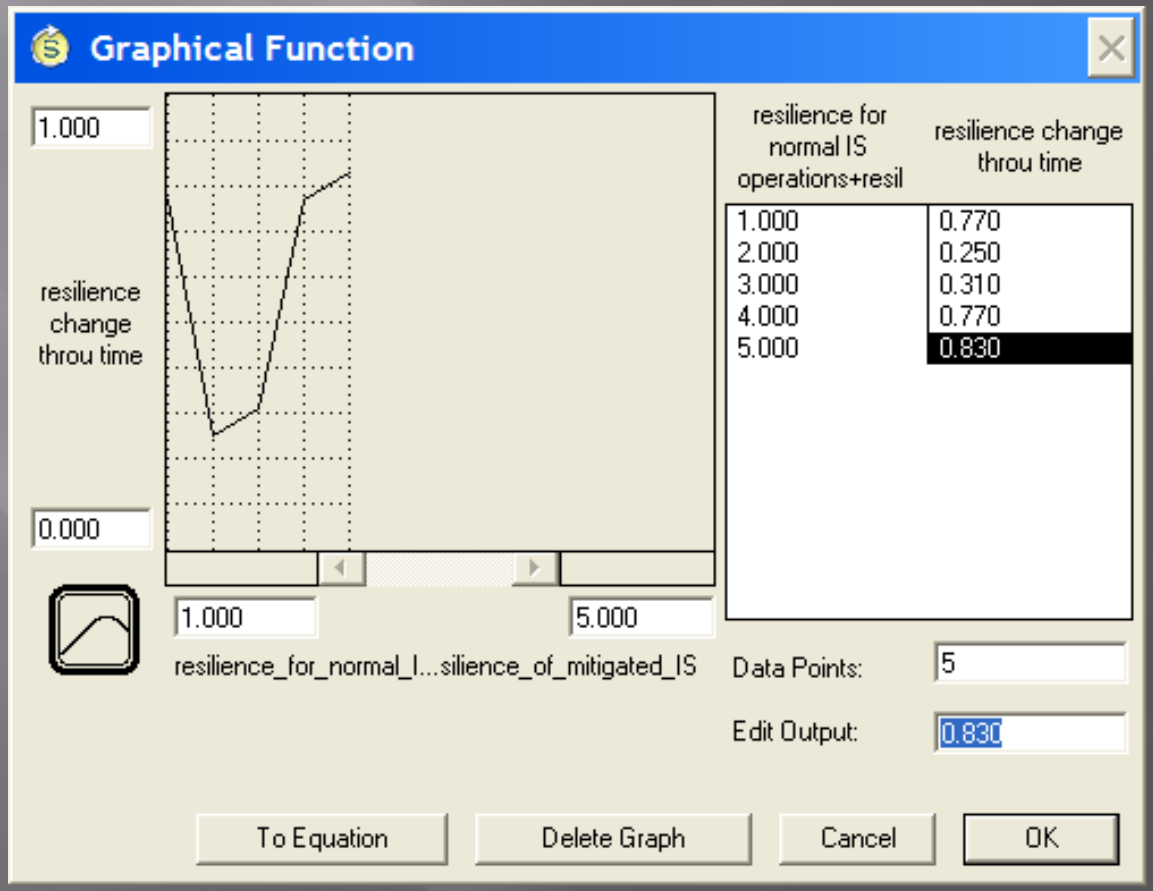
Probability of a 100-year storm event in the case study area	Result of (Recovery projects - Mitigation projects)
1%	-9809 recovery cost less than mitigation
4%	44065 recovery cost more than mitigation
8%	115896 recovery cost more than mitigation



↑ frequency of the 100-year storm event

↑ worthwhile investments in mitigation projects

- Resilience can be captured reflecting changes on infrastructure <u>system condition and performance</u>
- Different "key performance indicators" may establish different optimum threshold value for resilience (case study value was 0.83)



Research Contributions - TAM

Model Results (examples)

- Disaster concept, principles and phases observation, integrating current disasters' governmental practices with general <u>asset management principles</u>
- Recovery and mitigation strategies insights focused in resilience of system improvement (enhanced approach to current practices) that also considers <u>financial trade-offs</u>

Regional Workshop

Transportation and Emergency Management Spatial Analysis

Dover-DE

11/2/2011

RELATION OF EMERGENCY SERVICES AND TRANSPORTATION ASSET MANAGEMENT

Alan Kercher and Dr. Simon Lewis
Kercher Engineering

MAGTUG,
Nov 2, 2011
Dover, DE.

Assessing the Vulnerability New Jersey's Transportation Infrastructure to the Impacts of Climate Change: Data Analysis and Needs

NJTPA SJTPO dvrpc DELAWARE VALLEY REGIONAL PLANNING COMMISSION NJTRANSIT The Way To Go.

USGS science for a changing world

Use of Sensors and Rapid Deployment Gages for Storm Surge Data from Coastal Storms

Mid Atlantic Geospatial Transportation Users Group Meeting
November 2, 2011
Dover, Delaware

U.S. Department of the Interior
U.S. Geological Survey

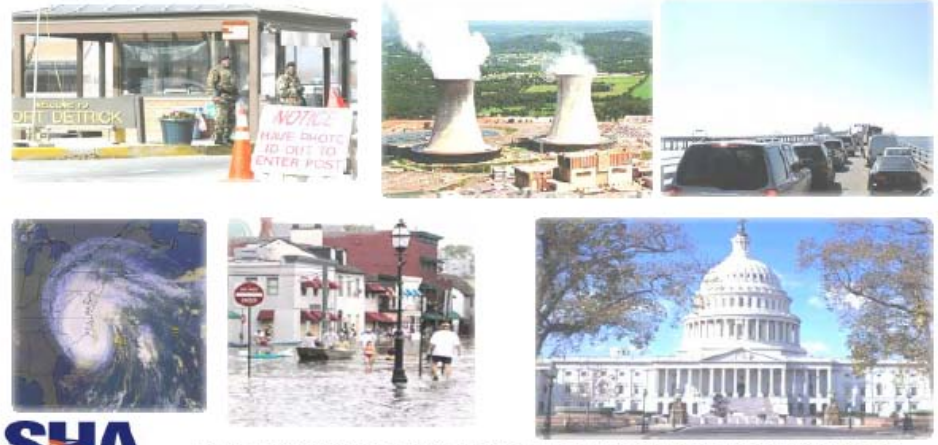
Delaware Department of Transportation Real-time Data Application for Planning and Operations

Mid-Atlantic Geospatial Transportation Users Group Meeting
November 2, 2011

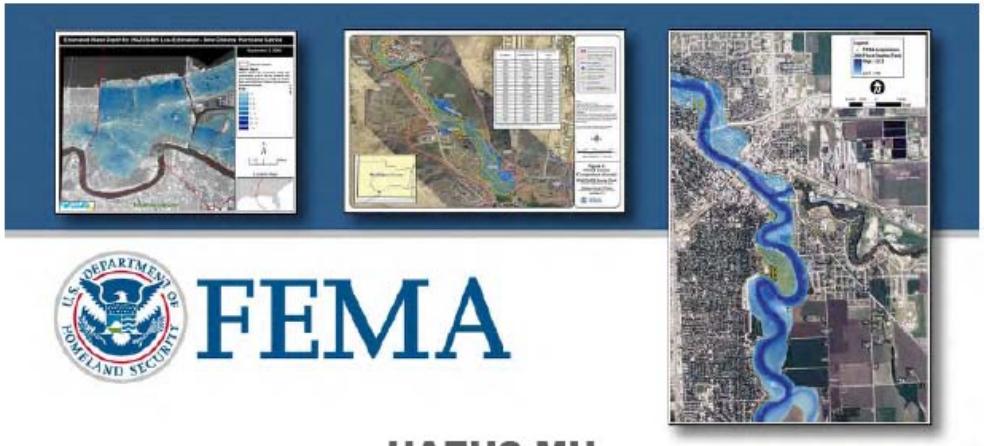
Gene Donaldson

DelDOT

State Brief – Maryland



EMERGENCY TRANSPORTATION OPERATIONS PLANS IN MARYLAND



FEMA

HAZUS-MH
Natural Hazard Loss Estimation

"Risk MAP—powered by HAZUS"

Improving DEMA's understanding of DEOS and HAZUS-MH

By David Carlson
State Hazard Mitigation Officer

Introduction

The need of GIS Data for Situational Awareness and Decision Making

Matthew Laick, GISP
GIS Coordinator
Delaware Department of Safety and Homeland Security

DNREC's Sea Level Rise Vulnerability Assessment and Related Coastal Storm Protection Projects

Robert Scarborough, Ph.D.
Delaware Coastal Programs

Delaware's Sea Level Rise Initiative

A Municipal Perspective on Highways, Emergency Services and Flooding in Delaware

MAGTUG. Nov 2 DelDOT

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Ralph Mitchell, Bethany Beach, DE
Matt Lawson, Mercer County, NJ
Rick Williams, City of Newark, DE

Climate Change and the Challenge for DOTs:
FHWA Climate Change Adaptation Activities and Lessons Learned

Mid Atlantic Geospatial Transportation Users Group Meeting
November 2, 2011

Rob Hyman
FHWA, Office of Natural Environment

U.S. Department of Transportation
Federal Highway Administration

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On-going Project to Address Flood on Roads

A Collaborative, Inclusive and Scientific Approach
DelDOT – TMC
(11/2011)

Silvana V Croope, Ph.D.

11/2011 – Workshop Findings

- Research and activities on transportation and disasters
  - Different shapes, software and operational and planning effort
  - Incident or emergency, climate change and sea level rise issues
  - Policies, recovery and mitigation projects look for feasible/optimal solutions (public and stakeholders)
- Procedures, data, tools and discussions include elements needed for <u>Asset Management, however they fit better Emergency Services Management</u>
  - Asset Management is a concept that requires more discussion as means to better integrate research, practices and investments principly by Governmental Agencies at large and in speacial DOT's

Delaware DOT

Asset Management - an on-going subject
• verify and determine inventory management, logistics management and asset management

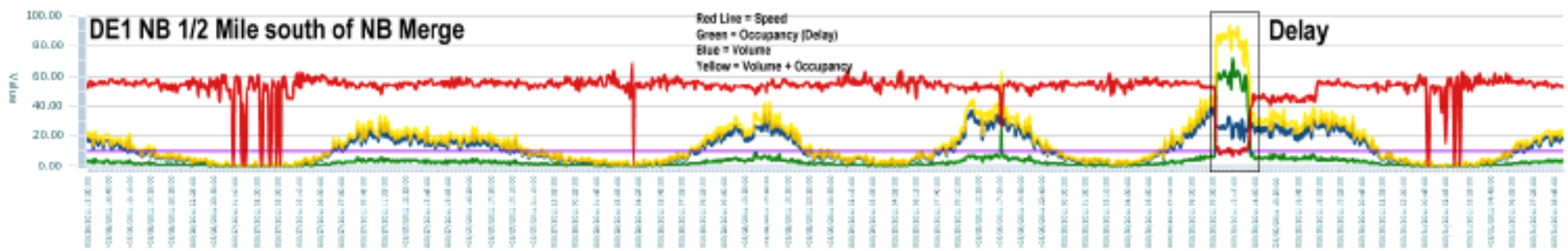
- Transportation Management Center
  - Focus on operations
  - ITMS tools to manage emergencies and transportation incidents

- Main Current Projects
  - 511 traveler information system
  - Early Weather/Flooding Monitoring System
  - Telecommunication & detection systems expansion
  - Mapping applications (GIS)
  - Planning and Operations (integration working group)

DEDOT

Roadway Weather Sensor Working Group

- Stakeholders: Delaware Dept Natural Resources & Environmental Control, Delaware Emergency Mgt Agency, DOT, USGS, University of Delaware
- Actitities
  - data requirements, monitoring system requirements, integration of existing systems (sensors), application development (map and specific functions)
- Current Systems Effort and Availability
  - E.g. Memorial weekend 2011 (traffic flow condition)



DOT TAMS Implemented …

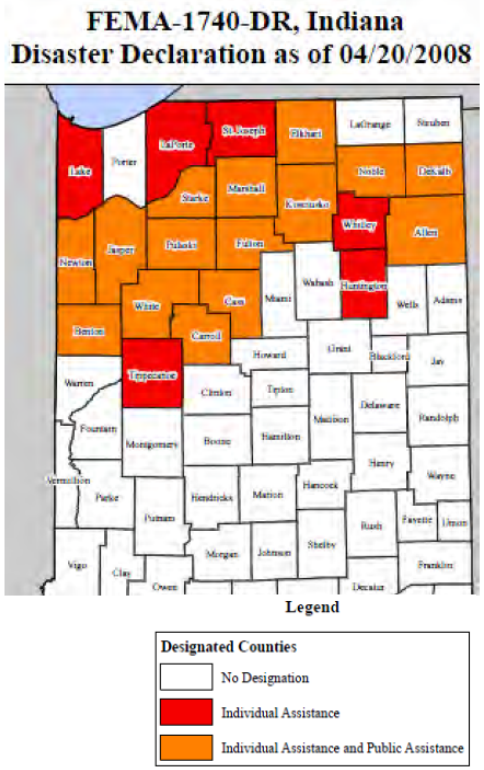
- Issues for TAM: drainage, evacuation/flooding roads, emergency services, utility companies …

- NCDOT
- KYTC – Kentucky Transportation Cabinet
- INDOT (HERS-ST)
- Québec Ministry of Transport
- Ohio
- Washington State

AMS Configuration

The **work flow** for INDOT's FEMA reporting process is:

- After a disaster (snow, ice or rain flood) FEMA decides if to render Storm assistance & informs INDOT of the Counties which qualify and the Start and End Date for which work will be reimbursed.



http://www.fhwa.dot.gov/infrastructure/asstmgmt/casestudies.cfm

Conclusions

- Process: TAMS is more than software
  - Asset management plan or roadmap
  - Data husbandry
  - Adoption of best practices
- Software: need a well-planned, well-integrated, agency-proven, TAMS package
  - Successful implementations not happen by accident
- Focus: manage for success!!!

Acknowledgements

- FHWA (supporter)
- DelDOT (employer)
- Alan Kercher
- Dr. Simon Lewis