**PURPOSE:** The conference intends to provide the opportunity for attendees to share ideas and to build more resilient and effective Departments of Transportation nationwide.

**OBJECTIVES:** In an engaging and creative environment, we will:

- Discuss existing practices and challenges to implementing resiliency
- Learn about successful practices around the country
- Be a part of a larger resiliency effort taking part over the next 12 months in preparation for the 2018 conference
- Develop specific guidance and recommendations for being proactive in DOT resiliency efforts.
- Increase understanding of how efforts can be implemented at DOTs around the nation and develop a more complete understanding of the direct and indirect impacts and costs associated with disaster events by:
  - Understanding responsibilities of DOTs before, during, and after negative events
    - Understanding the life cycle of an adverse event, from advance warning to resumption of normal service and everything in between.
  - Understanding responsibilities of ALL affected departments
  - Identifying multiple response pathways for any disruption quickly and reducing time and resources to attain a state of normality / to progress to further higher stages of operational performance.
Welcome from Paula Hammond & Opening Remarks from Josh DeFlorio
Summarizing Questions to report back to larger group:

• Using your team’s concept of the **phases of an extreme weather event**, which ideas are THE MOST promising for EACH phase?

• What are the MOST promising actions your team feels are **critical to creating a more resilient DOT** that are not linked to a specific phase?
Team One

Phases of an Extreme Weather Event

Policy ➔ Communication ➔ Planning ➔ Design ➔ Sensing/Response ➔ Recovery

COMMUNICATIONS

Communications
Resiliency is Insurance

Success Factors
1. Policy - Explicit statement of Resilience goal
   - We shall - Administration/Governor
2. Communication - Active coordination In/Out Agency
   - Champions/Advocates
   - Inter-State Learning
3. Planning - Prioritization and Vulnerability assessment
   - Environmental - New, how will we implement
   - Develop methodology for risk and Resilience framework
   - Asset Management System
5. Financial Planning - ER Fund plan/methods
6. Resiliency is Insurance
   - Incorporate Climate Change
7. Design - Criteria for recovery
   - Lifecycle costs (not recovery)
8. Recovery - (Post event) - Critical assets open
9. Sensing + Forecasting tools & partners
10. Response (During Event)
    - Continuity of Operations - SHC, materials
    - Emergency Operations
    - Public Communication Before/During/After
    - Internal Comms
    - Agency-wide Emergency Response Plan of Action/Recovery
       - ER training exercises

Team's output reported back to group
Team's working wall
Team Two

ADAPTIVE DESIGN (PRE)
- SYSTEMS IN PLACE (PRE)
- FORMAL DEBRIEFING (LEARNED)
- TRAINING (RESILIENCE) MULITPLE (PRE)
- COMMUNICATIONS (INTERNAL, EXTERNAL) ALL
- PRE-EVENT COORDINATION (PRE)
- STAFF OR PROCESS FOCUS (PRE)

INSTITUTIONAL MEMOY

ANY promising ideas/actions that your team
feels are critical to creating a more resilient
DOT that are NOT linked to a specific phase

COMMUNICATIONS
- LEARNING ORG.
- FINANCIAL MGT.
- STRATEG PLAN.
- RISK ASSET MGT.

THE most interesting/helpful aspect
(or the key learning)
resulting from your small group's discussion

TEAM’S output reported back to group

TEAM’S working wall
Team's output reported back to group  

Team's working wall
Team Four

Your team’s concept of the PHASES OF AN EXTREME WEATHER EVENT

1. Policy/Leadership is Key
2. Long term planning
3. Comprehensive data collection
4. External communication and data
5. External communication and education
6. Disaster coordination
7. Comprehensive data interpretation

Any promising ideas/actions that your team tests are critical to creating a more resilient DOT that are NOT linked to a specific phase.

The most interesting/helpful aspect (or the key learning) resulting from your small group’s discussion:

8. Define policy for risk
9. Fund

Team’s output reported back to group

Team’s working wall

NOTES:

1. PLAN/ADAPT
2. COMMUNICATE
3. PREPARE/RESIST
4. MITIGATE/RESPOND
5. RESTORE/RECOVER

Resilience for Recommendations

- Identify Events
  - Acknowledge Climate Risks
    - Increase # of Resilience
  - More resilient buildings + due to Climate Change
  - Fully implemented
  - Low
  - Need for centralized data + urgent skills to ensure robust climate
  - Data integration into policy
- Facilitate + ensure outreach to communities in + communities
**Team Five**

**Plan/Prepare**

- Assess “Level” of Event & Response
- Response - utilize existing plans/checklists
- Coordination w/in agency & outside other state agencies:
  - Federal agencies, locals

**Post-Event Assessment** - Fold lessons learned back into plans & checklists

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**Technology**

- Predictive analytics
- Data-driven decision making
- Institutional/organization support
  - Integrated into how you do business

**Controlled Failure**

**Land use policies**

---

**Resilience has to be integrated into how you do business**

**Institutional/organizational**

**Phases**

- “Oh Sh*t” phase
- Bring together ops & maintenance staff:
  - They know the trouble spots.
  - Weather events = time to prepare.

**Level of Event**

- Understand both:

**Level of Response**

- Checklists

**Coordination across agency & Govt.**

- Set expectations

- Follow existing plans (conduct exercises)

**Post Event**

- Coordinate w/other agencies to monitor/assess:
  - Predictions? Technology & data, Models & apps
  - Decision making

**Education & Outreach**

- Event preparation:
  - Pagers
  - Public, State legislators, Stakeholders

**Development**

- Population increases

Institutional & DOT
Team Six

Your team's concept of the PHASES OF AN EXTREME WEATHER EVENT:

1. Long-range planning
2. Local planning/development
3. Design/construction
4. Management/ops
5. Leadership
6. Capture knowledge from field (formulate)

- Consistent funding needed
- Leadership
- Niche of preparedness/damage
- Multiple feedback loops
- Capture knowledge from field (formulate)

Leadership needed
- RECOVERY/RESPONSE
- ASSESS
- LEAD PLANNING/DEVELOPMENT
- DESIGN/CONSTRUCTION
- MANAGEMENT/OPERATIONS
- LEADERSHIP
- CAPTURE KNOWLEDGE FROM FIELD

- SIMPLICITY IS KEY
- How can we leverage to enhance resilience?
- How do we think bigger, broader about solutions after recovery?
- Build back the same for CAT-EX?
- FACTORING RESILIENCE IN CORE PLANNING SCENARIO EVENT (OR POSSIBLE)
- LESS: Rethinking rebuilding, after years failures (capacity issues)

Funding consistent: motivating
- Adequate (teammate)

- LEADERSHIP
- Efforts
- Niche of preparedness/damage
- Multiple feedback loops

Team's output reported back to group

Team's working wall
Team Seven

1. Planning + Prep
   - Long-term planning + risk mitigation
   - Short + medium-term prep

2. Storm Prep

3. Weather Ops + Commun

4. Immediate clean-up

5. After-action analysis

ANY promising ideas/actions that your team sees are critical to creating a more resilient DOT that are NOT linked to a specific phase

Integrating climate mitigation into all regular processes - make "business as usual" coordination "know who to call"

Pre-response
   - Establishing streamlined processes for storm response

Leadership Support

- Promote + celebrate work underway
- Integrate resiliency into regular capital planning process
- Understand and treat climate as a risk

Team’s output reported back to group

Team’s working wall
Your team's concept of the PHASES OF AN EXTREME WEATHER EVENT

**Key:** What is your climate science going to be?
- Trends: near term
- Sea level projections
- Precipitation projections
- Other (e.g., wildfire effects)

**Key:** What is your climate science going to be?
- Trends: near term
- Sea level projections
- Precipitation projections
- Other (e.g., wildfire effects)

**Embrace uncertainty - climate isn't stationary!**
- Get resilience costs built into project early
- Identify state-specific models

This backs up engineers - state determines acceptable level of risk.

**Table 8: Planet**

- ID critical corridors
  - Where they cross watersheds/tributaries

**Key:** What is your climate science going to be?
- Trends: near term
- Sea level projections
- Precipitation projections
- Other (e.g., wildfire effects)

**Build/operate**
- Long-range plan
  - Define transp. needs way out
  - What corridors do you "harden"?

- Share with local govt. and state
- Measure via social media, not part of cleanup

**Design**
- Hardware into codes (plus)
  - Design manuals (evolve them!)

- Early on with permitting agencies
  - Inform state

- Individuals who aren't part of cleanup

**Programming**
- Make hard calls on which projects build in resilience at expense of others
  - Early on with permitting agencies

**Planning**
- An event may force us to reassess which items need to harden or not
  - Use event to calibrate your model assumptions

**Team’s output reported back to group**

**Team’s working wall**
Luncheon & Information Sessions
Luncheon

Information Sessions

**Meg Pirkle:** Georgia (efforts to respond to future vulnerabilities)

**Therese McAllister:** Ongoing Resiliency Efforts and Lessons Learned: California (legislation, agency policies)

**Chris Schmidt:** NIST Community Resiliency Framework
Breakout: Critical Factors for DOT Resilience

Summarizing Questions to report back to larger group:

• Understand and align on what is critically important to each of the following four State DOT groups from a resiliency perspective: 1) Budgetary and Policy (leadership); 2) Planning/Environment Group; 3) Engineering Design; 4) Operations/Emergency Response/Maintenance

• The #1 critical thing that feels is the most important thing among all discussed that agencies could do to become more resilient. Why is this the most important?

*** OPTIONAL BONUS OUTPUT: A graphic image which captures the key elements of DOT resiliency to extreme weather events.***
Budgetary and Policy (Leadership)

Institutionalize Resilience into agency:
- workflow
- position decl.
- standards
- etc...

Executive Leadership
Buy-In & Advocacy

Leadership Champions from each discipline

Political/Legislative Support

Buy/Funding/Long Term Benefits

Budgetary and Policy (Leadership)

1) Have a policy
   a) develop
   b) integrate
   c) communicate it

2) Whole Life-cycle cost
   "cost of recovery curve"

3) Avoid underestimating

Policy Mandate

$1

Also:
- Critical success factors + perf, measure
- Life cycle costing + resilience
GHG reduction is goal #1

Incorporate your stock Vulnerability Assessment into NEPA

Vulnerability Assessment:
- Training
- Impact on Envir.
- Coordination w/ Envir. Portranny Agencies
- Asset + Nrg.
- Incorporate into Planning/Program/Project Development Processes

Pre-planning:
Check to ensure the Vulnerability assessment is completed.

Integrate prioritization into projects, early on.

Resiliency is built-in; buy-in with data and all pertinent departments.
(Same page/one goal)

Vulnerability Assessments:
- DATA
- CRITICALITY
Engineering Design

\[ \Delta \text{ the Manual!} \]

\[ \Delta = \text{Change (v)} \]

Engineering Design

Engineers need procedures:
- Science-based
- Repeatable
- Defendable in court
- Design process & integrated scoping (incorporates state-1d'd acceptable risk)
- Lifecycle costing for options

Engineering Design

- Design manual updates (hard to do)
- AASHTO/HTWA/TRB/STATE DOT guidance/research
- Training
- Incorporating into plan/programming/proj dev processes

Engineering Design

- Resiliency should be a part of ALL Phases.
- Incorporated into preliminary designs.
- Bring correct analysis to project; best methods.

Engineering Design

Guidelines for Design
- Flexible design
- Design alternative
Operations/Emergency Response/Maintenance

Proactive Response

Communications!
- These folks know things, connect them to planners.
- Listen to them... or lose them.
- Leverage what you learn from them about past events to prepare for future ones!

- Exercises
- Training
- SOPs and contacts coordination (internal/external)

- Updates to Emergency Response Plan (Coordination internal/external)

Program to incorporate broader resiliency requirements

Prioritize maintenance based on risk

Communication (ALL)

Response plan informed from past events + De-briefings
Best Thing From Team Discussion

Use Resilience as the entry point (lever) for transformation and approach for our transportation system.

Best Thing From Team Discussion

SHARING INFO AMONGST EACH OTHER

Best Thing From Team Discussion

- Leadership/Champion from Each Disciplined
- Incorporate into Planning/Progress/Project Development Process
- Updates to Emergency Response Plan (Coordination Internal/External)

Best Thing From Team Discussion

Integration of Resiliency as part of the culture and daily operations 😊

Best Thing From Team Discussion

Importance of policy mandate
**Budgetary and Policy (Leadership)**

Institutionalize Resilience into agency:
- Workflow
- Postion desk
- Standards
- etc...

**Planning/Environment Team**

1. GHG reduction is goal #1

2. Incorporate your state Vulnerability Assessment into NEPA
<table>
<thead>
<tr>
<th>Engineering Design</th>
<th>Operations/Emergency Response/Maintenance</th>
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Team One

Best Thing From Team Discussion

Use Resilience as the entry point (lever) to transform an approach for our transportation system.
Executive Leadership

Buy-in

& Advocacy

Having a Solid Framework:

Consistent Methodology - Vulnerabilities for Risk

Data

Climate Model
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<th>Team Two</th>
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**Engineering Design**

- Engineers need procedures:
  - Science-based
  - Repeatable
  - Defendable in court
  - Design process & integrated scoping (incorporates state-id'd acceptable risk)
  - Lifecycle costing for options

---

**Operations/Emergency Response/Maintenance**

- Communications!
  - These folks know things. Connect them to planners.
  - Listen to them... or lose them
  - Leverage what you learn from them about past events to prepare for future ones!
Best Thing From Team Discussion

SHARING INFO AMONGST EACH OTHER
**Team Four**

**Budgetary and Policy (Leadership)**
- Leadership/Champions from each discipline
- Political/Legislative support
- ROI/Funding/Long-term benefits

**Planning/Environment Team**
- Vulnerability Assessment
  - Training
  - Impact on Envir.
  - Coordination w/ Envir. Partnering Agencies
- Asset Mgt.
- Incorporate into Planning/Program/Project Development Processes
Team Four

**Engineering Design**

- Design Manual Updates (Hard to do)
- AASHTO/FHWA/TRB/State DOT Guidance/Research
- Training
- Incorporating into Plan/Programming/Project Development Processes

**Operations/Emergency Response/Maintenance**

- Exercises
- Training
- SOPs and Contacts Coordination (Internal/External)
- Updates to Emergency Response Plan (Coordination Internal/External)
Team Four

Best Thing From Team Discussion

- Leadership / Champion From Each Disciplining
- Incorporate into Planning/Program/Project Development Process
- Updates to Emergency Response Plan (Coordination Internal/External)

BONUS GRAPHIC

Working Together Building Resilience
Do It!
Team Four: Wall

**BUDGETARY/POLICY**
- ROI / FUNDING / LONG TERM BENEFITS
- LEADERSHIP
- CHAMPION FROM EACH DISCIPLINE
- POLITICAL / LEGISLATIVE SUPPORT

**PLN/ENV**
- VULNERABILITY ASSESSMENT
- IMPACTS ON ENV
- COORDINATION w/ ENV PARTNER AGENCIES
- ASSET MET
- INTEGRATE INTO PLN/PROGRAMMING/PROJ DEV PROCESSES

**ENGINEERING DESIGN**
- DESIGN MANUALS UPDATES (HARD TOUR)
- AASHTO/FHWA/TRB GUIDANCE / RESEARCH
- STATE DOTS
- INTEGRATE INTO PLN/PROGRAMMING/PROJ DEV PROCESSES
- TRAINING

**OPS/Maintenance/EmergRes**
- SOP CONTACTS
- COORDINATION (INTERNAL / EXTERNAL)
- UPDATES TO EMER RESPONSE PLAN
- COORDINATION INTERNAL & EXTERNAL
- EXERCISES
- TRAINING
Budgetary and Policy (Leadership)

1) Have a policy
   a) develop
   b) integrate
   c) communicate it

2) Whole life cycle cost
   "cost of recovery curve"

3) Avoid underestimating

Planning/Environment Team

Pre-planning:
Check to ensure the vulnerability assessment is completed.

Integrate prioritization into projects, early on.

Resiliency is built-in; buy-in with data and all pertinent departments.
(Same page/one goal).
Team Seven

**Engineering Design**

- Resiliency should be apart of **ALL** Phases.
- Incorporated into preliminary designs.
- Bring correct analysis to project; best methods.

**Operations/Emergency Response/Maintenance**

- Program to incorporate broader resiliency requirements
- Prioritize maintenance based on risk
- Communication (ALL)
Integration of resiliency as part of the culture and daily operations.

Note: Team did not use work wall
**Budgetary and Policy (Leadership)**

- **Policy Mandate**
  - Also:
    - Critical Success Factors + Perf. Measures
    - Life cycle costing + Resilience

**Planning/Environment Team**

- Vulnerability Assessments -
  - Data
  - Criticality
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Best Thing From Team Discussion

Importance of policy mandate

BONUS GRAPHIC

THE MANDATE
1. Budgetary / Policy (Leadership)
   1. add critical success factors / PM's
   2. incorporate resilience in Life-Cycle Cost
   3. policy mandate / impetus for resiliency
      - factor resiliency in capital programming / project budgeting / selection
      - update policies / guidelines for various functions
      - establish criteria for prioritization, allocation and selection

2. Planning / Environment
   - inventory of infrastructure and climate data
   1. vulnerability assessment (feedback to capital programming)
      - natural systems as mitigation strategies
      - role of system / assets in serving community
      - collaboration w/ regulatory agencies
      - co-benefits (transp & environment)

3. Engineering Design
   - Guidelines for Flexible Design
   - Design Alternatives

4. Operations / ER / Maintenance
   - Incorporate in Engineering Design / Planning / Policy
   - Post-event de-Briefing
   1. Response Plan informed by past events
      - Tabletop Exercises
      - Communications
      - Institutional Relations
      - Feedback to Asset Management -> Planning
EXECUTIVE LEADERSHIP CHAMPIONS THE CAUSE

RESILIENCE

COMMUNICATE! ONE VOICE - INTERNALLY AND EXTERNALLY

TOTAL LEADERSHIP BUY-IN FROM PLANNING AND DESIGN

DESIGN RESILIENT INFRASTRUCTURE DOWN THE ROAD

DO RECOVERY IN A FRAMEWORK OF RESILIENCE

PLANNING FOR CLIMATE IMPACTS AND OTHER THREATS

INSTITUTIONALIZE RESILIENCE

CONNECT TO PARTNERS BEFORE, DURING AND AFTER CRISIS

BAKE RESILIENCE INTO EVERYTHING WE DO
Any questions? Contact us!

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