

The Arizona Department of Transportation - Mainstreaming Climate Change and Extreme Weather Resilience



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Transportation Research Board
Conference on Transportation System Resilience to
Climate Change and Extreme Weather

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Arizona DOT Assets

Arizona

140,000 maintenance lane miles

7,800 bridges

1 International border

ADOT

30,000 maintenance lane miles connecting those 140,000

4,700 bridges

10 maintenance and construction districts

1,500 facility buildings

Spread over 114,000 square miles

Our assets operate from sea level to 8,000 feet

Temperatures below 0°F to over 120°F

Arizona DOT Approach

- **ADOT recognizes the critical need to plan and prioritize resources more efficiently to maintain and operate a robust, economically beneficial transportation network. By evaluating and retooling its practices, ADOT strategically addressed and has begun integrating climate and extreme weather risk based strategies into core design, project development, and maintenance and operations activities.**
- **ADOT was one (1) of nineteen (19) second round FHWA climate and extreme weather vulnerability assessment pilot agencies and was instrumental in utilizing the CMIP-5 tool during the project's climate downscaling phase. The results of this effort, found in ADOT's January 2015 Final Report, created the impetus to begin crafting an appropriate implementation process.**

Implementing at the Agency Level

- **ADOT has received recognition for their pioneering approach to large geographic area climate data downscaling, mainstreaming these fledgling activities inside a State DOT, and is developing appropriate, cost effective approaches to these issues.**
- **ADOT also serves along with the Arizona Department of Health Services (AZ DHS) as an early adopter and assessor of these effects and is a statewide collection point for these efforts as they relate to transportation and ADOT's system stakeholders.**
- **ADOT's Director Halikowski chairs the AASHTO Standing Committee on Research and is a member of the Resilient and Sustainable Transportation Systems Steering Committee.**

Implementing at the Agency Level

- **ADOT's mission to provide a safe, efficient, cost effective transportation system can be compromised from the effects of heat extremes, dust storms, wildfires, flooding, landslides, rockfall incidents, and slope failures.**
- **The development of programmatic and project-specific approaches to assessing risk are underway as a subprogram activity within ADOT's Sustainable Transportation Program.**
- **That subprogram, ADOT's Resilience Pilot Program (RPP), was formalized in August 2015. Since ADOT has had a long history considering the balance between predictable asset deterioration curves and the unknown, erratic, and abrupt incidents of flood, overtopping, system hotspots, hydraulic-related failure, and extreme weather impacts, this is the core of the pilot program.**

Implementing at the Agency Level

ADOT's Resilience Pilot Program catalyst

- **Centralize the unknown, erratic, and abrupt incidents of stormwater and its contributors of flooding, overtopping, system hotspots, hydraulic-related failures**
- **Introduce extreme weather adaptation to agency and engineering design processes and establish transportation asset sensitivity to extreme weather**
- **Handle scientifically-informed climate data downscaling as it relates to transportation systems**
- **Incorporate actions into existing planning, design, construction, operations and maintenance criteria**
- **Take advantage of available technologies, tools, and partnerships**

Impacts



Impacts



Impacts

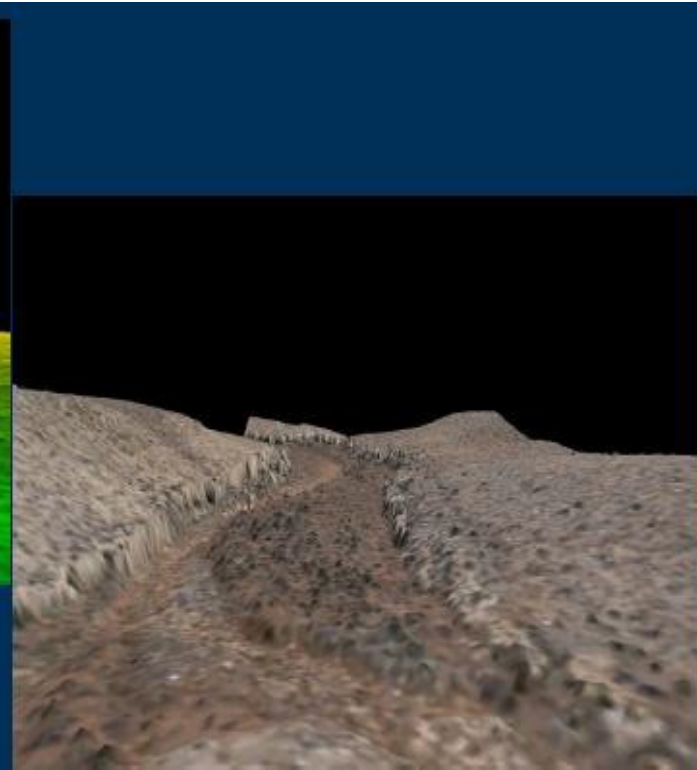
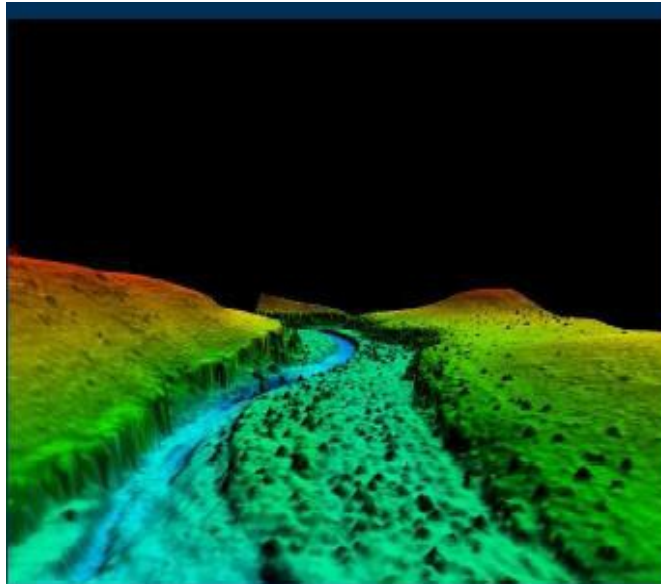


ADOT's RPP – Project Development

- **ADOT issued its Highway Drainage Design Manual - Hydrology in 1993 and it represented a significant advancement in the practice of hydrology for highway drainage design in Arizona. The 2014 update of the Manual - updated, refined, and improved the methods for estimating stormwater runoff, cognizant of the diverse nature of hydrologic conditions in Arizona.**
- **ADOT is currently using the drainage manual update and several flood related asset rehabilitation and replacement projects to facilitate a wider review of project approaches and what tools could be implemented to complement these efforts. The project goal is to reevaluate the entire risk approach for flood related events and ensure that all these aforementioned efforts are happening at one time to optimize an enhanced flood event decision making model.**

ADOT's RPP – Project Development

The driving force behind both the RPP goal of adopting the latest technology, tools, and partnerships, and making sure the pilot effort was not just a spectator sport, was the 18-month development of an ADOT/USGS partnering project. Many state DOTs utilize best in class data available from USGS. However in many instances the data usage tends to be more static.



ADOT's RPP – Project Development

ADOT envisioned, stewarded, received federal funding to: Incorporate USGS Arizona Water Science real-time storm monitoring and data collection, post-storm event monitoring and data collection, and next generation StreamStats and surface water flow data collection capabilities. This effort would directly and meaningfully contribute to expediting and improving ADOT's efforts in planning and responding to incidents of flood, over-topping, system hotspots, hydraulic-related failure, and extreme weather events in connection with 1) NEPA jurisdictional and wetland delineation expediting and streamlining 2) Highway stormwater runoff management 3) Evaluating scour potential and countermeasure development at water crossings 4) Drainage structure siting, design and construction 5) Response to Federal extreme weather regulatory activities.

ADOT's RPP – Planning

INVEST Version 1.2 – Summary of Revisions

- **PD-30: Low Impact Development**
- **PD-31: Infrastructure Resiliency in Planning and Design**

INVEST to Accomplish your Goals

Specifically, the following topics are covered:

- **Advance Better Business Practices**
- **Integrate Sustainability Into Projects and Programs**
- **Improve Education and Understanding of Sustainability**
- **Improve Internal and External Communication and Outreach**
- **INVESTing Time and**
- **Relating INVEST to Other Sustainability Tools**

ADOT's RPP - Maintenance & Operations

ADOT's metrics for gauging performance in maintenance and operations are being developed under ADOT's Level of Service (LOS) resource budget process and the Transportation System Management and Operations (TSMO) effort respectively.

- **ADOT's Phoenix District Pump Station Evaluation Plan - This project will refine assumptions made in developing capital projects.**
- **Healthy Forest Initiative - Ease some weight restrictions in the White Mountains region to aid forest recovery efforts, more than 67 million pounds of timber removed to reduce risk of future wildfires. ADOT partnered with the Arizona State Forestry Division and Eastern Arizona Counties Organization to launch the "Healthy Forest Initiative" to promote healthy forests, improve commerce and protect state infrastructure from devastating wildfires.**

ADOT's RPP – Cascading Effects

July 2015 - Tex Wash on Interstate 10/Approximately a 1,000 yr. event. Huge impact to commerce and public in Arizona. CALTRANS District 8 did a fantastic job getting the mainline up and running and repairs underway.

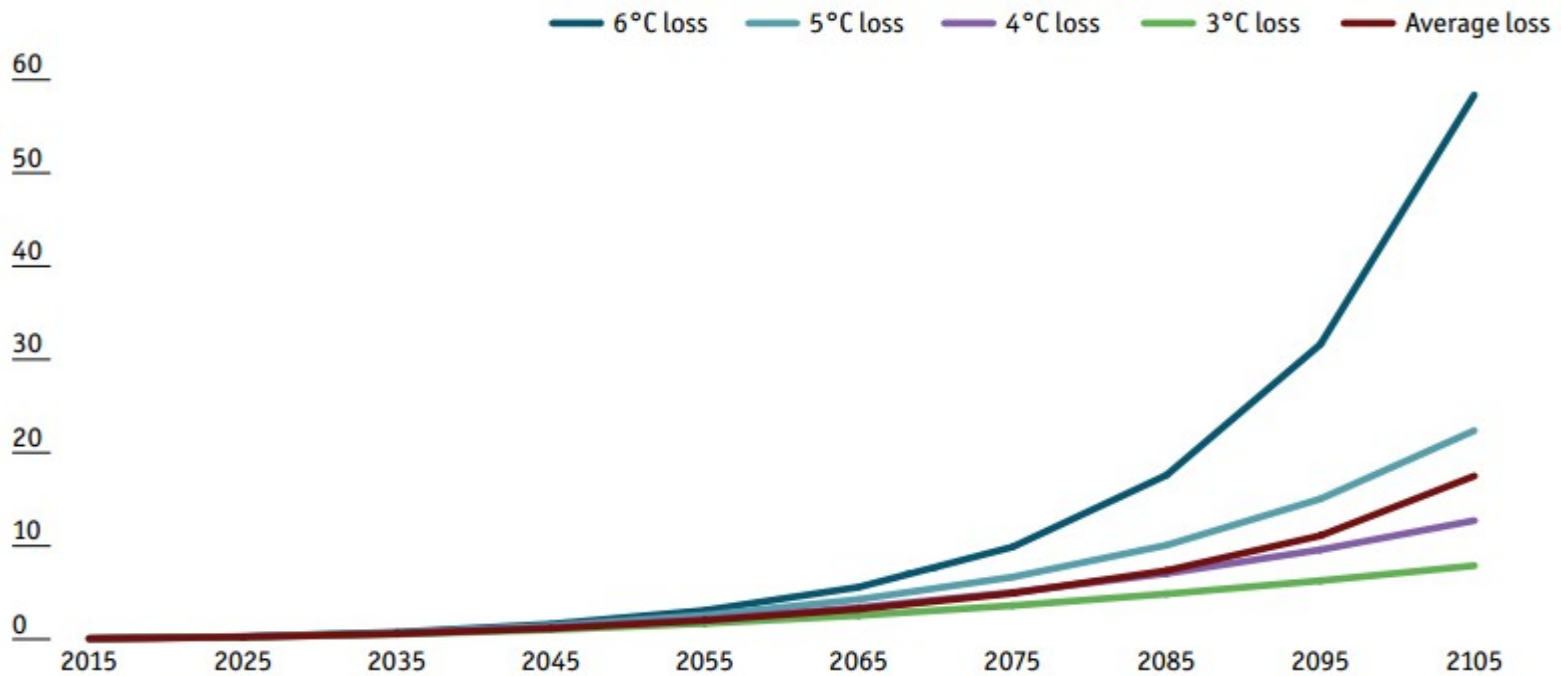


ADOT's RPP – Climate Risk Modeling

The Economist - The cost of inaction: Recognising the value at risk from climate change
Linking the transition from deterministic to probabilistic decision making with Climate Value at Risk (VaR).

Figure 3: Range of expected losses discounted from a government perspective, in accordance with the Stern Review

Present value loss to current manageable assets (trillion \$, 2015 prices)



Source: Vivid Economics.

Questions?

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