FAQ: Emergency Relief Program and Resilience

Q: Can FHWA emergency relief program funds be used to rebuild a damaged highway in a manner that can prevent damage from future extreme weather events?

A: Yes, if consistent with current standards or if it would save the FHWA emergency relief program money over time. (FHWA ER Program Manual p24)

Consistent with current standards

Repaired facilities may be rebuilt to current geometric and construction standards, without being considered a betterment. For example, a repaired length of roadway may have an improved waterway opening that results from following current standards. As another example, a State may be using more current precipitation data from NOAA Atlas 14 rather than an older data set that may have been used when the facility was originally designed. Also, some states now require incorporating information on future conditions into transportation planning and project development processes. For instance, Caltrans requires considering sea level rise in planning of coastal transportation facilities.

Example from Colorado: Improve resilience by bringing up to current standards.

September 2013 flooding in Colorado washed out this stretch of US 36 between Lyons and Estes. The segment was reconstructed to be more resilient to future floods by shifting the road a few feet further from the river onto bedrock, and using grouted riprap and native vegetation to stabilize the riverbank. The work was eligible for and funded with FHWA Emergency Relief funds. It brought the road up to current geometric design standards calling for 6 foot shoulders (pre-flood there were minimal shoulders). Colorado DOT worked in close partnership with the Central Federal Lands Highway Division and the FHWA Colorado Division Office on this project. Photo Credit: CO DOT

Save the FHWA emergency relief program money over time

In general, FHWA emergency relief funds are provided to restore a facility to its pre-disaster condition. However, in some circumstances, restoring the facility to its pre-disaster condition would leave it vulnerable to repeat damage, costing the FHWA emergency relief program more than if the facility had been rebuilt with protective features. In fact, transportation law requires States to consider alternatives for facilities repeatedly requiring repair with FHWA emergency relief funds.[1]

Adding protective features is considered economically justified under the FHWA emergency relief program if:

> Cost of protective feature < probability of damage within facility lifetime * cost of damage that would be incurred by FHWA emergency relief program.

Note that for the economic justification, only costs to the FHWA emergency relief program are included. Other costs, such as cost of traveler delay or reduced economic activity are not included. The State must submit an economic analysis to the FHWA Division office and the Division office must approve it in order for the protective feature to be eligible for FHWA emergency relief funds.

[1] Sec. 1315(b) of Pub. L. 112–141 (MAP-21) as implemented in 23 CFR 667

Examples of betterments that have been approved include:

- raising roadway grades,
- relocating roadways,
- stabilizing slide areas and slopes,
- installing riprap,
- lengthening or raising bridges to increase waterway openings,
- deepening channels,
- increasing the size or number of drainage structures,
- replacing culverts with bridges,
- providing scour countermeasures at bridges, and
- adding spur dikes.

Example from Texas: Economic justification for betterment to improve resilience.

SH 91 at Shawnee Creek, June 2015.
Photo Credit: TxDOT

Replacement structure under construction.
Photo Credit: TxDOT

In 2015, water cresting over the Denison Dam spillway washed away the existing pipe culvert and roadway surface of SH 91 at Shawnee Creek. The culvert has been overtopped multiple times during its lifespan. It was previously washed out during flooding in 1990 and repaired at a cost of $882,000. After the 2015 flooding, Texas DOT conducted life cycle economic analysis of two alternatives – 1) replace in kind; and 2) replace with a bridge.

Alternative 1 entails installing a 80 ft long, 5 – 12 ft diameter barrel Corrugated Metal Pipe (CMP) culvert spaced 4 ft apart. Alternative 2 entails a 305 ft concrete span-bridge to accommodate the historic extreme event (6/1/15) of 90,000 cfs. It also entails raised approach ways to the bridge, heavier columns with tie beams, extensive riprap around the abutments for scour protection, shear key design to secure the superstructure to the substructure during overtopping, and rail that will allow water to pass through.

Alternative 1 (replace in kind) would cost $1.0 million, but likely require replacement approximately every 25 years over the 100 year lifespan. Alternative 2 would cost $1.7 million, but would likely last the full 100 year lifespan, with $152,000 rehabilitation at the 60 year point. The analysis used standard discount and inflation rates to calculate present costs. It found that Alternative 2 would have lower cost over the lifespan.

Based on the analysis, the Texas FHWA Division certified the betterment as economically justified and the cost was covered by the Emergency Relief program. In addition to saving money in reconstruction costs, Alternative 2 also saves $5.9 million in road user delay costs over time.

What if it would not save the FHWA emergency relief program money over time but the State would still like to include additional protective features?

Even if rebuilding the facility would not save the FHWA emergency relief program money over time, a State may still decide to rebuild more resiliently using other funds because it may be cost beneficial from a broader perspective. For instance, adding protective features might prevent disruption to travel and economic activity that carry benefits not included in the more narrow analysis of cost savings to the FHWA emergency relief program alone. States may use their regularly apportioned Federal-aid funds for the incremental cost to protect the asset where the betterment cannot be justified with FHWA emergency relief funds.

Proactive approach carries benefits

Rather than waiting for a disaster to damage a facility, a proactive approach protects the traveling public, prevents damage, and saves money. While the FHWA emergency relief program does not provide funding for a proactive approach, other FHWA programs do. For instance, planning and research funds can be used to conduct a vulnerability assessment and analysis of adaptation options. Regular FHWA program funds can be used for activities to plan, design, and construct highways to adapt to current and future climates and extreme weather events (see memo).

A proactive approach involves the following steps:

1. **Conduct a vulnerability assessment.** Using FHWA's Vulnerability Assessment Framework, determine which assets are most vulnerable and prioritize action.
2. **Integrate into transportation system planning.** Incorporate the results of the vulnerability assessment into the long range transportation plan such that decisions on siting new transportation facilities and allocating funds to rehabilitate or protect assets take into account relative climate risks in addition to other community needs and considerations. For instance, in Tampa, FL the Hillsborough MPO included climate resilience analysis in their transportation plan, identifying adaptation actions that would cost $31 million, but avoid $265 million in losses.
3. **Incorporate into engineering design processes.** When designing new highways or rehabilitating older assets, evaluate future climate impacts on the structures and consider design changes as appropriate. FHWA resources include the 11-step process for transportation facility adaptation assessments, Hydraulic Engineering Circular 25, Vol. 2: Highways in the Coastal Environment: Assessing Extreme Events, and HEC-17: Highways in the Riverine Environment.
4. **Incorporate into asset management.** Incorporate information on vulnerability into asset management in order to include adaptive action in regular maintenance and in rehabilitation of assets. NCHRP25-25(94): Integrating extreme Weather into Transportation Asset Management Plans provides helpful information.

Over the past several years, FHWA has partnered with many DOTs and MPOs to respond proactively by assessing vulnerabilities and analyzing adaptation options (see pilots).

Example from North Carolina: NC 12

Hurricane Irene in 2012 breached this section of Pea Island on the Outer Banks of North Carolina, washing out a segment of NC 12. The breach is in an area known as the "S-Curves" which have a history of ER eligible damages. This area has been repaired eight times since 1998. Replacing the segment in kind was not practical given the severity of the breach. The most practical solution was to build a bridge. A bridge would be consistent with Section 404 permit requirements. Without a bridge, frequent beach nourishment would be required. NCDOT decided to address the long term issues of this area through a longer bridge than required to just bridge the breach. A longer bridge allows for future migration of the breach as well as shore line erosion. The portion of the project that would have been needed to bridge the existing breach was funded by ER: 0.71 miles of the 2.11 mile project (34% of project is ER eligible). The rest of the project was eligible for other federal and state funding. Photo Credit: Tom MacKenzie, US FWS.

Relevant Policy and Guidance

- FHWA Order 5520 - states that it is FHWA policy to integrate consideration of climate and extreme weather risks into its planning, operations, policies and programs.
- Memo: Eligibility of Activities to Adapt - clarifies that FHWA funds can be used for adaptation to changes in climate.
- 23 CFR 667 - requires States to consider alternatives for facilities repeatedly requiring repair with FHWA emergency relief funds.
- Emergency Relief Manual – provides guidance on use of FHWA emergency relief funds, including explaining that emergency relief funds may be used to rebuild damaged facilities to be more resilient to future climate impacts if consistent with current design or if it would save the FHWA emergency relief program money over time.
- FHWA Order 5182.1 – provides procedures for administration of the emergency relief program.
- 23 CFR 515 - requires climate and extreme weather risks in risk-based asset management plans.

> "The FHWA supports planning, designing and constructing highways to adapt to current and future climate and extreme weather events under the Federal-aid program. Features that will improve the resilience of repaired federal aid highways should be considered and evaluated consistent with risk, cost effectiveness and regulatory conditions. The evaluation should apply the best available scientific and economic information to forecast and assess future risk factors." – FHWA Emergency Relief Manual

For more information:

FHWA Emergency Relief Program Website
FHWA Resilience Website

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