A community’s infrastructure consists of publicly and privately owned facilities and buildings that support the community’s general functions and the health, safety, and welfare of its citizens and its economy. It is generally considered to include water supply and wastewater systems (plants and distribution/collection); roads and streets; stormwater and drainage facilities; gas and electric power systems (plants, substations, distribution); public buildings (office buildings, emergency operations centers, fire and emergency medical system stations, police stations, correctional facilities, schools); institutions of higher learning; health care facilities (hospitals, clinics, long-term care); and dams, levees, diversions, and reservoirs. Building and maintaining infrastructure and public buildings represent a significant investment. America’s infrastructure is aging and the costs of maintaining it are rising.

Flood and erosion damage to infrastructure and public buildings can slow a community’s recovery from a disaster in both the short and long terms. Damage can take the form of physical/structural damage and/or the loss of services provided by the infrastructure. The economic impacts of loss of service are difficult to count, but ways must be found to do that. Damage that is eligible for reimbursement under FEMA’s Public Assistance program accounts for a large share of recovery costs. Many costs (both for ineligible facilities and for the local cost-share, which can be considerable in a major disaster) associated with putting infrastructure back online are not eligible for federal assistance.

Congress incorporated into the Stafford Act some incentives for the mitigation of infrastructure and public buildings.

First, Section 404 Hazard Mitigation Grant Program funds originally were authorized to be computed based on certain categories of Public Assistance. Early implementation considered mitigation of public buildings to be a priority.

Second, Section 406(d) specifies a reduction in the amount of Public Assistance provided to public and nonprofit facilities that are insurable under the NFIP but not insured for flood damage. This reduction is equivalent to a “deduction” of $500,000 for a structure and $500,000 for its contents (the maximum coverage available for nonresidential buildings).

Finally, Section 406(b) specifies a reduced federal cost share (to not less than 25%) if a facility damaged more than once in a 10-year period has not been mitigated.

These provisions represent steps in the right direction, but an additional measure would improve the resilience of infrastructure over the long term.

- Public Assistance funds should not be available to communities unless cost-effective mitigation measures are applied to their infrastructure and facilities, including following advisory base flood elevations when they are issued.

**Construction of New Buildings and Infrastructure**

Under the NFIP, communities are required to regulate all development in Special Flood Hazard Areas, including buildings and infrastructure other than buildings. Although the NFIP regulations and ordinances adopted by communities address non-building development, there are few if any technical standards for the design and placement of these components of the infrastructure. In
addition, some states preempt local regulation of certain utilities and regulate them through a public services commission. This situation has resulted in gaps in the flood mitigation measures applied to new infrastructure, which could begin to be remedied through these steps.

- National standards should be developed for the location, design, and construction of infrastructure exposed to flooding, flood-related erosion, and other impacts, including a requirement to consider alternative locations.
- Utility companies that are eligible for Public Assistance should be required to examine flood and flood-related risks in the planning, design, and construction of utility systems.

**Evaluation of Existing Infrastructure and Public Buildings**

All states and many communities have prepared plans to meet the requirements of the Disaster Mitigation Act of 2000, and many others are in the planning stage. These plans may identify specific projects, but usually they lay out broader objectives that support the identification of specific projects when funding becomes available. Damaged infrastructure and public buildings can have long-term adverse consequences, sometimes affecting entire communities, but many mitigation plans have yet to address these vulnerabilities in meaningful ways.

- As a condition of participation in the NFIP, FEMA should require that states and communities identify flood-prone buildings and facilities that are insurable under the NFIP, evaluate the potential for damage, and identify the need for flood insurance.
- FEMA should require that, as part of their mitigation planning, states and localities evaluate the type, nature, and severity of damage to their infrastructure that would qualify for Public Assistance in order to determine if there are feasible and cost-effective mitigation measures to reduce such losses in the future. The measures to be considered should include relocation outside of the Special Flood Hazard Area, change in use, and retrofit floodproofing. Particular attention should be paid to costs associated with public facilities, roads and bridges, public utilities, and parks and recreational facilities. Some projects may be eligible for FEMA mitigation grants.

**Roads, Bridges, and Railroads**

The Federal Highway Administration requires state departments of transportation to comply with NFIP requirements when building and replacing roads and bridges as a condition of receipt of federal funds; local bridges in the federal system (longer than 20 feet) meet the same requirements. New and replacement roads and bridges are to meet certain minimal standards (notably the floodway standard that requires no encroachment that would result in an increase in flood heights), but implementation is not uniform. Many local roads and bridges are built in Special Flood Hazard Areas without due consideration of performance during passage of the base flood. Under E.O. 11988, bridges should not cause an increase in flood elevations, but enforcement of that requirement is uneven and uncertain.

Perhaps the biggest failure to prevent future damage related to roads and bridges occurs in the post-disaster situation on county and local roads. Very few standards are applied to the repairs, including any consideration of reducing the impact on flooding caused by the road or bridge—it is simply replaced in kind in most instances. However, most counties would apply different standards if they were available.
Many local and state officials have similar concerns about railroad embankments, most of which, particularly in rural areas, were built many years ago and act to impede drainage and/or redirect flood waters in ways that exacerbate flooding problems and increase losses. Addressing this problem is difficult, since railroads historically were granted exemptions from many state and local laws. However, there is no reason why railroads should continue to be able to pass adverse impacts on to other entities.

- FEMA and the Department of Transportation should work together to produce guidelines and standards for the replacement of roads and bridges with federal disaster funds.
- FEMA should work with the Department of Transportation (EO 11988 provides the authority) and state highway departments to develop standards for local, county, and state transportation departments to use in post-disaster repair.
- National standards should require that roads, bridges, and railroads are built or rebuilt to avoid or minimize adverse impacts on other property and on natural functions and resources.

**Post-Disaster Recovery**

FEMA’s Public Assistance program generally reimburses local governments for their costs to repair damaged facilities to their pre-damage condition. Under many circumstances, additional funding can be provided for feasible and cost-effective mitigation measures that will reduce future damage and resultant public expenditures. A list of pre-approved measures is maintained, and others may be approved on a case-by-case basis. Although the situation is improving, too few federal Public Assistance inspectors (often contractors) and state Public Assistance inspectors fully understand what constitutes effective mitigation and even fewer communities are aware that mitigation can be accomplished as part of Public Assistance-funded recovery.

- FEMA and state Public Assistance programs should ensure that employees and contractors have the necessary guidance and training to identify, assess, formulate, and approve mitigation measures for public facilities and public infrastructure.
- In their hazard mitigation plans, communities and other eligible entities should be required to identify feasible and cost-effective mitigation measures in advance of damaging floods to expedite the incorporation of those measures into Public Assistance projects and mitigation measures and other recovery activities.
- To obtain Public Assistance funding or mitigation grants, floodprone communities should first be participating in and be compliant with the NFIP.

**Federal Investment in Infrastructure: Executive Order 11988**

Other federal agencies that support construction of new and replacement public facilities and infrastructure should be following the rules they adopted for compliance with EO 11988, but this does not appear to be happening uniformly. This implementation should result in guiding new and
replacement facilities to less hazard-prone areas and to the protection of facilities that are located in flood hazard areas (including protection to the 500-year flood for critical facilities).

Executive Order 11988, Floodplain Management, needs to be reinvigorated and federal agency compliance should be evaluated. More emphasis needs to be placed on avoiding the Special Flood Hazard Area, especially for critical facilities; on protecting facilities to higher-than-minimum requirements to acknowledge consequences of loss of service after a flood; on establishing 500-year protection for critical use facilities; on the avoidance of transferring negative impacts; on compliance mechanisms; and on incorporating future-conditions hydrology in decisionmaking.