

# Setting Performance Goals for Infrastructure

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## Infrastructure

The first step in addressing this topic is to define infrastructure. In the 1980s, the National Council on Public Works Improvement (1988) concentrated on infrastructure in the public sector, such as highways, roads, bridges, airports, public transit, water supply facilities, wastewater treatment facilities, and solid-waste and hazardous-waste services. After 9/11, the number of "critical" infrastructure sectors and key assets listed in the National Infrastructure Protection Plan (DHS, 2006) was expanded to 17. The list includes agriculture and food systems, the defense-industrial base, energy systems, public health and health care facilities, national monuments and icons, banking and finance systems, drinking water systems, chemical facilities, commercial facilities, dams, emergency services, nuclear power systems, information technology systems, telecommunications systems, postal and shipping services, transportation systems, and government facilities.

The proliferation of critical-infrastructure sectors has added complexity to an already complex field. To develop basic principles that govern performance and clarify interactions, it is helpful to focus on a smaller number of sectors based on the concept of a "lifeline system". Lifelines are grouped into six principal systems: electric power, gas and liquid fuels, telecommunications, transportation, waste disposal, and water supply. Taken individually, or in the aggregate, all of these systems are intimately linked with the economic well-being, security, and social fabric of the communities they serve. Moreover, lifelines are especially vulnerable to natural hazards, such as earthquakes, hurricanes, and floods.

It is recommended that ACEHR and NEHRP focus on the six principal lifeline systems. This follows the approach of lifeline earthquake engineering and is consistent with

previous NEHRP activities. Lifelines are a large and essential part of critical infrastructure. Other critical infrastructure that can be seriously affected by earthquakes and other natural hazards are hospitals, schools, and emergency response facilities. We may wish to expand our coverage to include these facilities.

## **Performance Goals**

This is a complex topic, and depends in part on what we intend to address as infrastructure. Generic issues related to all lifelines include public safety, protection of property, business continuity, community impact, social equity, and regional economic consequences.

Resilience of lifelines and infrastructure in general is related to (e.g., Bruneau et al., 2003):

- **Robustness:** the inherent strength or resistance in a system to withstand external demands without degradation or loss of functionality.
- **Redundancy:** system properties that allow for alternate options, choices, and substitutions under stress.
- **Resourcefulness:** the capacity to mobilize needed resources and services in emergencies.
- **Rapidity:** the speed with which disruption can be overcome and safety, services, and financial stability restored.

Lifeline system performance goals are often set according to the inherent strength or resistance in a system to withstand external demands without degradation or loss of functionality and the speed with which disruption can be overcome and safety, services, and financial stability restored. Redundancy and resourcefulness depend on system configuration, emergency planning, and management.

## References

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