



Infrastructure: Disaster and resilience - by Barbara Champoux

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Urban societies depend heavily on the proper functioning of complex infrastructure systems. The convergence of several trends and conditions now pose unprecedented risks for those systems world-wide: Urbanization, which is creating a larger built-environment potentially impacted; growing importance of electricity in supporting modern economic systems; increasing frequency and relative ferocity of natural—and man-made—disasters on a global scale; and dearth of new infrastructure projects, compounded by aging legacy assets.

The consequences of this convergence demonstrates that infrastructure—in developed and developing countries—is highly vulnerable and problems must be addressed to avert disaster.

Critical to Communities

There are three classes of infrastructure: Transportation; energy, communication and utilities systems; and “social” (e.g., healthcare, education and other civic uses). Communities rely on transportation and energy/utility infrastructure systems for carrying out basic social and economic functions, while social infrastructure enables those communities to thrive.

As the world’s largest urban areas rapidly evolve to ‘megacities,’ necessary infrastructure development, revitalization and repair serving those megacities has not kept pace. Contemporaneously, the inadequacies of existing foundational infrastructure have been exposed, as the installed base of global power generation has grown almost 800% over the past 40 years.

The commonality of reasons for inadequate infrastructure globally include: Regulatory impediments; economic distress; maintenance; bureaucratic red tape and indecision; politics and corruption.

While New Yorkers face daily annoyance from increasing infrastructure stress, more serious ramifications are growing ranging from: Stunting economic growth, to undermining global competitiveness; and significant job loss and lack of productivity, to injury and death.

Disaster Strikes

Disasters—both natural and unnatural (e.g., terrorist attacks)—are increasingly common, detrimentally impacting already compromised infrastructure systems relied on by billions of people.

Infrastructure is inexorably intertwined with the economic and social well-being of a community. This

reliance becomes painfully evident when critical infrastructure systems fail during disasters. Because of the network properties of infrastructure and increasing urban density, damage in one location often disrupts service in an extensive geographic area, significantly damaging complex, interdependent social, environmental, and economic systems, and leading to greater losses of life.

Analysis of disaster events commonly reveals:

- A. Inadequacy of critical infrastructure sufficiently resilient to withstand these calamities;
- B. Lack of mitigation strategies by emergency-related organizations, industries, and communities; and
- C. Gridlock arising from competing/overlapping governmental agencies and private companies involved in recovery.

Mitigation & Resiliency

These steps, among others, can be taken to minimize the impact of disasters on critical infrastructure and accelerate recovery, including pursuing an integrated mitigation and resiliency strategy:

Advance planning/preparedness:

- Implement early warning system;
- Perform multi-hazard risk assessment;
- Develop disaster recovery and mitigation plan;
- Regularly update data on likely hazard vulnerabilities; and
- Train personnel in emergency response/evacuation.

Structural/physical measures:

- Avoid development in vulnerable areas;
- Harden critical facilities;
- Deploy backup power systems;
- Enhance coastal and flood protection;
- Improve drainage capacity and storm water runoff;
- Retrofitting;
- Elevate flood-prone structures;
- Buyout programs to acquire flood-prone structures; and
- Convert land to green space.

Non-structural measures:

Strategically use regulatory tools (zoning/land use, setbacks, building codes, LEED standards);
Affordable insurance coverage;
Collaboration across public and private sectors, and among governmental agencies; and
Explore available mitigation grants.

FEMA recently unveiled its National Mitigation Investment Strategy (NMIS), taking a whole-community approach across federal, state, tribal, territorial, and local governments and the private and non-profit sectors, to enhance effective disaster mitigation and recovery resilience by improving coordinated efforts and streamlining effective decision-making, while maintaining appropriate review/standards.

Strategically addressing legal, procedural, physical and communications gaps in disaster preparedness and response, and coordinating interagency, and public/private, actions are critical to successfully achieving resiliency and mitigation and averting a global infrastructure catastrophe.

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