



Hurricane Sandy Disaster Recovery Principles

- **Utilize natural infrastructure as an effective long-term solution to make people, infrastructure and natural systems less vulnerable.** While risk reduction strategies will vary based on location, natural infrastructure can provide a cost effective means of reducing overall risk to infrastructure and people. Utilizing natural infrastructure for climate resilience can include augmenting existing habitats through conservation strategies; protecting and restoring habitats to enhance flood mitigation and ecosystem services; creating new habitat such as oyster reefs and artificial wetlands; and integrating natural systems into hard infrastructure (and vice versa) to provide long-term ecological and climate benefits. In addition to flood control, ecosystems provide many economically beneficial services that support and protect humans and nature such as filtering pollutants, erosion control, production of fish and shellfish, and clean drinking water. Moreover, natural infrastructure has lower maintenance long-term maintenance costs than “grey” infrastructure.
- **Value and protect natural systems as a critical component of infrastructure.** Natural resources provide essential benefits to communities: clean water and air, significant economic activity, and a reduction in the overall damage from a natural disaster. While there are places along the Northeast coast that will need to build hard infrastructure, shorelines hardened by concrete walls, groin fields and other “grey” infrastructure can cause significant harm to valuable natural systems like barrier beaches that reduce the strength of storm surges and tidal marshes that hold flood waters. Unnecessary impacts to natural infrastructure should be avoided.
- **Consider and integrate knowledge of likely future climate impacts when rebuilding infrastructure.** Existing infrastructure that failed and must be rebuilt (e.g. sewage treatment plants flooded in NY and NJ) should be rebuilt with measures in place to reflect future climate risks. Most power plants, hospitals, bridges, roads, sewage treatment plants and other public infrastructure have design lifetimes of decades. The best available science tells us that we should expect further rises in sea level and increasingly intense storms over those same timeframes. The Northeast will also experience more extreme rain events and severe heat waves. These changes should be reflected in the design and siting of rebuilt infrastructure.
- **Anticipate and plan for changes in barrier beaches, dune systems and other natural risk reduction features.** Barrier beaches and dune systems are continuously changing. Major storms such as Sandy and sea level rise can accelerate inland movement and, if not planned for, decrease the ability of these natural features to protect houses, infrastructure and natural systems in flood zones and on or near beaches from wind and wave damage. Deliberate action is required during rebuilding efforts so that building siting and design standards take likely shoreline change and increased exposure into account.

- **Clearly communicate and accurately portray risk and vulnerability.** With increasing coastal development and projections for both stronger coastal storms and increasingly rapid sea level rise, we need to fully understand the future risks and to plan with those in mind. This includes accounting for the impacts of a changing climate –rising sea levels, changing precipitation patterns, increased droughts, and heat waves– and providing up to date information on the status of built infrastructure, natural resources and current vulnerabilities to flooding and storms. This information must be made available in easy to access data, tools and maps to allow state and local officials and private property owners information they need to complete hazard mitigation plans.

- **Empower local governments and communities to address storm risk and vulnerability.** Local governments own much of a community’s infrastructure, ranging from roads and bridges, to landfills and sewage treatment plants. Local governments must have the ability to plan, protect, mitigate, and recover from extreme storms. Federal and state agencies should provide local governments with training, up to date science and data, and decision support tools to properly guide storm related disaster decision making. In particular local communities need to be informed about the full range of solutions to protecting their coastal infrastructure, including the benefits of using natural infrastructure. Such information should inform hazard mitigation and land use plans and local ordinances.