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What Is Geodesign–and Can It Protect Us from Natural Disasters?

By Larry Greenemeier | January 25, 2013

Esri created this fictional rendering of urban redevelopment in Philadelphia using GIS data and 3-D modeling.

As New York, New Jersey and other states hit hard during Superstorm Sandy last fall begin their long road to recovery, the decisions they make on how to rebuild are crucial to determining how well they're weather than next big storm. The choices range from installing large storm-surge sea barriers near Staten Island and at the mouth of New York Harbor to keep rising waters at bay, to cultivating wetlands around the southern tip of Manhattan that can provide a natural buffer.

Both concepts are on the drawing boards and are being fiercely debated on their merits. Although they are radically different, each one takes geographic design into consideration to some degree. Geodesign is an approach to city planning, land use and natural resource management that takes into account the tendency in recent years to overdevelop land at the expense of natural habitats, as well as population growth and climate change, which have left communities increasingly vulnerable to natural disasters.

Geodesign arose thanks largely to the availability of geographic information system (GIS) data. Such data is gathered from maps, aerial photos, satellites and surveys and stored in large databases where it can be analyzed, modeled and queried. Particularly useful is data provided by the Landsat program, a joint initiative between the U.S. Geological Survey and NASA, has been placing satellites in orbit since 1972 to collect GIS data.

"With GIS, we have the tools to understand our landscape and [the] impact of our design decisions," says Tom Fisher, dean of the University of Minnesota's College of Design. As an analytical tool, GIS is more than geographical information—it's a way to visualize weather, climate and demographic data as well, he adds.

Careful study of GIS data—which includes weather data but also takes into account population demographics, land use and a variety of other factors—could uncover clues about the likely intensity and impact of future storms as well as the extent to which zoning decisions can mitigate potential damage, according to Fisher, the emcee and moderator of this week's Geodesign Summit hosted by GIS mapping software maker Esri at the company's Redlands, Calif., headquarters. "This is an issue with Sandy—do we rebuild on the same sites, considering there could be another [major] storm within the next seven or so years? My sense is not that we lack data but that we've lacked the ability to visualize it and apply it to certain places," he adds.

Geodesign is not entirely new, of course. After the1930s Dust Bowl across the over-farmed Great Plains, the U.S. government initiated changes in land cultivation, Fischer says. Federal organizations such as the Civilian Conservation Corps cultivated grass on government-protected lands to keep topsoil in place and retain moisture. They also planted millions of trees from Canada to Texas to block wind gusts and likewise keep soil in place. Farmers were also educated on how to rotate crops, implement soil terracing and use other more sustainable farming methods.

Regardless of how New York and New Jersey decide to rebuild, geodesign projects are already underway nationwide. The city of Asheville, N.C., offers an interactive mapping tool called Priority Places to help local businesses determine where best to put their offices and factories, help urban planners find neighborhoods for renewal projects and help real estate developers make decisions based on population demographics and zoning regulations. In Montana, the Yellowstone Ecological Research Center's data processing and modeling capabilities help biologists and land managers with landscape planning and management of local species and their habitats. Meanwhile, Florida planners are turning to geospatial data that reveals information about the state's population distribution to anticipate the state's needs in 2060, by which time the population is expected to have doubled to 36 million people, placing a heavier burden on already overcrowded urban areas and infrastructure.

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