

## How to make slums more resilient to climate change

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In our rapidly urbanizing world, access to sanitation, transportation, and other essential services remains a challenge for more than a billion people. In the world's poorest and most vulnerable urban communities, finding new ways to meet these day-to-day human needs not only leads to sustainable development, it also fortifies them against the effects of climate-induced disasters.

This week, scientists from the Santa Fe Institute (SFI) and Arizona State University (ASU), together with Slum Dwellers International (SDI), a network of community-based organizations of the urban poor in 33 countries and hundreds of cities and towns worldwide, were selected to tackle a challenge put forth by OpenIDEO's Amplify Program: How might urban slum communities become more resilient to the effects of



climate change?

In the coming decades, climate change is expected to drive more frequent extreme weather events—such as hurricanes, flooding, and droughts—in many parts of the world. Such disasters hit slum dwellers particularly hard because they lack physical accesses to essential services, such as water and sanitation, and to emergency response such as fire protection and health assistance.

The Amplify Program's Urban Resilience Challenge aims to address these issues by providing funding and design support for innovative solutions. The proposal from the SFI-SDI-ASU collaboration was selected from hundreds of submissions as a "winning idea"; it will receive support from the Global Resilience Partnership (which includes The Rockefeller Foundation, the Swedish International Development Cooperation Agency [Sida], and the U.S. Agency for International Development [USAID]).

For many urban slums, the key to resilience may lie in an integrated development approach called "reblocking," a process by which slum communities physically rearrange themselves to create new streets and public spaces that provide accesses to every residence and workplace, facilitating the universal introduction of modern services, and providing each household with a recognized address.

"There are social, economic, and spatial considerations in creating a street network in a neighborhood," says Luís Bettencourt, a professor at the Santa Fe Institute who leads the Institute's Neighborhoods, Slums, and Human Development project together with Professor José Lobo at ASU's School of Sustainability. "Unless you bring them all together in a single platform that everyone can use, it is very difficult to coordinate local communities, create good solutions, and collaborate with their local governments. Technology and design can now help us do this much



better."

"Creating visual digital images for a dialogue within the city and between communities is not a process presently in place," says SDI Chair Sheela Patel. "Enabling slum communities to generate this data, getting internal agreements within their members, and presenting it to cities is of great value to Slum Dwellers International affiliates."

The SFI-SDI-ASU collaboration is developing a digital reblocking platform as an open-source tool that will allow residents to re-plan their communities with the minimum cost and disturbance. The platform allows users to map buildings, thoroughfares, and services within their communities and propose new layouts that most efficiently solve the problem of universal access. They can iterate and edit these suggestions to coordinate community and local government objectives. Quantities such as street length and proximity to existing services provide real-time estimates for how much each street plan will cost. The website OpenReblock.org includes a beta version of these urban planning tools that the project will now improve through better design and collaboration between slum communities, local governments, researchers, and technologists.

"By providing a map that can be iterated to create a well-serviced neighborhood, we ensure that everyone involved is working from a common reference," says Christa Brelsford, an SFI-ASU postdoctoral fellow who has designed the Open Reblock algorithms and is helping develop the platform.

With the new support from the Global Resilience Partnership, the project will create a more dynamic and user-centric design that will enable slum communities to easily generate, analyze, and edit maps for providing access to each place of work and residence, and in this way set neighborhoods on a path of resilient development, as dictated by local



knowledge and needs.

The Urban Resilience Challenge is one of ten innovation challenges under OpenIDEO's Amplify Program that "find and support solutions to some of the world's most pressing development issues." The challenges are a collaboration between the international design group IDEO.org, OpenIDEO, and the Department for International Development.

"The science and the algorithms behind Open Reblock allow you to create potential solutions faster and more systematically," SFI's Bettencourt says, "which we hope will speed up the process of converging on a great design that will more surely improve the lives of people in the neighborhood - according to their own preferences - and their city. It also provides a new perspective on the street plans of neighborhoods in all cities."

Provided by Santa Fe Institute

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