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Strategies for Sustainable Communities: Landscape-Based Landslide Risk Alleviation in Medellín

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Medellín, Colombia

Established: 2010

Lab Leadership: Alejandro Echeverri (Cofounder and Director of URBAM)

Current Lab Structure:
Academic Faculty: 2
Research Staff: 8
Postdoctoral Researchers: 2
Graduate-Level Students: 33
Visiting Faculty and Students: 4

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Context

Medellín is Colombia's second largest city. After being globally infamous for violence and a drug crisis during the 1980s and 90s, the city has, over the past decade, become an icon for urban transformation. One particular case of interest within the Medellín transformation has to do with the strategy of social urbanism, that is, integral interventions targeted at locations affected by significant degrees of informal construction and settlement and violence.

This alternative approach is led by an interdisciplinary team codirected by Alejandro Echeverri, head of URBAM, and Christian Werthmann of the Landscape, Architecture, and Design Department at Leibniz University of Hannover, Germany. Funding support is provided by the city of Medellin within the research project Rehabitar la Montaña (Echeverri et al. 2013).

Research Question

Urban population growth has been considerable during the last five decades in Medellín. It has varied between a 1% and 3% yearly growth rate, mostly characterized by internal migration due to violence and internal displacement (Echeverri and Orsini 2011). A significant proportion of this growth has occurred outside of the official growth boundary established by the city and in areas with significant landslide risk.

This solid trend is expected to continue, as explained by Echeverri et al.: "Since 1996, thousands of new houses have been built outside of the growth boundary and concluded that by 2030, an estimated 70,000 persons would settle in precarious sites around the valley, many in sites that are exposed to ever-higher geological risk, and much of this outside the updated growth boundary" (2012, 43). Deaths from landslide events in unplanned informal settlements are also expected to increase. This applies specifically when three conditions are met: the availability of a topographical relief upon which a landslide might occur, human habitation, and a landslide trigger. This trigger is almost always associated with soil saturation, most often following a period of heavy rain, as soil saturation can dramatically lower the coefficient of friction in a mass of earth (Petley 2012). However, it can also include human interventions in areas vulnerable to landslides. An analysis of the four worst landslides in Medellín, as measured by the number of fatalities, found that in addition to the presence of natural risk factors, all four also had a strong human-induced trigger associated with the disaster, such as the overflow and blockage of a drainage channel (Echeverri et al. 2012).

Research Methodology

Since previous efforts led by the city of Medellín in these hazardous and informal occupation sites have not been sufficiently successful in alleviating risk, the research team developed an alternative approach based on previous lessons derived from the strategy of social urbanism. Whereas most of the focus within social urbanism has been placed on formerly peripheral and informal settlements already advanced in their consolidation, the focus for this landslide risk approach was on informal high-risk sites, usually located in close proximity to the urban growth boundary, high up in the slopes of the Andean mountain range.

A community and landscape-based tool was designed to alleviate landslide risk in this context to suggest alternative solutions to the specific conditions at the neighborhood level within a framework of anticipation and mitigation possibilities. The tool facilitates direct collaboration with local community leaders in selecting potential pathways from an array of suitable tactics to tackle risk. The tool was designed after (1) examining the problem at the metropolitan scale, making use of extensive site analysis via municipal GIS data, digital elevation models, and aerial photographs; and (2) examining two specific neighborhoods, La Cruz and La Honda, which were selected due to their location, relief factor, and landslide risk.

In all cases, the tool privileges strategies to reduce social and physical vulnerability in informal settlements that are (1) low-cost; (2) easy to implement without extensive technical expertise; (3) scalable; and (4) that provide clear incentives (often financial) for nearby residents to implement and sustain the process.

Throughout the entirety of the process, close collaboration between experts and community actors is the primary principle in establishing a practical framework to turn theory into action. This goes as far as inviting members of the community to join this and other urban projects led by URBAM as participants and to enroll as students in the master's program led by the same institute. This detail is of major importance, since it is the crucial condition that allows for the closed-loop collaboration to attain long-term sustainability and presence in territories with significant degrees of informal construction and settlement.

Key Research Insights

In the context of anticipation and mitigation objectives, the project identified a number of landscape-based strategies that could be implemented in conjunction with the residents in order to both manage risk and improve residents' lives. The team focused on community-based approaches that could be coupled with more orthodox engineering approaches, as required.

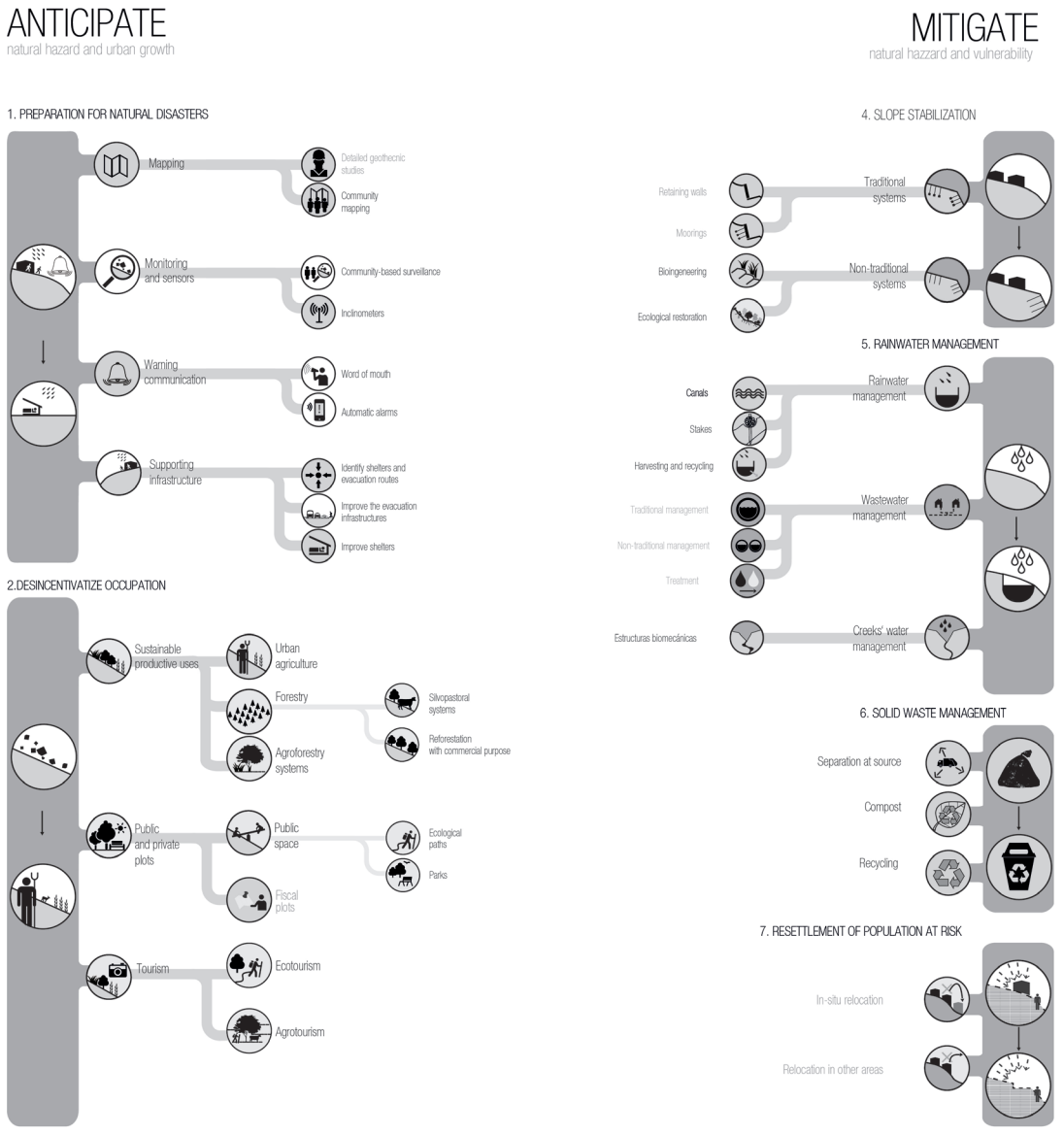
Strategies intended to mitigate the existing risk recognize that the underlying geology could never allow for complete elimination of landslide threat on slopes with characteristics like those found in Medellín. Nevertheless, simple measures to stabilize surface soil conditions (such as better management of stormwater, slope forestation, and micro-farming) could significantly reduce landslide triggers. Similarly, well-designed and well-communicated early warning systems to monitor risk conditions could allow for safe evacuation before disasters happen.

On the other hand, strategies to anticipate future growth are focused on long-term collaboration with communities. The research found that a relatively small early investment by the city to prevent the occupation of dangerous sites today would mean significant savings in the future, especially if such coordination is done in close collaboration with existing communities before future growth happens (Claghorn et al. 2016).

The next phase includes testing these strategies via a pilot project implementation. Through monitoring pilot projects in the coming years, the team hopes to answer questions regarding the technical and social implementation of low-cost, low-tech, community- and landscape-based strategies to manage risk in informal settlements, with the potential of high replicability in the Global South.

◁ Figure 1. (Previous Page) Boundaries and landslides in human settlements. (Credit: Echeverri et al. 2012)

▷ Figure 2. Process diagram for mitigation and anticipation. (Credit: Echeverri et al. 2012).



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Alejandro Echeverri is the Director and Cofounder of URBAM, the Center for Urban and Environmental Studies, at EAFIT University. His experience combines architectural, urban, and environmental projects with planning. As the Director of Urban Projects of Medellín (2004–2008), he led the social urbanism strategy to improve the most impoverished neighborhoods, making the city a blueprint for the future for other distressed cities worldwide. Echeverri is a Harvard Loeb Fellow and the 2016 recipient of the Obayashi Prize.

Carlos Cadena-Gaitán serves as the Academic Coordinator at URBAM, the Centre for Urban and Environmental Studies at EAFIT University. He obtained his PhD at the University of Maastricht-United Nations University in 2014. Cadena-Gaitán is a yoga student, teacher, researcher, activist, and urban cyclist.