



# CLIMATE CHANGE ADAPTATION IN INFORMAL SETTINGS

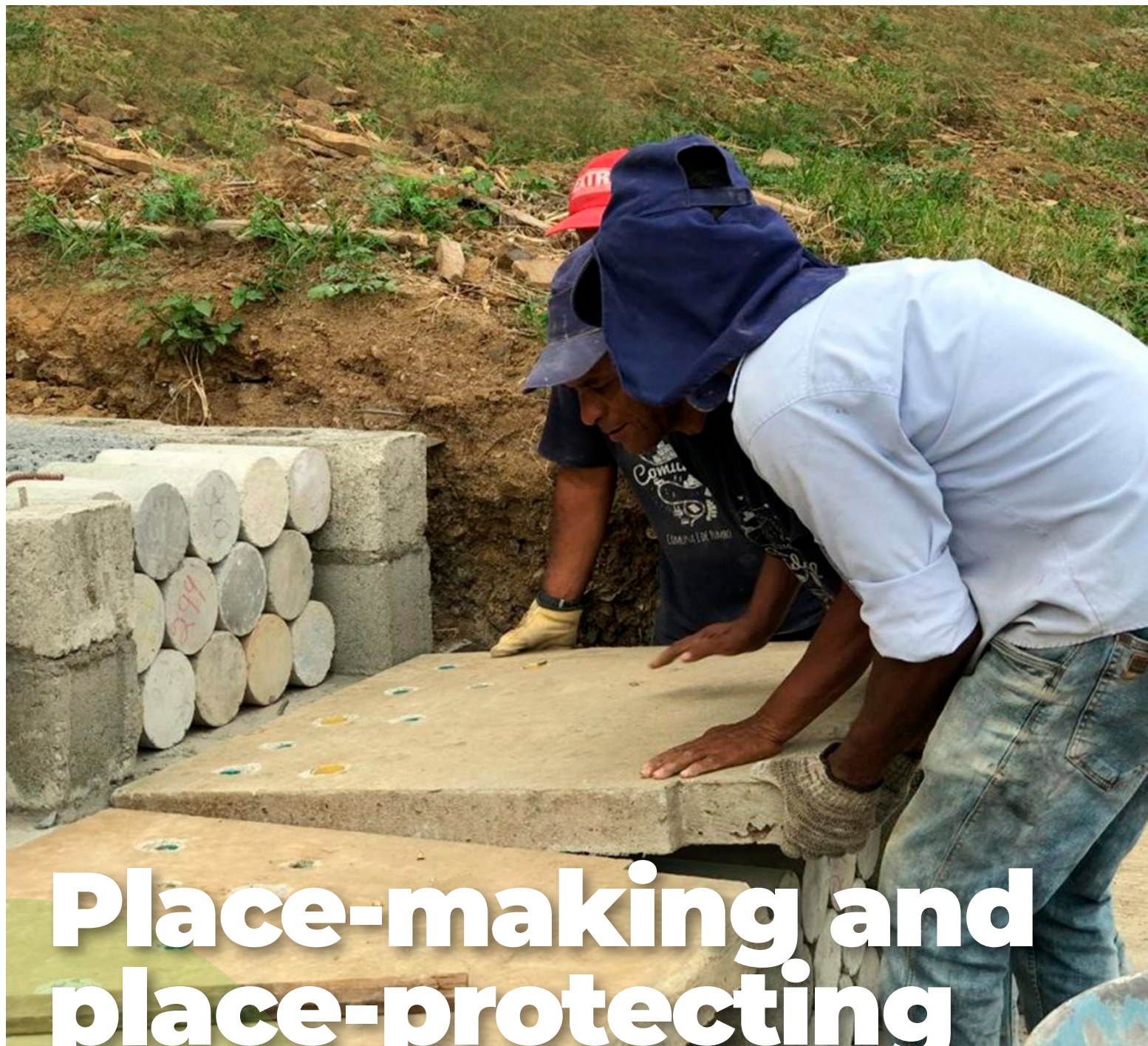
Understanding and Reinforcing Bottom-Up Initiatives in Latin America  
and the Caribbean



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# Place-making and place-protecting

A LOW-COST DRAINAGE SYSTEM FOR A PARK IN YUMBO, COLOMBIA

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Fig. 1. Construction of the Sustainable Urban Drainage System. Photo: Christian Camilo Villa (2019).

## General information

Sponsor Institution	Universidad del Valle
Partner organisations	Yumbo Municipality
Developed by	ADAPTO-Yumbo and community
University researchers	Adriana Patricia López-Valencia and Oswaldo López-Bernal
University students (ADAPTO-Chile)	Carolina Polo Garzón, Nathalia Guerrero, Laura Ávila, Camilo Villa, Karolina Vidal, Camila Soto, Jennifer Chávez, Catalina Becerra, Maricel Isaza
Community leaders and community members	Jaime Osma, Nicolai Paz, Angelica Trejos, Clementina Hernández, Viviana Pérez, Claudia Pérez, Maricela Herrera, Salvador López
Other participants	Duver Alarcón, Laura Ramos
Micro-project location	Colombia, Valle del Cauca, Yumbo, Barrio Las Américas
Micro-project date	05/2017 – 05/2020
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## Summary

The Sustainable Urban Drainage System (SUDS) initiative has developed a pilot system of stormwater infrastructure for a park in Las Américas neighbourhood, in Yumbo, Colombia.

The SUDS filters and drains the upstream rainwater and redirects the runoff to protect the communities living downstream during heavy rainfalls. The system uses simple and low-cost construction techniques. It mitigates slope movements, flash flooding, and erosion—all recurrent problems in Yumbo. The prototype was built on land donated by a private company, in an area where flooding is a recurrent problem.

The project was implemented with the participation of the local community and was co-managed by the government, a community action group, members of academia, and the private sector. Important activities included participatory design workshops, recreational events for the community, and trainings on community leadership.

This initiative can be replicated to improve risk reduction in other informal neighbourhoods in the region.

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# Description

The micro-project arose from local leaders' efforts to convert a piece of land donated by a private company into a park. The new park is located in the Las Américas neighbourhood of Comuna 1, a settlement of 3,200 people located on La Estancia hill in Yumbo, Colombia. However, recurrent flooding and landslides make the area along the hill unsafe for recreational activities. The risks are namely caused by rainfalls of increasing frequency and intensity, by growing urbanization on the hills, and by the lack of infrastructure upstream.

The collection of water and urban runoff is usually managed by traditional grey infrastructure sanitation systems located downstream. However, seasonal heavy rainfalls overwhelm the water system and exceed its capacity to effectively regulate and channel rainfall water to rivers. Due to the impermeability of the surfaces and the lack of infrastructure, excess water flows down uncontrollably at high speeds. As the grounds become saturated with water, landslides begin to form. This phenomenon causes damage to the houses located downstream and injuries to the people living in them, and overwhelms the capacity of infrastructure existing downriver to adequately retain rainwater or channel it to surface water bodies.

In response, the micro-project has aimed to test a low-cost experimental solution to flood risk in the new park. The alternative infrastructure could also be implemented in other parts of the city. The pilot Sustainable Urban Drainage System (SUDS) comprises 16 modules (Figs. 1, 2, 4, 5 and 6). Each module consists of two perforated concrete covers of 1 m x 90 cm, six side walls made of cement blocks, seven 30 cm x 15 cm concrete cylinders, perforated mesh, and gravel.

The modules filter rainwater, which is then retained and directed to a filtering trench and storm tank made from beer or gasoline tanks. Water is deposited in these baskets and retained for later use, preventing surface collapse during increased water flow, and reducing the speed of absorption. Each module functions independently and can also be joined to other modules to form an efficient flooding barrier with a customizable length. The design and construction process for these modules also had community objectives, beyond the testing of a technical solution.

First, the micro-project aimed to provide an opportunity for residents could learn simple and low-cost construction techniques to solve water-related problems on hillside communities.

The initiative created a learning space where residents were able to learn about self-management of resources for community-led projects on climate change in urban spaces. Second, the construction process prompted the organization of hands-on recreational gatherings onsite, with a view to sustaining the high level of community involvement in the initiative. For 39 days over the course of an 18 month-long period, the community actively participated in the construction and design of the park infrastructure as well as in the management of its resources.

Activities included weekly planning committees, biweekly recreational activities, guided tours by leaders with students and visitors (aimed at generating and discussing ideas), and technical meetings with public and private actors to support the different phases of the project (e.g., generating permits). In support of the initiative, the university provided training to the community leaders on filtration, infiltration, and treatment of rainwater, as well as on other related environmental issues such as recycling and solid waste management.

These various activities made the process more enjoyable and increased the entire community's involvement in the construction process, generating a sense of belonging to the new place. Moreover, the involvement of some community members made it possible to develop a better design for the park. For instance, one of the leaders, who himself uses a wheelchair, highlighted issues that are often overlooked in public space design despite existing norms. It is thanks to him that the park is now universally accessible.

Creative ways of saving resources, such as merging several functions into one infrastructure, were also put forward. The SUDS, for example, also serve as benches for the spectators of the nearby multiuse court. In addition to the infrastructure work, the researchers started working on technical and construction guidelines for the SUDS.



## Implementation and evolution of the initiative

The Universidad del Valle has 15 years of experience working with the community of Comuna 1 in Yumbo. Previous activities include yearly academic workshops on community assessments, collaborative proposals for urban interventions, and participation in the territorial planning process. For the creation of the park, the Universidad del Valle held 26 participatory workshops in the first phases (see phases 1 to 3, Fig. 3). During these workshops, community participants agreed on the need for a collective space, on the interventions required for the creation of the park in Las Américas, and on the key principles for the planning and management of financial resources. These principles include collaboration between the community and private and public actors, as a means of creating economies of scale. The university facilitated the management and implementation of the first experimental interventions, including this micro-project, while government actors and private companies managed the following activities to complete the entire project as planned with the community.

For the implementation of the first SUDS, community leaders—mostly women—formed an “El Poli” action committee to plan and define roles and responsibilities for design changes, resource management, and construction activities. The committee also organized peripheral and recreational activities on weekends to maintain the interest and motivation of neighbourhood residents. A group of professors and students collaborated with the community on solutions for water management and control in urban environments. In the process and in response to the community’s concern on the subject, the university provided training to community leaders on filtration, infiltration, and treatment of rainwater as well as other related environmental issues. The community, the Universidad del Valle, the Municipal Council, and Cementos Argos jointly completed the legal procedures for the transfer of the property, establishing a space of trust between actors and securing the project’s technical and legal viability. The process was however hampered by disagreements and delays. The woman steering the committee faced pushback and aggressive confrontations on ideological and political grounds. Feeling threatened, she withdrew from the project.

Her departure put the project at risk (see Fig. 3, phase 4). For some time, no one wanted to assume a leadership role, for fear of receiving the same threats. It was only after some time that a man from the community agreed to take over. In addition, the project faced several delays, as the Mayor’s Office deferred resources and permits and as the academic technical team took more time to complete technical drawings. These delays affected the progress of the activities, the community’s motivation, and the credibility of the governmental partners, as it took a lot more time than expected to see tangible results.

These challenges were resolved and the community’s interest and confidence in the project were recovered thanks to three developments: the intervention of Antioquia Presente, a community-based organization specialized in community empowerment; the organizers gaining their much-awaited access to ADAPTO resources; and the delivery of municipal permits. Together, these changes made it possible for the construction of the park to begin (see phases 6 and 7, Fig. 3). The participation of Antioquia Presente was fundamental at this stage. A social worker from Antioquia Presente developed a stakeholder table exercise in which participants (from the community, academia, public and private organizations, and government) identified their roles, responsibilities, and commitments regarding the project. The organization also implemented a communication plan to increase the participation of neighbourhood residents and to invite new community actors to join. During the construction process, information about the project and invitations to engage were disseminated on social networks, during weekend activities with neighbours, on the local radio station, in door-to-door conversations with residents, and in brochures distributed in the busiest areas of the neighbourhood as well as at the community development centre. During this stage, additional resources from private companies from Yumbo’s Alianza Empresarial (Business Alliance) allowed for the implementation of more complex elements and the adoption of new techniques, resulting in improved project quality. The SUDS was built, and a technical evaluation is underway to assess its efficiency in reducing flood risks.



# Stakeholder participation

The main stakeholders are the professors and students of the Universidad del Valle, who are in charge of research, dissemination, and project management; and El Poli, the action committee of the Las Américas neighbourhood, which was in charge of generating ideas, assessing needs, and consolidating the proposal. The roles of the community members were diverse. Several actors provided the contacts, resources, and spaces necessary for the development of the project. Women provided fundamental support, particularly at the beginning of the process. They managed the property to prevent encroaching and encouraged community participation in design and resource management. They also facilitated the legal process of registering the land donated to the municipality by Cementos Argos for exclusive use as a park. Women also gave the university access to earlier studies and information about previous projects in the area, and

established contacts with key actors. As previously explained, men later took on more prominent roles due to social tensions in the community. Women nevertheless continued to participate in the initiative. While their contributions were perhaps less visible, they remained very significant.

The private sector also contributed significantly to the project. In addition to donating the land, Cementos Argos provided cement. The Business Alliance paid for other construction materials and helped finance the recreational activities and workshops. The local government contributed to the construction process and proposal consolidation by authorizing the construction of the infrastructure in the newly acquired park. It also approved the use of specialized heavy machinery and the employment of skilled workers from the municipality.



Fig. 2. Construction of the pilot SUDS. Photo: Adriana Patricia López-Valencia.

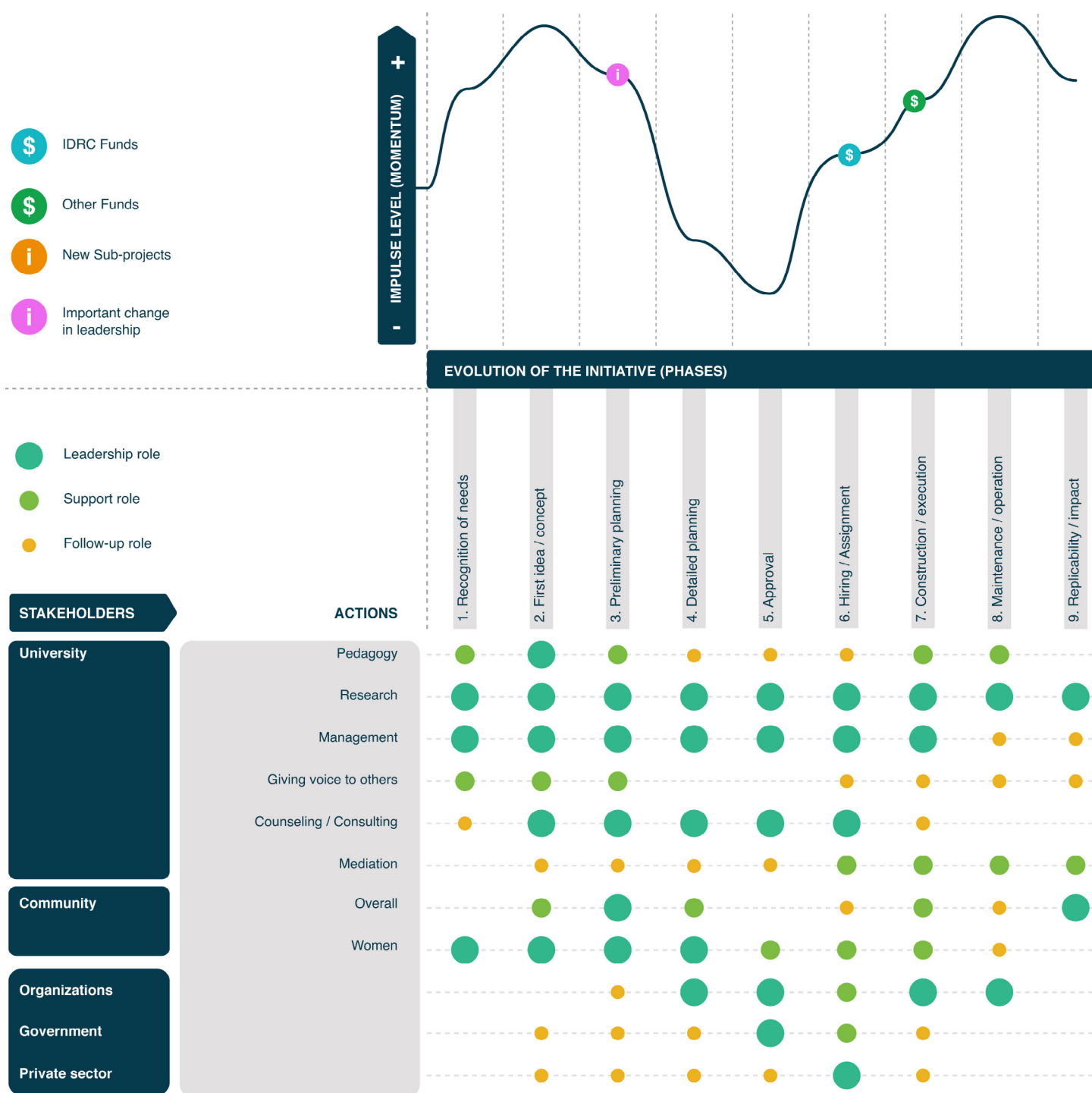


Fig. 3. Development and stakeholder participation of the Initiative.



## Results

1

Designed the Sustainable Urban Drainage System (SUDS), a low-cost infrastructure system to reduce flood risks during intense rainfalls.

2

Constructed a pilot of the SUDS, a 16-module drainage system that also serves as a grandstand, with the possibility for 20 more modules to be added when the soil study is provided by the municipality.

3

Integrated universal access for people with reduced mobility.

4

Delivered workshops and training sessions for 14 community leaders on filtration, infiltration, and treatment of rainwater, as well as on other related environmental issues such as recycling and solid waste management.

5

Published technical drawings and construction guidelines in the form of a "do-it-yourself" card for residents and other stakeholders, to be used toward the expansion of the pilot drainage system in the park and its replication in other parts of the city.



Fig. 4. Construction of the pilot SUDS. Photo: Adriana Patricia López-Valencia.

## Lessons learned

The leading role played by the university made it difficult for the community to take ownership of the management process. In the early stages, community actors did not understand their roles in the partnership or the activities. This misunderstanding probably contributed to the leadership contestations that later ensued. A lesson learned is the need to maintain open and concrete dialogue between micro-project participants. It is important that each actor is clear on their role in the process and that there is fluid communication between the various participants, so that the proposed activities can be developed without setbacks resulting from communication failures. As part of the process developed for this project, the barriers and problems caused by lack of communication were identified and overcome through management workshops and

worktables. These activities, which were developed by Antioquia Presente, helped us better face the social concerns and better capture the community dynamics underlying this type of project.

The consolidation of multiple project ideas into one initiative also played an important role during the project's implementation, as it made it easier for the community to take ownership of the space and its management processes. The SUDS not only reduces flood risk, but also serves as a recreational and social infrastructure. The enormous level of community organization made it possible to access additional resources and showed the power of mobilizing a community in a multidimensional project.



Fig. 5. Perforated covers for filtering rainwater in the modules. Photo: Nathalia Guerrero (2019).



Fig. 6. Assembly process for the modules' perforated covers. Photo: Laura Avila (2019).





Fig. 7. Las Américas neighborhood. Photo: ADAPTO-Yumbo.

## Future work and replicability

The researchers from the Universidad del Valle are evaluating the efficiency of the prototype. If they find positive results, it is expected that the municipality and the community will soon agree to finalize the SUDS of Las Américas Park based on this micro-project. If this is the case, they will manage the remaining infrastructure projects with private companies and relevant institutions. The neighbourhood committee is spearheading this task and has the technical plans

to continue the process. The committee also initiated meetings with key actors, who are managing resources for the community's next interventions, such as a multi-use court and other recreation spaces.

The SUDS model is also replicable in a “do-it-yourself” mode. It is hoped that the information kit that will be distributed to residents will encourage them to continue to install the SUDS in other areas at risk.



Fig. 8. Assembly process for the modules' perforated covers. Photo: Laura Avila (2019).