



RESILIENCE OR RESISTANCE?

NEGOTIATED MITIGATION OF LANDSLIDE RISKS IN INFORMAL SETTLEMENTS IN
MEDELLÍN

SYNTHESIS REPORT



SUMMARY

RESILIENCE OR RESISTANCE? NEGOTIATED MITIGATION OF LANDSLIDE RISKS IN INFORMAL SETTLEMENTS IN MEDELLÍN

This project has explored, and has developed, a way of working with vulnerable communities in informal settlements in Colombia, with the aim of empowering these communities to reduce the risk of landslide which they face on the steep slopes where they make their homes. It has explored how to empower these communities by helping them to understand the existing hazards and risks; by creating a system for monitoring landslide hazards, in which the community participates by way of community researchers using social media; by carrying out low-cost emergency mitigation work using community self-build (focussed on the proper management of rainwater); and, crucially, by facilitating a dialogue between the community and local government organisations to agree the division of responsibilities and to establish joint strategies for the mitigation of landslide risks.

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In collaboration with:

The community Pinares de Oriente; Mesa de Vivienda y Servicios Públicos de la Comuna 8; Servicios Públicos Domicilarios de la Comuna 8 and; Mesa de Desplazados de la Comuna 8.

OVERVIEW

This project recognises that there is a continuing urbanisation process that drives the growth of informal settlements in areas exposed to both natural and man-made hazards, increasing the risk particularly among low-income populations, and raising the need to improve the capacity for recovery in these communities. Simultaneously, there is a growing recognition of the importance of risk management as an alternative to (or in addition to) disaster management. Approaches for reducing the vulnerability and improving the resilience to landslides include land use plans, good construction practices, early alert systems, community preparedness, awareness-raising campaigns, measures for sharing and transferring the risk, and physical protection barriers (Nadim and Lacasse, 2008).

The research for this project was carried out in Medellín, Colombia, which has witnessed the growth of informal settlements on hillsides with steep slopes, and the resulting increase in exposure to hazards, vulnerability and risk. The threats facing the inhabitants of these poor settlements became evident in 1987, when more than 500 people died in a landslide in Villatina, an informal settlement with areas of land invasion located in Comuna 8 in Medellín (Coupé, Arboleda and García, 2007; Coupé, 2011). This fact contributed substantially to the total estimated number of 784 low-income residents who have died because of landslides in Medellín during the last 80 years (URBAM and Harvard Design School, 2012). However, despite awareness of the risk being raised by this event, and the arguments used by the city administration to relocate certain areas of informal settlements, based on geological studies, the residents resist relocation and argue that the local government has other motives. Such confrontations are based on a mixture of factors, including the fear of elimination of existing social networks and sources of livelihood; distrust of institutions, fuelled by the perception of a double standard since certain ‘formal’ buildings are permitted on the slopes (UVAs and Libraries, for example); the priority given to other demands for infrastructure and services; and, possibly, the influence of the armed groups that are behind much of the informal land allocation.

Therefore, the project presented here was proposed to explore the possibilities and acceptability of strategies for the reduction of landslide risk in informal settlements, from the community and state perspectives; to understand the obstacles to that acceptability and the reasons why these barriers arise; and to identify alternatives that are viable from a practical and political point of view, within a broader and more complex context of social and physical risk.

This aim has been met through activities that address three interconnected objectives:

OBJECTIVE 1:

- To explore the perceptions of risk and related narratives within the community and among the relevant public-sector organisations, and the consequences of these perceptions and narratives for the adoption of risk mitigation strategies and actions.

OBJECTIVE 2:

- To use small pilot projects to trial self-managed techniques (managed by the community) for the monitoring and mitigation of landslide risks in informal settlements, which can be developed on a broader scale through community researchers and trainers, and which focus respectively on the community and the individual home.

OBJECTIVE 3:

- Through a collaborative process, to identify ways and mechanisms to develop a sustainable process of co-creation of a risk mitigation strategy, and its implementation, by agreement between the communities of the informal settlements and relevant state organisations at different scales, based on the lessons learned from the activities carried out to meet objectives 1 and 2.

The activities developed to reach these objectives were centred in a neighbourhood located in the upper part of the Central-Eastern area of Medellín, in Comuna 8, called Pinares de Oriente. It is located between 1,738 and 1,824 metres above sea level, covers 1.52 hectares, and is inhabited by 180 families – approximately 800 inhabitants – 80% of whom are victims of the internal social and armed conflict that Colombia has gone through. According to the Municipal Land Use Plan, part of the Pinares neighbourhood is on urban expansion land identified for integrated upgrading; and part is outside the urban perimeter, i.e. on rural land. The La Loquita 1 ravine crosses the settlement, but only carries water in periods of heavy rain. The local authority has identified in the neighbourhood an area of no risk in the lower part, an area of mitigatable risk, and a non-recoverable area of high risk, which is also the area outside of the urban perimeter, where approximately 70 families are located.

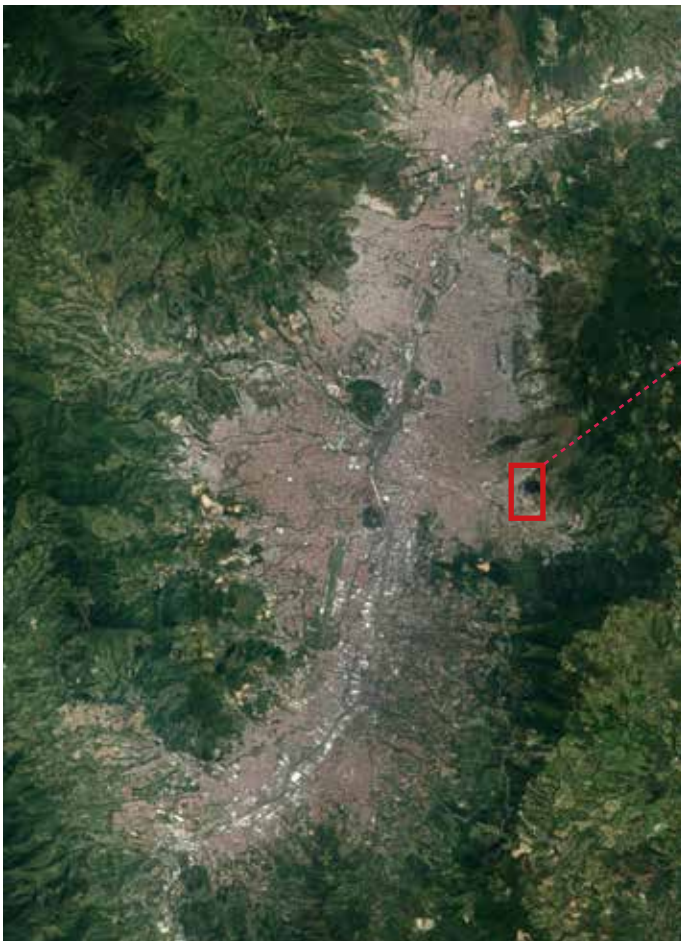


Figure 1: Aerial image of Medellín. The Pinares de Oriente neighbourhood within the Comuna 8 is highlighted in red. *Source: Google Maps.*



Figure 2: Aerial image of the Pinares de Oriente neighbourhood within the Comuna 8. *Source: Google Maps.*



SECTION 1: PERCEPTIONS AND NARRATIVES

PROBLEM AND WHY IT MATTERS

The daily experience of landslides in low-income neighbourhoods located on steep slopes in the peri-urban area of Medellín does not slow the increase in the number of people exposed to these hazards. This resembles the problems faced by similar settlements in other cities of Latin America and the rest of the world, which have also experienced certain incidents that were particularly tragic because of their magnitude.

This project starts with the hypothesis that part of the problem lies in the perceptions that exist around landslide hazards, and around the vulnerability of the inhabitants of these neighbourhoods. The possible lack of awareness among the residents of landslide hazards, and how to reduce the likelihood of them occurring, may contribute to the risk they run. Also, even when there is such awareness, it is possible that these hazards are given low priority in the face of other challenges faced daily by the inhabitants of low-income neighbourhoods. On the other hand, the municipal government perceives the hazards and consequent risks from the point of view of their institutional responsibilities, and within the framework of the regulations and their capabilities. This can lead to conflicting perceptions between resident and state, which can hinder open communication between the two in facing the problem, due to several factors such as the fear of eviction, the perception that the problem of risk is a budgetary problem, etc.

RESEARCH FOCUS

Exploration of the perceptions of risk and related narratives within the community and among the relevant public sector organisations, and the consequences of these perceptions and narratives for the adoption of risk mitigation strategies and actions.

HOW

The methods used were:

(1) Focus groups with residents and community leaders. In total, two focus group meetings were held. In the first focus group, participants were a combination of residents and community leaders from Pinares de Oriente. The other focus group was attended by leaders who came from other sectors of Comuna 8, as well as from Pinares de Oriente.

(2) Sixteen semi-structured interviews with community leaders and residents of sectors at risk in Comuna 8.

(3) Six semi-structured interviews with key players from the public sector, in meetings with the people directly responsible for institutional relations with the community on the issues directly related to the process. In addition, workshops and working processes involved third sector organisations.

The continuous work with the community during activities related to monitoring, mitigation and negotiation (see the following Sections) also allowed for verification of changes in the perceptions of the residents during the process. The research allowed for consideration of residents' perceptions at three points: on arrival in the neighbourhood, in the interview, and during implementation of the monitoring and mitigation works.



Figure 3: Taking a walk with residents of the Pinares de Oriente neighbourhood before the focus group session. *Source: Research Team.*



Figure 4: A semi-structured interview with DAGRD. *Source: Research Team.*

RESULTS

For those interviewed, arrival in Pinares meant a struggle to stay on the land, as the state's action for controlling informal growth was eviction. This type of action affects the perception of risk, because to mention that an area where one is living is at risk evokes the idea of eviction rather than that of protection of life.

For its population, Pinares de Oriente is a 'neighbourhood' in consolidation that seeks to take advantage of its geo-strategic location on the slopes of Cerro Pan de Azúcar, with a view over the valley, to improve living conditions, through 'rurban' tourism (on the rural-urban edge). This shared objective requires strengthening of the community fabric to ensure permanence in place, despite the risk conditions.

The majority of the residents interviewed have known some risk in their life, including floods, landslides and fires. But the perception of whether they currently live in a risk area as inhabitants of Pinares is more varied, from ignorance or lack of concern for the conditions of the site at the time of arrival due to other concerns, to knowledge of the risk and willingness to face the consequences.

The relationship with municipal institutions comes into play in these perceptions in three ways: as justification for the perception of non-existence of risk, since the municipal government has carried out large-scale projects nearby; as an explanation of the limitations faced by residents when it comes to defraying the cost of works that reduce their vulnerability, due to the value of the plot for the tourist programmes of the mayor's office; and as a threat of eviction. On the other hand, there is little knowledge of the tragedy that occurred in Villatina thirty years ago, despite its proximity and the similarity of conditions. In summary, the interviews on the subject of risk show that the inhabitants of Pinares de Oriente have lived between risks and violence, from one place to another, and that they refuse to think about a new displacement or eviction.

Even though monitoring has not habitually been a community effort, the community has been clear in recognising the critical points and in understanding the relationship with the management of runoff water. With awareness of the mitigation works and their association with monitoring, the community, both individually and in groups, saw the importance of defining the critical points of each element in the area, and the opportunity for doing so, and expanded the number of critical points to monitor. In addition, new residents turned up in the meetings to present the problems in their area or home.

In general, the community associates risk mitigation and targeted improvement, and then relates these with housing or a service; but dreams of integrated neighbourhood improvement that deals with the whole set of problems. The residents interviewed identified the following priority topics regarding the mitigation works, in order of importance: control of the waters of the La Loquita creek and runoff, the need to equip the roofs with guttering and downpipes, and the urgency of building channels along the footpaths; retaining walls, generally with the conviction that these must be built to technical specifications by the Mayor's office; improvements in housing and public services, with special emphasis on sewerage; cleaning campaigns, particularly after heavy downpours; construction, maintenance and cleaning of the footpaths; rock falls; and the importance of the orchards to stabilize the hillside. In addition, several interviewees referred to the works of the 'perimeter' Garden carried out by the local authority to consolidate the urban edge, in one case as a benefit for the community, and in others as damaging due to poor water management. Finally, despite the collective expressions aimed at integrated neighbourhood improvement, several people mentioned their willingness to accept possible relocation to another neighbourhood.

It is important to highlight that several members of the community clearly distinguish the works that the administration must carry out in a programme of public works, in accordance with the soil studies and the current standards, and the works that the united community can undertake to mitigate the risk and improve their living conditions. Regarding the latter, the community of Pinares de Oriente had previous experience in what is known in Colombia as the *convite* ('reception'). This is a tool for community participation and cohesion, which had been used to improve the neighbourhood's public spaces, after part of the settlement, located on the steepest slope, had been built on by individual home-makers. This activity had helped to

strengthen ties of neighbourliness and a sense of belonging among the first residents.

With regard to the convites organised to carry out emergency mitigation works as part of this project (see also Section 3), the interviews gathered a variety of perceptions, from the notion that they serve both to prevent risk and to create community and union, to disgruntlement with the fact that not everyone participates. In general, the community perceives the great benefit of this type of work. However, investigating the type of benefits provided by the interventions identifies differences based on the constancy of participation in the project process. The active and committed population is clear that the works are of a temporary nature for risk reduction and are understood as emergency actions. On the other hand, the population that only attended the convites considers that the works are for the improvement of the houses and the neighbourhood, and shows a false safety in the face of the risks. These positions require clarification of the objectives of the works that are of a temporary and emergency nature.

A process towards reaching agreement, understood as the capacity to enter into dialogue with public or private or social organisations, has not been a common practice in Pinares de Oriente. Relations with these institutions have generated perceptions of them that are predominantly negative, based on the fact that: the few attempts at agreement have failed due to delays and non-compliance, which weaken the community's trust in the partners; experiences concerning the UVA and the Perimeter Garden have been negative because these grand works have been excessively costly and are perceived as of little use by a community that is waiting for risk mitigation and the overall improvement of the area; these works have raised concerns about their weight in cement and for the lack of water runoff management; relations with the EDU during building works (UVA, footpaths and the works on the Perimeter Garden) and the proposal to build some apartment buildings to resettle the families occupying the highest plots are not considered to be beneficial to the community.

Along with these negative perceptions, other more positive ones were also observed: the difficulties with certain organisations were compensated for by the numerous advisory services received from higher education organisations and from some NGOs whose presence is less known; the resources contributed by the Participatory Budget have been very useful; the works of the EDU have generated employment in the community; and the participation and organization of the community, regardless of the presence or absence of the municipal administration, are important achievements.

The semi-structured interviews with key actors in the public sector revealed that state organisations agree on the importance of intervening on the edge of the city and on the need to control new land occupation; that they share the view that the occupation of land to form new settlements in areas of risk should not be allowed; that they have a positive view of interventions which tend towards emergency mitigation while integrated neighbourhood upgrading takes place where conditions permit; and that they will act in accordance with the Land Use Plan, which includes a review of hazards across the city.

IMPACTS

- The community has expressed its identification and understanding of the hazards they are affected by, this being facilitated by a relationship of trust with the research team and on the basis of various training processes run by public and private actors.
- The appraisals of the hazards by all the actors refer to the same plans that detail the levels of hazard which exist in the settlement of Pinares. All are awaiting the final approval of these plans by the municipal administration.
- This understanding of the hazards has allowed the participation of the community in the monitoring and mitigation activities.
- At the end of the process, and after regular meetings, the perceptions from all the actors are expressed in very similar ways, which allows a discussion around new interventions tending towards integrated neighbourhood upgrading.



SECTION 2: MONITORING

PROBLEM AND WHY IT MATTERS

It is estimated that some 44,600 homes in low-income neighbourhoods are at risk of landslides in Medellín (URBAM and Harvard Design School, 2012). Most of the landslides that occur are small scale, affecting a small number of homes and people, but add up to a considerable amount as a whole. Of the 6,750 events recorded between 1880 and 2102 in the Metropolitan Area of the Aburrá Valley (AMVA), 33% were due to mass movements (Aristizábal and Gómez, 2007).

The Early Warning System of Medellín and the Aburrá Valley (SIATA) uses sensors located at strategic points of the metropolitan area to monitor meteorological, hydrological and air quality variables. But this system is not able to monitor the behaviour of soils and slopes on the scale of areas and neighbourhoods. It is therefore suggested to engage the participation of the resident community in these neighbourhoods in the monitoring of conditions specifically related to possible earth movements on this scale.

RESEARCH FOCUS

Use of a pilot project to try out community-managed techniques of monitoring landslide risk in informal settlements, which can be developed on a broader scale through community-based researchers and trainers.

HOW

The research team had the permanent cooperation of a group of citizens interested in the process, who participated as community researchers. The monitoring work started with preliminary reconnaissance walks by the technical team with the community (Community Researchers), for the visual identification of the hazard and the risk conditions. The main problems in the field were identified and the community's perception of the risk conditions was introduced (through interviews – see Section 1). During interviews with community residents, several points were identified that concerned residents because of moisture, water springs and floods.

Using the information provided by the community and the technical team's appraisal, fourteen initial points where the community monitoring work would take place were defined in a joint participatory mapping workshop. Once the points were known, the technical monitoring group in Edinburgh prepared detailed guidance

to facilitate monitoring by the community, which indicated the point to be monitored, the frequency of observation, and the safety conditions that need to be taken into account during the actions.

With the manual or guide, a working meeting was held with the people who showed an interest in participating in the monitoring under the conditions established for this work. During this meeting, the meaning of the word monitoring was made clear, as was its importance in a community risk management process. The great importance of taking photos periodically and systematically was indicated. The images thus produced could then be analysed technically by the Edinburgh-based group. The ethical terms of the participation were also discussed in this meeting, as well as the safety measures and the detail of the procedures.

After the session in the meeting room, the previously selected points were visited with the interested parties, and each of the participants were given instructions on the specific way in which the photographs should be taken, indicating the importance of the physical feature to be observed. It was necessary to include several new ones at the request of the participants, some of whom had joined the project at the last meeting.

The monitoring was carried out between the months of May and October, covering a dry period and a rainy one. At the end of this period, the experience was evaluated in two community workshops, and the community researchers, supported by the academic team, shared it with the local authority organisations and NGOs in two workshops.

RESULTS

From the very beginning, a process was established whereby volunteers were organised into 6 WhatsApp groups, each of these groups being responsible for taking photographs at several predetermined monitoring points. The photographs were received in Edinburgh and analysed by looking at the following points:

- Chronological comparison of the images;
- Comparison and correlation of the images with the average monthly rainfall level;
- Evaluation of mass movements;
- Identification of the most critical points from the point of view of the hazard.

Through their participation in this process, community researchers demonstrated that residents in low-income neighbourhoods, with appropriate technical instruction, are able to participate in a detailed monitoring system for landslide risks, and to collaborate with academic researchers in the collection of data that can be analysed. Community researchers took part in the experience in order to improve the community and because they understood the importance of the process.

Lessons were learned during this pilot experience about the limitations faced by this type of community participation, and on possible ways in which these community research processes can be optimized. Although the volunteers had committed to sending the photographs with the conditions and frequency established in the aforementioned workshops, there were difficulties regarding the regularity, the decrease in the number of participants, and the detail of the photographs. Some sent small videos which, although important, complicate the technical analysis of the images by specialists, who require that they are always taken as indicated.

Of the initial six monitoring groups, only two remained to the end and sent photographs throughout the process. Among the reasons for this decrease in participation, identified in an evaluation workshop with community researchers who had participated, were technical difficulties with the mobile phone, changes of residence of participants, and family circumstances. Among the factors that were identified, together with the community researchers, as possibly leading to more continuous participation, were: local administration of the WhatsApp networks, instead of abroad; closer accompaniment of community researchers through the more frequent presence of a member of the academic research team, or possibly students of the university

that accompany the process; concentration of effort in a smaller number of monitoring points within the community; and activities in which the methods and results of the analysis of the images collected by the community researchers are shared, to reinforce their understanding of the process.

An additional activity was the characterization of the hydro-mechanical behaviour of the soil. For this, soil samples were taken at points chosen by the technical team. The samples were analysed in the Geotechnics laboratory of Heriot-Watt University.

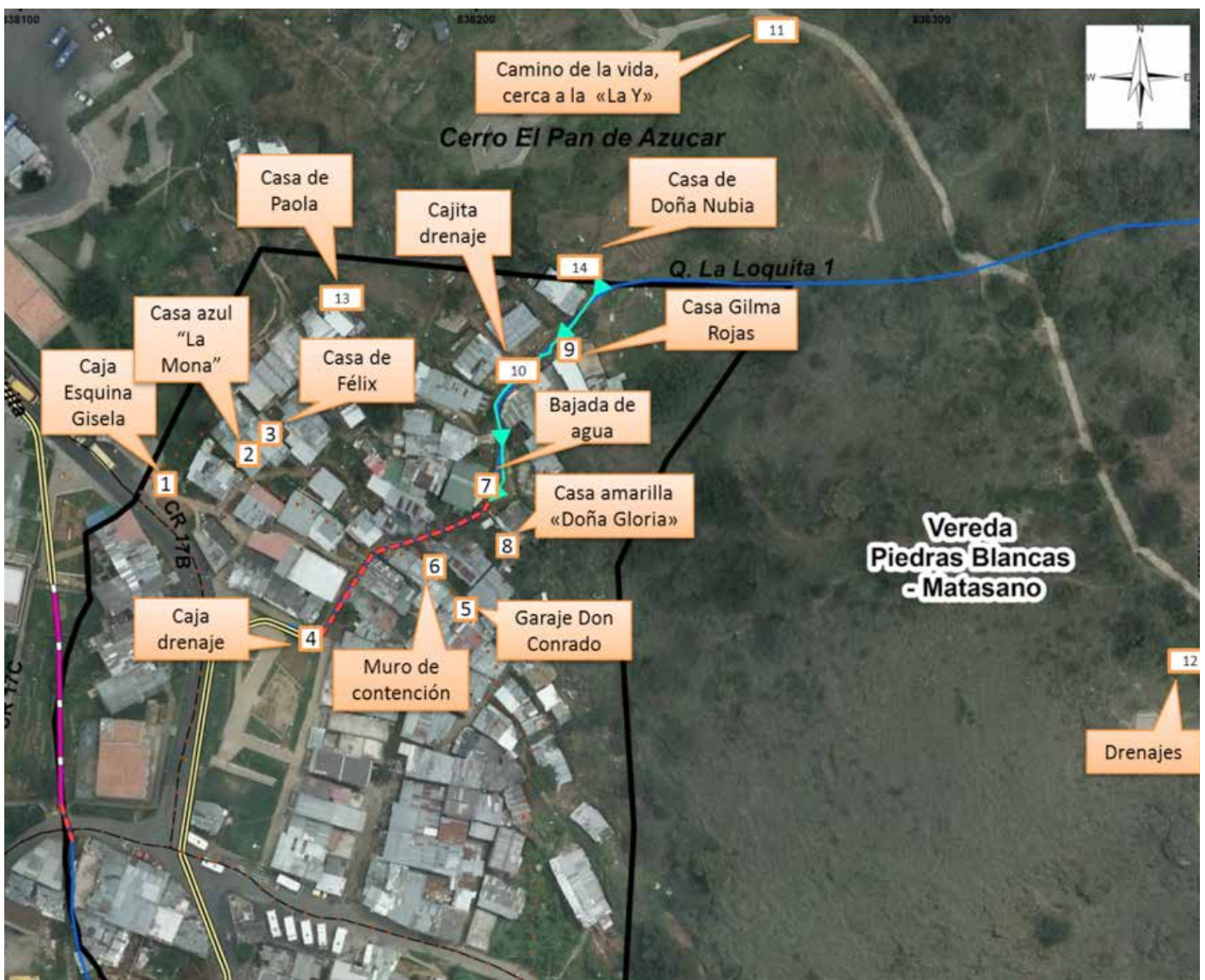


Figure 5 : The result of a participatory mapping workshop where fourteen monitoring points were identified. *Source: Research Team.*

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| <p>(2) Casa Azul: “La Mona” Eurelis</p> <p>¿Qué debo monitorear?</p> <ul style="list-style-type: none"> - La inclinación de la casa y del árbol. Se debe tomar dos fotografías desde diferentes ángulos. - Los pequeños deslizamientos y derrumbes <p>¿Con qué frecuencia debo realizar el monitoreo?</p> <ul style="list-style-type: none"> - Normalmente una vez al día, si es posible. <p>Y si llueve, con más frecuencia: durante las lluvias, al final de la lluvia, dos horas después de la lluvia, 12 horas después y un día después.</p> |  |
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Figure 6: A sample from the manual or guide prepared for the community researchers. This is monitoring point 2 (see Figure 5). The technical monitoring group in Edinburgh prepared this guidance to facilitate monitoring by the community, which indicated the point to be monitored, the frequency of observation, and the safety conditions that need to be taken into account during the actions. *Source: Research Team.*

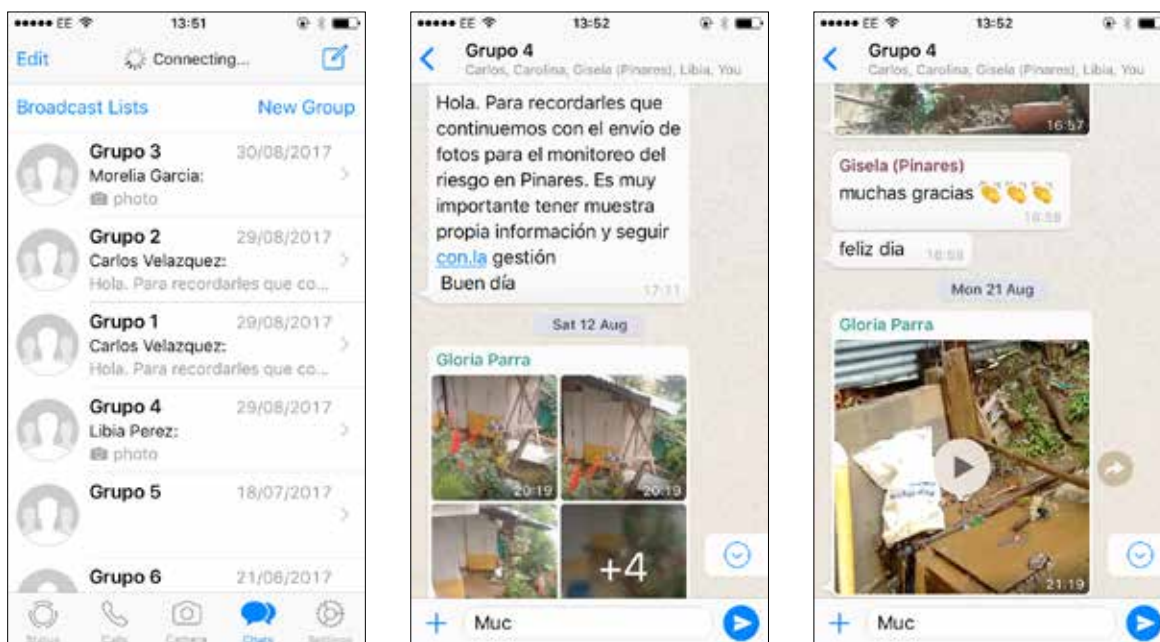


Figure 7: A screenshot of the WhatsApp groups. Each of these groups was responsible for taking photographs at several predetermined monitoring points. The photographs were received in Edinburgh and analysed. *Source: Research Team.*

IMPACTS

- A group of community researchers who understand the importance of monitoring soil conditions at critical points, who feel capable of transferring their knowledge and experience to other communities, and are empowered to enter into a dialogue with local government institutions.
- A system for monitoring soil conditions at critical points, in order to detect and anticipate possible small-scale land movements, which allows residents in poor neighbourhoods to participate in a risk management system that has been tested and that can be adapted to different contexts following appropriate analysis of them.
- Openness of local government institutions with responsibility for risk management, to the contributions that communities can make through the tested system, and a willingness to complement these activities with the contribution of more technically sophisticated sensors.



SECTION 3: MITIGATION

PROBLEM AND WHY IT MATTERS

The occupation of the territory by informal settlements and the forms of construction in them are due to conditions and dynamics that do not necessarily take into account the natural and anthropic hazards, among which is the possibility of landslides of various scales. These processes, which combine exposure to hazards with the construction of houses that leave their inhabitants in vulnerable conditions, lead to many inhabitants in these neighbourhoods being at high risk.

The hypothesis of this project is that through the implementation of appropriate and low-cost works by the community, residents can reduce this risk, at least as an emergency measure to deal with the situation in the short term.

RESEARCH FOCUS

Use a pilot project to trial community self-managed techniques for the mitigation of landslide risks in informal settlements, which can be developed on a broader scale through community-based researchers and trainers.

HOW

This research component focused on mitigating the risk of landslides by establishing a series of activities developed in collaboration with the community in the Pinares de Oriente neighbourhood, with the aim of achieving a decrease in the likelihood of a landslide event. The research sought to build on the experience and knowledge from comprehensive and incremental settlement consolidation programmes in neighbourhoods that, to an extent, are covered by urban planning regulations. An example is the Integrated Programme of Subnormal Neighbourhood Improvement in Medellín (PRIMED), conceived as an orderly, systematic intervention with a range of small works all carried out with a focus on disaster prevention.

This action-research component was based on two main elements: technical analysis of the conditions of the land and buildings, identifying factors that could contribute to landslide hazards, and linking this analysis



Figures 8 and 9: The project requires the reducing of costs and expenses to make resources more efficient and increase participation. For this reason, the recipient community provided a part of the labour to carry out the works, by means of the *convites*. *Source: Research Team.*



Figures 10 and 11: Community participation in carrying out the works also involved preparing and transporting the materials to the mitigation areas. In this process, women and men with knowledge in construction were identified. These people, coordinated through social organisation, were called to be helpers, generating a mutual benefit. *Source: Research Team.*

to the identification of monitoring points (see Section 2); and the establishment of action strategies that are the result of community collaboration and intervention. Therefore, the priorities identified during the project are the result of multidisciplinary workshops, taking into account the knowledge of the expert members of the project's technical team (geologists, architects, sociologists, etc.), and the community. During these workshops, the community shared their concerns, particularly during rainy periods, their specific knowledge of the area, identifying key points, and their willingness to take part in the participatory monitoring and risk mitigation processes.

For the technical analysis, an initial roof survey was carried out with the support of university students and an NGO. This was supplemented by perceptual surveys that enabled the establishment of a hierarchy of spaces and networks that, in turn, enabled prioritising of the points of intervention, as well as the more detailed definition of the character of the works to be executed in each place. This analysis required a considerable investment of time by the technical staff of the research team, given the precariousness of the graphic and cartographic information available.

The works were arranged to be carried out by groups of neighbours through 'receptions' (*convites*) or community events during the weekends, supplemented with partially paid work during the week. The construction was led by the consultant architect for the project, and guided and coordinated by a local builder. The community self-build works were carried out during the months of September and October. The initial intention had been that some of the sites where works were carried out were to be included in the monitoring process (see Section 2), but this was not possible as these works were carried out in the final stage of the project. At the end of this period, the mitigation experience was evaluated in a community workshop, and the residents who took part in the *convites* shared the results from their evaluation with local government organisations and NGOs in subsequent workshops, supported by the academic team.

RESULTS

On the basis of the first survey of the area carried out by the technical team, working in parallel with the process of establishing a monitoring system and continuing with the focus on rainwater management, low-cost mitigation strategies that the community could carry out were established. The approach was based on the mitigation of small-scale ground movements within the neighbourhood, rather than on large-scale landslides that would require larger engineering works. The results of the workshops led to modification of the intervention in three prototype houses that had been defined in the initial proposal, amending it to intervention in common areas covering most of the settlement.

The behaviour of the natural and managed hydraulic flows in the settlement and their impact on the slopes and micro-basins were identified as key factors in determining the level of exposure to the hazard of landslides of the residential infrastructure and the population. Likewise, it was considered important to know how rainwater was being conducted from the roofs of the houses and within private homesteads, and to assess their conduction towards the general rainwater drainage network. Initially, then, two possible types of intervention were identified: the conduction of surface water to the underground drainage network built at the foot of the settlement, and the vertical conduction of rainwater from house roofs to the channels by the side of the footpaths and then on to the drainage network.

Analysis of the settlement showed that it is a cluster of houses with very poor roof structures and almost total lack of gutters and downpipes, so a significant amount of water ends up being poured onto and absorbed by the ground, as internal courtyards with hard floors and drains are also very scarce. This contributes to a weakening of the load-bearing capacity of the soil and to an increase in the likelihood of landslides. On the other hand, the way in which the settlement was generated initially by individual houses and its gradual but dispersed consolidation, disorganised and lacking in an overall plan, has generated a series of residual spaces, with little accessibility, next to the slopes. These spaces serve as separation between the dwellings and are areas where there is dampness and, therefore, are a source of conflict between neighbours. These areas also generate erratic and uncontrolled water flows, which heighten the risk of landslide due to



Figure 12: The research team consisted of professionals with technical knowledge of construction techniques that was made available to the residents. Here one of the team members shows a resident how to prepare timber shuttering prior to pouring the concrete. *Source: Research Team.*



Figure 13: As is customary in developing neighbourhoods, both women and young children (of both sexes) participated to a greater degree in the *convites* than male residents. *Source: Research Team.*

the widespread presence of exposed slopes without treatment or protection. This aspect requires the analysis and identification of control and protection measures that are more structural, which was not foreseen in the two measures that were initially proposed. This could be addressed through other mitigation measures, and as another supplementary intervention unit, when the settlement is considered for improvement and final consolidation.

As a result of this critical analysis, four levels of water management were identified, from which the proposal was able to be spatially organised by establishing a community network structure for the mitigation of landslide risk, comprised of the following elements:

- *Primary network for conducting surface water:* Large existing public network of underground pipes under the main access roads and under the responsibility of local authorities in collaboration with public companies.
- *Secondary public drainage network:* Located within the neighbourhood, these drains can be underground or exposed, generally located along access roads, stairways and footpaths. These secondary drains are the responsibility of the local authority.
- *Tertiary drainage network in residual areas:* These are usually found at the back of the houses, in semi-private places that are the result of the location of accesses between groups of houses and are the responsibility of the owners of the adjacent homes.
- *Fourth level in individual houses:* This level considers interventions in gutters and downpipes in private homes.

Considering the community intervention in the mitigation works and the proposed benefit to the entire neighbourhood, the project gave priority to the tertiary network, with some interventions in the secondary network when deteriorating or deficient areas were identified. A number of interventions were also carried out in individual dwellings, generally in the case of houses that affect others, always seeking to benefit the neighbourhood rather than specific individuals.

In July 2017, an open meeting with leaders and the community was held in the community hall. The perceptions, analysis and proposals for a community strategy for the mitigation of landslide risks within Pinares de Oriente were presented, and the community's expectations were discussed. The works were carried out between the end of August and the beginning of October. During execution of the works in the two areas of the neighbourhood agreed during the monitoring process, a proposal was made by another third group of neighbours. As materials were available to undertake work in this area, it was decided to implement mitigation works along a third footpath.

The project requires the reducing of costs and expenses to make resources more efficient and increase participation. For this reason, the recipient community provided a part of the labour to carry out the works, by means of the convites. As is traditional in the communities of emerging neighbourhoods, women and young people of both sexes showed greater participation in the convites than men. Sundays especially were better attended by women and young people, since many of the heads of household are men, who arrive home on Saturday afternoon and rest from the work activity of the week.

Both the opening and closure of the process by the community are elements that guarantee greater participation. The cleaning of the work fronts consists of preparing the sector for the mitigation works, by weeding and removing obstacles and waste that impede carrying out the works. The closing event involves the community in the delivery of the works, thus generating awareness among the population of the importance of the process in terms of risk monitoring and mitigation.


Community participation in carrying out the works also involved preparing and transporting the materials to the mitigation areas. In this process, women and men with knowledge in construction were identified. These people, coordinated by the social organisation, were called to be helpers, generating a mutual benefit.



Figures 14 and 15: This is the house of a resident called “La Mona” (monitoring point number 2) showing before (left) and after (right) the mitigation works. *Source: Research Team.*

IMPACTS

- At the level of the physical environment, the conduction of rainwater and the safety along spaces and footpaths in the community were improved, as well as the rainwater drainage systems in some individual houses, with these works as a whole affecting approximately thirty dwellings.
- The residents who participated in the evaluation workshop explained that they have noticed differences in the way in which the soil is affected by rainfall and that because the collection and channelling are more rational, there are evident changes in the level of soil moisture.
- Both the monitoring process and the mitigation works have generated awareness among the community of the risk of landslides, as well as of the importance of proper management of runoff waters. This is manifested in works to improve water management by gutters and downpipes in homes that were not beneficiaries of the project, but followed its example.
- On the other hand, a concern for achieving continuity of these intervention works has been created in the community, and an awareness of the importance of identifying other means to carry out mitigation works in the future, such as the participatory budget, for example. Participation in this community self-build process generated awareness of the need for the community to approach institutions and the private sector to negotiate possible partnerships.
- A hierarchy of emergency mitigation works related to water management was established, which helps both to establish priorities in interventions within the neighbourhood, and to study and negotiate other forms of financing for interventions in the public and private space.
- The project provided learning for both the community and the municipal government organisations to whom the mitigation works were shown, on the importance of the convites as a community action strategy. The residents appreciated and valued the group work and the participation of the community in carrying out the works.
- Finally, the residents also considered that fear and anxiety in the community have been reduced. However, the fact that the community tends to perceive that the works carried out completely reduce the risk of landslides in the neighbourhood, when this is not the case, is a point to be taken into account both in future work in this pilot community and in other experiences that are based on this way of intervening.



SECTION 4: AGREEMENT (CONCERTACIÓN)

PROBLEM AND WHY IT MATTERS

Landslide risk management in informal settlements generally has tended to be limited to emergency response actions, be it assistance when an event has occurred, or prevention through the evacuation of inhabitants that, according to government organisations, are at risk. In some cases, local government organisations have accomplished mitigation works of considerable size, using civil engineering solutions, designed to protect neighbourhoods exposed to landslide hazards. But equally visible have been the interventions of the administration through which public infrastructures have been built in places that had been classified as high risk, and from where sometimes the inhabitants have been previously evacuated. This has created a climate of distrust among the population of the poor neighbourhoods, towards the public administration, which expresses itself in a relationship that is often one of conflict between community-based organisations and local government.

The nature of this relationship hinders the development of joint strategies for confronting the risk of landslide in these neighbourhoods in a concerted manner. Moreover, it leaves no room for sufficient consideration of possible actions in the short, medium and long term, nor for identifying the responsibilities and capacities of the various actors, which could contribute to co-produced risk mitigation strategies that could cover the entire at-risk population.

RESEARCH FOCUS

Through a collaborative process, to identify the ways and mechanisms for developing a sustainable process for the co-creation of a risk mitigation strategy, and its implementation through agreement between the communities of informal settlements and the relevant state agencies at different scales, based on the lessons learned from the activities carried out in relation to perception, monitoring and mitigation. In Spanish this agreement-seeking process is referred to as *concertación*.

HOW

Agreement (*concertación*) was achieved at two levels:

- At the district (comuna) level, within the wider community, addressing the deep differences between the Local Administration Board (Junta Administradora Local) and the Working Groups on Housing and Internally Displaced People (Mesas de Vivienda y de Desplazados): a meeting between these organisations and a joint call for an Open Council Meeting (Cabildo Abierto – a legally-binding type of meeting). This is important because the Local Administration Board is elected by residents and has the capacity to convene meetings with the municipality, and the Working Groups on Housing and Internally Displaced People can mobilise the community due to their constant work in the neighbourhoods.
- At the level of the community of Pinares, with local government. After the Cabildo, a working group was established with participation of the community of Pinares and four departments of the municipality (DAP, DAGRD, ISVIMED and EDU), which is looking at the possible ways forward for the at-risk area of the settlement once the risk survey plans have been approved. In addition, it was agreed that the larger interventions required to mitigate risks (channelling of La Loquita, box-culvert and screens to protect from rock falls) would be analysed to see if these could be addressed using municipal resources. These meetings were suspended at the end of 2018 for the holiday period, and were due to restart in 2018.

The process of preparation to reach an agreement began with meetings between the research team and officials from the Planning Department of the Mayor's Office of Medellín (DAP), the Metropolitan Area of the Aburrá Valley (AMVA), and the Department for Disaster Risk Management (DAGRD), in January 2017, at the beginning of the project.

Then, in the months of May and June, one of the team members coordinated two training workshops for residents and leaders of Pinares, mostly members of the Housing Working Group, in response to a request from the community and as part of a training cycle organised by Corporación Montanoa, an NGO that works with the communities.

Joining a process developed by the community leadership of the Comuna 8, and responding to an invitation from the same, the research team participated in an open council meeting (Cabildo Abierto) in which residents and representatives of the Mayor's Office of Medellín took part. This open council meeting took place in August 2017 at the Sol de Oriente UVA Coliseum, located in front of Pinares de Oriente, with the theme of "For Risk Mitigation and Integral Legalisation". Among the proposals on risk mitigation presented by the Comuna 8 at this open council meeting, the community leadership of Pinares de Oriente asked the local authority to open a space for dialogue on risk mitigation in the community.

Once the activities were carried out to meet the objectives related to monitoring and mitigation, the following workshops were held:

- Community evaluation workshop, with the participation of the community-based researchers (residents of Pinares de Oriente) and leaders, on October 1, 2017.
- Multi-stakeholder workshop at neighbourhood level, with the participation of representatives of the community and those responsible from the main relevant public organisations, on October 4, 2017.
- Workshop with NGOs and other organisations that can participate in, or interact with, the new project that has emerged from this one, on October 6, 2017.

RESULTS

A role-play activity was included as part of the community evaluation workshop. This allowed participants to prepare for the multi-stakeholder workshop with local government organisations. The activity allowed them to define the goal of the meeting with the institutions: to advance in how to incorporate the experience of Pinares in acting against risk in the city. For this, the community identified two fundamental factors: that the community should be clear about what the community can demand as the local authority's responsibility; and that the social conditions of a high percentage of the communities in this area, who are victims of socio-political conflict and who should therefore receive preferential treatment, should be taken into account in the conversation with the municipal organisations.

The evaluation workshop also identified specific objectives with which to initiate the process of reaching agreement with the public administration: present specific proposals for Pinares, among which was the construction of a public drainage system along the main road that crosses the area (box-culvert); commit to continue working together in the community on monitoring and small-scale works; request that the local authority provide continuity and drainage for the waters of the Camino de la Vida, a public infrastructure that is at a higher level than the Pinares sector, and whose drainage affects the settlement; carrying out another pilot project, this time more closely accompanied by the Mayor's office or the DAGRD; and coordinate these actions with a broader strategy for the upper part of the Comuna 8.

The suitability and validity of solutions previously developed in the city were identified. These solutions were developed through programmes and projects for the integrated neighbourhood improvement, such as the PRIMED, which in fact was in part a response to the tragedy that occurred in Villatina due to a mass landslide in 1987.

Two lessons learned through the pilot experience in monitoring and mitigation (see Sections 2 and 3) that were identified as important arguments for agreements with local authority organisations were: the importance of the time factor, the short term versus the long term, taking into account what had been achieved in a short time, between community and university, with small works; and the economic factor, highlighting the considerable number of homes (approximately



Figure 16: An invitation to take part in a *Cabildo Abierto*, which is a council meeting, where residents and representatives of the Mayor's Office of Medellín participate. This meeting took place in August 2017 at the Sol de Oriente UVA Coliseum, located in front of Pinares de Oriente, with the theme of "For Risk Mitigation and Integral Legalisation". *Source: Community leadership of Comuna 8.*

thirty) that had benefited from a very limited budget. Finally, the importance of this type of evaluation with the community was confirmed.

A workshop was held with the community and public administration institutions, including the Urban Development Company (EDU) and the Medellín Social Institute of Housing and Habitat (ISVIMED). The workshop began with a visit to the mitigation works in the sector, as well as brief joint presentations of both exercises by the research team (both academics and community researchers). The representatives from the local government organisations valued the experience very positively, and it was recognised as a problem that municipal resources do not allow to simultaneously tackle all of the communities affected by the risk. The EDU proposed to identify what happens in the meantime. That is, temporary solutions will be identified until a final solution is arrived at, as has been done with

water supply elsewhere in the city. A condition for tackling the problem in this way would be for the community to be aware of the temporary nature of the solutions, not a permanent exercise.

The value of the Pinares pilot project was recognised, both as a way of working that can be initiated immediately in other communities, and also by showing the need to study how the pilot is typified and categorised when replicated. The local government organisations proposed the creation of a Working Group with an agenda based around the continuation of the work done in Pinares. This group could be extended in the future to think about the planning of other places. There was also a call to recognise the effort made by Comuna 8 against the third Land Use Plan for Medellín (POT), now in force, and the fact that many of the concepts in the plan had been contributed by the community organisations of that comuna.

The importance of recognising the scale of the works to be undertaken, in addition to the temporal aspect, was also identified in the workshop held between the community and local government institutions. The role that small emergency mitigation works can play in preventing small-scale landslides was highlighted, as was the low cost of these works with the contribution of community labour.

There was a call for local government organisations to approach the communities in the area, to get to know them directly, and for there to be a change in the way of intervening, by which the regulations would adapt to the context, instead of the other way round.

Recognition of the capacity of the community to face the risk of landslide through monitoring and with small emergency mitigation works was confirmed in the workshop between the community and third sector organisations, as was the need to face the risk in the short term, and the relevance of similar approaches in the provisional supply of other public services such as water. Several factors were highlighted to be taken into account regarding relationships between the community and external organisations that could support these processes: the effect of differences between the official position and the personal or even professional vision; the danger of establishing a relationship of dominance of the local government organisations over the community (for example with respect to the intellectual property of the images collected in the monitoring and the use that could be made of them) which could negatively affect the relationship between stakeholders; the need to generate and maintain trust among the stakeholders, recognising what the communities contribute to the process; the need to avoid using the risk as a political discourse in order to expropriate land; the role that stakeholders such as universities and NGOs can have, acting as intermediaries, providing support, and helping to access resources.



Figure 17: The research team participated in a legally-binding open council meeting (Cabildo Abierto) where the team explained the objective of the project. This was followed by the community leadership of Pinares de Oriente asking the local authority to open a space for dialogue on risk mitigation in the community. *Source: Research Team.*

IMPACTS

- A community aware of its ability to engage in dialogue with public administration institutions, based on a pilot experience in monitoring and mitigating the risk and its reflection on this. A community with knowledge of the basic principles of agreement-seeking processes (*concertación*), of the responsibilities that it can demand from the state, and of the commitments that it is capable of undertaking.
- Public administration institutions with knowledge of what the community is able to contribute in facing the risk of landslides in the short term, through monitoring and small emergency mitigation works.
- An NGO sector willing to support community initiatives in risk management, providing access to resources and supporting reflection on strategies to be developed through consultation.
- The creation of a Working Group on risk, with a specific agenda and work programme, able to be expanded to a larger part of the population, based on acceptance of the need to develop strategies to address risk in the short term, and on recognition of the respective capacities and responsibilities of the local government and the community.



CONCLUSION

NEXT STEPS

The next step is to study the transferability of the pilot experience in the monitoring and mitigation of landslide risk in Pinares de Oriente to other communities, reflecting on this experience, adapting its methodology to other contexts, and analysing the results that are obtained. This will be done at two levels:

- In the context of the same city of Medellín, but in different neighbourhoods, one in the same *comuna* where the pilot project was developed, and another in a different *comuna*.
- In a different context, that of the city of São Paulo, Brazil, where this methodology will be tried out in one neighbourhood.

Following these experiences in different contexts, conclusions will be drawn about the possible adaptation of this risk management approach, so that its principles are transferable to other cities in the Global South.

ACRONYMS AND ABBREVIATIONS

NAME

ACRONYM

Área Metropolitana del Valle de Aburrá
(Metropolitan Area of the Aburrá Valley)

AMVA

Corporación Autónoma Regional de Antioquia
(Board of the Autonomous Region of Antioquia)

CORANTIOQUIA

Departamento Administrativo de Gestión del Riesgo de Desastres
(Department for Disaster Risk Management)

DAGRDR

Departamento Administrativo de Planeación
(Planning Department)

DAP

Empresa de Desarrollo Urbano
(Urban Development Company)

EDU

Empresas Públicas de Medellín
(Public Companies of Medellín)

EPM

Global Challenges Research Fund

GCRF

Instituto Social de Vivienda y Hábitat de Medellín
(Medellín Social Institute for Housing and Habitat)

ISVIMED

Junta de Acción Comunal
(Community Action Board)

JAC

Junta Administradora Local
(Local Administration Board)

JAL

Natural Environment Research Council

NERC

Plan Operativo Anual de Inversión
(Annual Operating Investment Plan)

POAI

Presupuesto participativo
(Participatory budget)

PP

Plan de Ordenamiento Territorial
(Land Use Plan)

POT

Sistema de Alerta temprana
(Early Warning System)

SIATA

Sistema Municipal de Prevención y Atención de Desastres
(Municipal System for Disaster Prevention and Response)

SIMPAD

Unidad de Vida Articulada (Centro cultural y/o deportivo)
(Articulated Life Unit) (Cultural and/or sports centre)

UVA

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