

INTERNATIONAL SOCIETY FOR SOIL MECHANICS AND GEOTECHNICAL ENGINEERING



This paper was downloaded from the Online Library of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE). The library is available here:

<https://www.issmge.org/publications/online-library>

This is an open-access database that archives thousands of papers published under the Auspices of the ISSMGE and maintained by the Innovation and Development Committee of ISSMGE.

The paper was published in the proceedings of the 13th International Symposium on Landslides and was edited by Miguel Angel Cabrera, Luis Felipe Prada-Sarmiento and Juan Montero. The conference was originally scheduled to be held in Cartagena, Colombia in June 2020, but due to the SARS-CoV-2 pandemic, it was held online from February 22nd to February 26th 2021.

Social appropriation: method for understanding and applying landslide knowledge to territorial planning and risk management

Gabriel Avellaneda A, Gloria Lucia Ruiz P.

Servicio Geológico Colombiano

gavellaneda@sgc.gov.co, gruiz@sgc.gov.co

Abstract

Landslides in Colombia are highly important phenomena, and the social and economic impacts of landslides include the loss of human life and damage to civil structures, which have hindered the economic and social development of the country, its regions and communities. In this context, social appropriation becomes a tool and process for understanding landslides and for generating landslide hazard and risk mitigation as well as landslide reduction and management plans from different perspectives (e.g., political, social, economic, normative, educational and cultural perspectives). Social appropriation of knowledge on landslides has allowed multiple actors to participate in decision making on landslide management and prevention, which generates further knowledge on landslides. As a result, technical and social knowledge on landslides can be combined, thereby developing a dialogue between science and society to ultimately transform the unstable conditions presented by landslides through evidence-based landslide knowledge, which is converted into actions using risk management, territorial development and social and land-use planning tools.

1 INTRODUCTION

Landslides have been highly impactful phenomena in Colombia because they have caused great tragedies, such as Quebrada Blanca on Bogotá-to-Villavicencio road, which occurred on June 28, 1974 and caused more than 500 deaths, Armero in Tolima, which occurred on November 13, 1985 and caused more than 23,000 deaths, Villatina in Medellín, which occurred on September 27, 1987 and caused more than 500 deaths, Supía in the department of Caldas, which occurred on December 16, 1970 and caused more than 200 deaths, and Guavio in the department of Cundinamarca, which occurred on July 28, 1983 and caused more than 200 deaths.

More recently, other events also stand out, such as Manizales on April 19, 2017, which caused 17 deaths, Mocoa on March 31, 2017, which caused more than 300 deaths, the landslide along Pasto-to-Tumaco road in January 2018, which caused 12 deaths, Salgar in the department of Antioquia on October 17, 2015, which caused 104 deaths, and the landslide in the municipality of Rosas (department of Cauca) in April 2019, which caused 33 deaths and the closure of Bogotá-to-Villavicencio road, which connects two major sectors and territories of Colombia and is one of the main roads of the country. All of the aforementioned events demonstrate a single dimension of landslides (number of deaths); however, landslides are also responsible for injuries, economic losses and public service structure losses, such as aqueducts, gas, electricity, roads and bridges, which has a considerable impact on Colombian society and its development.

Cases such as those referenced above occur every month and year and in many areas of the country. In recent years, the media has shown that many of these landslide tragedies are somewhat anticipated because the landslide hazard or risk inherent to the territory is known. Thus, one of the main questions is as follows: why has no one intervened when the phenomenon risk was known in advance? The answer to this question is related to the lack of social appropriation of knowledge on landslides by society and by state entities responsible for the administration of the territory.

2 RATIONALE

The section above described the problem associated with landslides due to the geological conditions of our country, the location of

population centers and populations living in mountainous areas, which are susceptible to this phenomenon and where such tragedies are anticipated or at least. Therefore, geoscience knowledge on landslides has not been used, possibly for different reasons.

One of the first reasons is the lack of understanding of landslide jargon. Because landslides represent a specific subject matter with specific technical concepts of earth sciences, engineering and geotechnics, social and administrative actors of the territory struggle to understand these complex terms. This difficulty is correlated with the lack of technical experts in municipal councils, who would apply landslide knowledge to disaster risk management and planning and to land-use planning.

Moreover, a landslide represents a land-use factor or a possible hazard to villagers and thus is a complex topic for actors to address because recognizing the existence of land instability problems may involve assumptions pertaining to political, social, cultural and economic costs. However, from the perspective of social appropriation, geoscience knowledge on landslides opens new possibilities to efficiently and safely organize the territory and human activities within said territory.

From this perspective and based on multiple experiences, geoscience knowledge (i.e., the preparation of landslide technical reports and hazard maps) does not lead to changes in the territory but instead requires an applied analysis together with other elements and dimensions to positively affect the landslide hazard, vulnerability and risk conditions in the territory. This type of analysis is developed through processes of social appropriation of knowledge on landslides.

3 THEORETICAL FRAMEWORK

Different elements establish the theoretical framework of social appropriation of geoscience knowledge on landslides because this process is generated by a government entity, such as the Colombian Geological Survey. Primarily, three legal aspects frame the process. The first is the mission of the Colombian Geological Survey, which is to “Comprehensively manage geoscience knowledge of the national territory and to ensure its accessibility”. In fulfilling this function, ensuring that geological hazards are flagged is inherently related to the process of communication and dissemination of geoscience knowledge. These elements are associated with social appropriation to

help communities and actors understand, appropriate and apply geoscience knowledge on landslides.

The second aspect is law 1523 of April 2012, pursuant to which “the National Disaster Risk Management Policy is created and the National Disaster Risk Management System is established”, This law mentions in article 2 that “Risk management is the responsibility of all authorities and inhabitants of the Colombian territory”. Accordingly, the Colombian Geological Survey, as part of the National Disaster Risk Management System, is the actor responsible for generating knowledge about geological hazards.

The same law states that another disaster risk management element associated with social appropriation of knowledge on landslides is as follows: “The communication of risk to the public and private entities and to the population for public information, perception and awareness purposes”.

The third aspect is the National Strategy of Social Appropriation of Science, Technology and Innovation, which is promoted by Departamento Administrativo de Ciencia, Tecnología e Innovación – Colciencias. This strategy considers the creation and strengthening of debate spaces to find solutions for social, political, cultural and economic problems based on scientific knowledge a priority; thus, social appropriation of geoscience knowledge on landslides is required to meet the needs of the country.

The Multinational Andean Project - Geoscience for Andean Communities, which was developed from 2002 to 2009 by the Geological Services of Andean countries (Argentina, Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela) and the Geological Survey of Canada, provides two other elements of the theoretical framework and background of this social appropriation process. This project set the following goal: “to contribute to improving the quality of life for the people of the Andes by reducing the negative impact of natural hazards”. (PMA: GCA). From the outset, the project determined that generating and collecting scientific knowledge was not enough to improve the quality of life of the inhabitants of the Andes. Rather, this scientific knowledge had to be transferred and applied, thereby converting it into actions that would help to improve the quality of life of the inhabitants, with communication identified as the appropriate tool to generate such transformation as stated in the document: “Transforming geoscience knowledge into action; community communication”.

From a more theoretical perspective, one of the basic conceptual aspects is the applied concept of communication, which emerges from the semantic concept of communication, namely, “to participate in”, which is derived from the Latin word “*communicare*”, which means to make something common or to relate. Another definition is that of Yepes, 1996: “...To communicate, in the social sense discussed here, is more than to inform; it is not merely speaking but rather saying something to someone, having in common what is said. To communicate is to dialogue, to provide information to someone who receives it and accepts it as theirs and who responds to it. It is an act of interpersonal dialogue in which something is shared” (Yepes, 1996).

Based on communication from the aforementioned perspectives, knowing that social appropriation of knowledge on landslides enables the dialogue between technical knowledge and social knowledge and that the interrelation of this knowledge also allows successful appropriation processes, the concept of co-construction of knowledge is applied: “The co-construction of knowledge emphasizes the basic element of the exchange of information between peers, whether tacit or explicit knowledge, in a democratic, horizontal, endogenous and natural process on which knowledge is rooted and appropriate both in academia and in communities. From this base, ancestral knowledge, skills and worldviews, constantly undervalued, become tools for conducting endogenous development processes in whatever their modalities might be” (Schmcker, 2009).

Considering these two concepts of communication and co-production, the concept of social appropriation must be mentioned: “The term appropriation, in contrast to understanding, refers to “to make something one’s own”, that is, the audience plays a more active role” (Daza, S, Arboleda, T – 2007). This active role means that to appropriate is not simply to understand what a type of knowledge about a phenomenon states but instead to develop motivated actions from this knowledge in everyday life.

Considering the above, social appropriation must be conceptually based on scientific communication and use processes: “Communication is understood as a two-way process, an exercise of recognition of the “other” (...), an attempted encounter and relationship, which will necessarily transform the actors” (Delgado, 1990 in Daza, S, Arboleda, T, 2007). This type of science communication with

these characteristics is known as the democratic model of science communication, which is defined as follows: “The democratic model recognizes that the audience has knowledge and expertise, as well as values and interests, which are useful in the reflection on scientific applications to specific social contexts, and promotes two-way communication processes between science and the audience” (Daza, S, Arboleda, T, 2007).

Another aspect of the proposal of applied social appropriation is related to understanding and knowing the audience. “Nisbet and Scheufele (2009) state that any effort to communicate science must be based on a systematic empirical understanding of audiences, knowing their attitudes, their social and interpersonal context, their preferred sources and their communication channels. Participatory communication processes involve consulting with community members, which will allow mutual understanding between scientists, policy makers and the public; in turn, scientific institutions should learn to prepare their messages so that participation is encouraged and is more active and far reaching”. (In G, Ruiz, 2013).

Accordingly, this identification of the others actors in dialogue with science highlights the importance of culture as a determinant of social appropriation scenarios because science as such enters into a negotiation with culture or is mediated by it, both in its development and construction and in its application. In this context, the following contribution is important: “the close connection between science and culture, which is shown as an activity that helps to develop worldviews and simultaneously, in some way, is conditioned by those worldviews” (Granés, J, Bromberg, P – 1986). Therefore, knowing those actors and their knowledge is crucial for the dialogue that allows for the social appropriation of geoscience knowledge on landslides.

4 STRATEGY

The development of social appropriation is based on the encounters and interactions with social actors when applying knowledge on landslides as well as the previously described theoretical premises of two-way and symmetrical communication. For such purpose, different tools are applied to generate social knowledge about landslides (dialogue of knowledge about landslides) and possible interventions for addressing the topic of landslide for landslide mitigation, reduction, prevention and management.

To organize and prioritize actors throughout each phase of the social appropriation process, three stages are proposed, and they are considered fundamental to transforming scenarios of hazard, vulnerability and risk conditions due to landslides. The first level is generating technical and social knowledge. The latter is related to social perceptions and representations of landslides, that is, how landslides are rationalized from other nonscientific perspectives. This knowledge is interesting as a reference social perspective for the social appropriation of landslide knowledge.

The second level is related to proposing solutions. At this level, structured brainstorming based on landslide knowledge and their implications and impacts makes it possible to associate multiple actions with interventions to reduce landslide hazard, vulnerability and risk. The last level is related to implementing the planned actions, that is, generating and monitoring intervention plans, programs and projects.

5 METHOD

Considering the levels described in the strategy and based on the premise that landslide knowledge is applied for the social and economic development of the country and its regions, there are several periods at each level in which specific activities are developed via the application of tools with particular objectives and scopes.

The method was applied in three periods related to the execution of a zoning project of landslide hazard, vulnerability and risk. The “before” period occurs before starting the landslide study, the “during” period occurs when the study is performed, and the “after” period refers to the period after delivering the final products of the study (hazard map and final report). This method can be defined as diachronic because it is structured with continuous interaction, communication, understanding and appropriation processes in the periods before, during and after the landslide study, and its goal is applying landslide knowledge towards transforming the territory into a harmonious, stable and sustainable relationship between the populations and the environment.

A relevant aspect of the proposed social appropriation is its ability to have a flexible structure; although human interaction is dynamic, territorial knowledge and perceptions change, mutate and evolve in each specific sociocultural context.

It should be noted that the structure of the method is divided into four cross-sectional activities: 1) identification and characterization of actors, 2) ethnographic observations, 3) identification, analysis and description of social representations and abstractions and 4) discourse analysis.

5.1 Before

In this section, the sociocultural context of the study area is analyzed, and it covers general and specific aspects and uses appropriate qualitative methods and techniques to collect data to show this reality, which is expressed in the ethnographic document.

In this phase, the perceptions of different actors of the land instability problem and its study are learned. This phase creates and strengthens a social space for the subject of landslides and their study based on previously established social conditions to establish a context of social appropriation of landslides, thereby positioning the topic by generating trust between actors.

In this phase, various topics of the context are approached with different qualitative tools, such as conversation, situated observation, participant observation, structured and semi-structured interviews, opinion polls, social memory, social mapping and surveys, among others. For such purposes, the sociocultural world of the area with landslides is analyzed to understand the communities and how they regard geological and landslide phenomena and determine their history with the territory by identifying the actors, languages, abstractions and affectations, among others.

5.2 During

The period “during” starts from information generated in the sociocultural identification stage, which gathers relevant aspects of the historical and contemporary reality of the societies themselves and of their relationship with the territory and landslides.

First, social knowledge on landslides is generated by implementing qualitative tools, such as issue trees, social mapping and interviews. With these elements, social representations and abstractions of landslides are analyzed and described. For

such purposes, social representations are defined as follows: “... social representations are a set of propositions, reactions and evaluations of specific points issued by the “collective chorus” of here or there, during a talk or conversation. Whether voluntarily or involuntarily, we are all part of the “collective chorus”. The term “public opinion” could be used instead, but the organization of these propositions, reactions and evaluations considerably varies by culture, class and group within each culture. They are thus “universes of opinions” well organized and shared by categories or groups of individuals”. (Carugati, F., and Palmanori, A, 1991). Such social representations are the social knowledge of landslides and everything that this phenomenon represents. Its causes, effects, logical structure and graphic representation in the territory are known through social mapping.

The next aspect is the intersection between social knowledge and technical-geoscientific knowledge about the land instability problem, which complements existing views on the land instability problem through two-way understanding.

This stage of the process arranges technical and social perspectives through the dialogue between social representations and abstractions and technical concepts of the land instability problem by comparing social and subject-matter maps drawn by experts in generating scientific knowledge on landslides.

The combination of knowledge from subject-matter experts and social groups promotes a two-way dialogue. On the one hand, the technicians understand the social representations of the land instability problem of nonscientific social groups. On the other hand, the communities will be able to understand geoscience issues and products associated with the evaluation of land instability.

The convergence of the two perspectives is essential for a unified vision of the problem, which is shared and forged in a space suitable for generating solution proposals.

The last “during” phase is the construction of a matrix of possible interventions and solutions. In this phase, the results from the analysis of the social

context, the generation of social knowledge, the combination of different knowledge, the identification of actors, and primarily the technical knowledge on landslides, which identifies the dimensions of interventions, namely, technical, social and administrative, are materialized in a matrix that identifies land instability problems or elements of these problems, possible interventions and solutions and actors involved in executing such interventions and solutions.

Thus, this matrix specifies the knowledge shared and constructed via the sharing of knowledge and the integration of social and technical knowledge to propose decisions about the territory. After deliberation and negotiation, the most relevant and pertinent problems of the landslide phenomenon are identified, and then possible interventions and solutions for the identified problems are proposed. As a last step, the role playing tool is used to identify the actors involved in these solutions and the roles of each of these actors.

5.3 After.

The “after” phase starts with the delivery of the final results from the study of landslides (susceptibility, hazard, vulnerability and risk maps and final reports). From these products, activities are performed to further understand the results, including the causes that explain the presence of landslide hazards or risks in each territory or area, thereby enabling actors, which in Colombia are territorial administrators, such as Colombian mayors, to internalize knowledge on landslides.

The next aspect is the analysis of current scenarios of social conditions and exposed elements related to the landslide hazard. Such analyses are performed with the objective of proposing scenario-specific interventions, wherein other elements, such as the housing density, population and provision and structure of public services, converge and overlap with landslide knowledge. Such an integration promotes land-use planning by zone according to the premise that landslide hazard conditions based on technical criteria may be the same but the repercussions and impacts of the landslide hazard are different.

With this process, new legends describing the threat levels, their impact and the interventions to be carried out are generated, including both the landslide hazard knowledge described by the same actors and all the interventions for each sector. Such work ultimately results in intervention matrices, plans, programs and projects for landslide hazard and risk prevention, reduction, mitigation and management. The “after” process uses translated technical presentations, forums, workshops and meeting spaces, among other tools. At this stage, knowledge appropriation is materialized in the application and implementation of solutions and interventions, including land-use planning tools, such as the Land-Use Planning Strategy (Esquema de Ordenamiento Territorial – EOT), Basic Land-Use Plan (Plan Básico de Ordenamiento Territorial – PBOT), Land-Use Plan (Plan de Ordenamiento Territorial – POT), disaster risk management plans and development plans at municipal and community scales.

6 PRODUCTS

The various activities of the social appropriation process generate different products. For example, the ethnographic document shows the relevant aspects of the sociocultural context of the landslide study area, which identifies the number of elements that can play a key role in the appropriation process. The identification of the actors also shows the current and potential future participants of the process of understanding, appropriating and applying landslide knowledge, including social mapping. The combination of social mapping and cartography makes it possible to read the social knowledge on landslides, thereby interrelating this knowledge with scientific knowledge on landslides. The analytical matrix for the identification of specific landslide problems and the proposal of formulas of intervention for these problems leads to the development of multidimensional action plans. These plans address land instability through local land-use planning and disaster risk management standards, thereby materializing social appropriation into short-, medium- and long-term action plans. All these actions are ultimately converted into sustainable relationships between the territory and human societies.

7 CONCLUSIONS

The process of social appropriation of landslide knowledge makes it possible to understand the construction of landslide knowledge, identify landslide elements from different types and subtypes of landslides to geological, geomorphological and soil cover and use conditions, and highlight the importance of soil and rainfall as a landslide trigger. Such work allows the actors to accurately recognize the conditions of their territory and environment and internalize these factors.

Social appropriation of landslide knowledge makes it possible to know and interact with different actors at different levels of intervention and organize support processes and synergies that facilitate action plan generation for landslide hazard and risk interventions in terms of reducing, mitigating, preventing and managing possible landslide disasters.

Social appropriation enables community actors as well as other administrative and social actors to appropriate geoscience knowledge on landslides as their own knowledge because they participate in landslide knowledge construction based on their own perceptions.

The social appropriation process enables land use and land-use planning based on landslide knowledge of both landslide and landslide hazard zones. Accordingly, landslides are determinants of human activities, which involve different actions that allow even further social appropriation of landslide knowledge, such as educational and normative processes on sustainable land use.

8 REFERENCES

- Carugati. G. y Palmonari (1991) "A propósito de las representaciones sociales" En: Revista Arthropos #124 Sept. 35-39.
- Daza, S, Arboleda, T (2.007) "Comunicación pública de la ciencia y la tecnología en Colombia: ¿políticas para la democratización del conocimiento?" En: Colombia Signo Y Pensamiento ISSN: 0120-4823 ed: Editorial Pontificia Universidad Javeriana v. fasc.47 p.100 – 125.
- Departamento Administrativo de Ciencia, Tecnología e Innovación – Colciencias (2010) Estrategia Nacional de Apropiación Social de la Ciencia la Tecnología y la Innovación.
- Granes, J. y Bromberg, P (1986) La divulgación científica: ¿un mito? En Revista Naturaleza: educación y ciencia, nº 4.
- Ministerio del Interior, Republica de Colombia (2012) Ley 1523.

Proyecto Multinacional Andino-Geociencias para las Comunidades Andinas (PMA: GCA), (2009) Comunicación para transformar el conocimiento geocientífico en acción.

Ruiz, G, Avellaneda, G, Espinosa, (2013) "Guía para la Apropiación Social del Conocimiento de la Zonificación de Amenaza por Movimientos en Masa. Grupo de evaluación de amenazas por movimientos en masa, Servicio Geológico Colombiano.

Ruiz, G, (2013) Acercando conocimientos para transformar realidades: caso de estudio municipio de Cáqueza.

Schmkler, B. (2009). Co-construyendo el espacio de la cooperación: Evidencias en el vínculo académica-OSC, Beatriz Schmukler coord. Instituto Mora.

Yepes, R, (1996) intimidad, don y libertad narrativa: Hacia una antropología de los trascendentales personales.