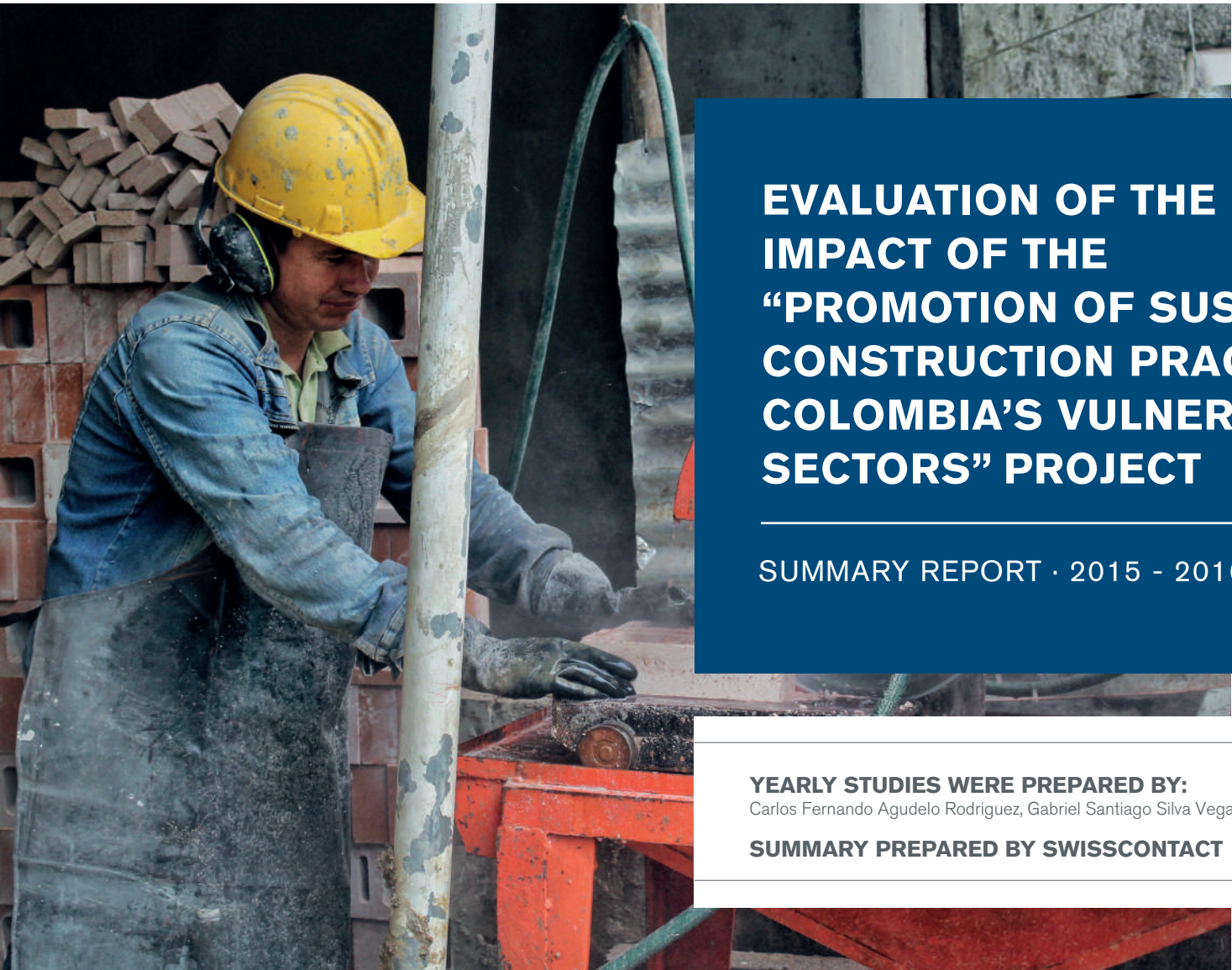




EVALUATION OF THE PRELIMINARY IMPACT OF THE “PROMOTION OF SUSTAINABLE CONSTRUCTION PRACTICES IN COLOMBIA’S VULNERABLE URBAN SECTORS” PROJECT

SUMMARY REPORT · 2015 - 2016 - 2018

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Lima, September 2023

SUMMARY PREPARED BY SWISSCONTACT

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EXECUTIVE SUMMARY

The report details three evaluations of construction work interventions conducted by individual construction workers trained under the “Promotion of sustainable construction practices in Colombia’s vulnerable urban sectors” project during 2015, 2016, and 2018. These assessments primarily focus on the condition of the intervened dwellings following the construction works. Performance of the workers is comparatively evaluated with untrained ones to validate the impact of the Construya Project, as well as the effect on the intervened houses. Data was collected from on-going construction cases with specific characteristics and analysis was executed through an Excel interface linking each case to an evaluation database.

Results are similar over the three studies, showing a general better performance (less bad construction practices) in most trained workers compared to the performance of untrained ones. In the vulnerability-focused cases the results are higher (75% on average), compared to the livability-focused ones, that remain at 63% on average of the three studies.

Regarding the direct impact in the housing conditions, most of the cases were situated in the unaffected / slightly positive positions, meaning that new interventions have not drastically affected the original condition of housing. This is considered as a good result compared to what would have happened if an untrained worker would have done the intervention.

INTRODUCTION

This report presents the summary of findings from three evaluations on intervention (construction works) performed by individual construction workers trained as part of the “Promotion of sustainable construction practices in Colombia’s vulnerable urban sectors” project during the periods 2015, 2016 and 2018.

The analysis focuses on the condition of intervened dwellings which is one of the two dimensions considered in the impact logic of Construya. The second dimension is the construction workers’ income increase, which has been analyzed through separate impact studies that are not in focus in this summary.

This assessment makes use of the data from case studies which have been collected along the years in which the impact study was carried out. This data was used to evaluate, in a synthetic manner, and in accordance with the methodology set forth in the project’s impact analysis, the conditions of housing units that were subject to construction works interventions.

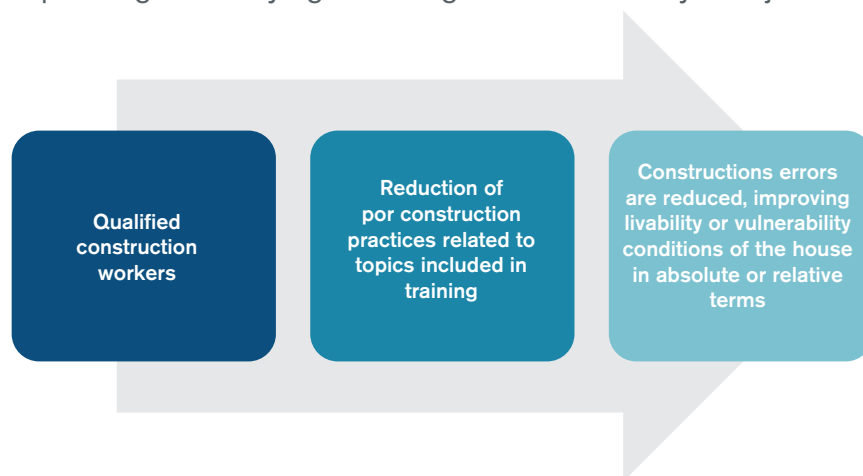


SCOPE AND METHODOLOGY

OBJECTIVE

UNDERSTANDING THE INCIDENCE

This study analyzes the performance of construction workers trained when conducting independent works, to validate the impact logic underlying the design of the Construya Project:



¹ SENA is the Colombian National Training Service, offering and implementing professional training in several productive activities and along the country.

For the study purposes, the following definitions are used:

<i>Absolute or effective improvement</i>	Dwelling condition is better than before the intervention took place.
<i>Relative or comparative improvement</i>	Dwelling is less affected (in terms of livability or vulnerability conditions) than if it had been intervened by a non-qualified construction worker.
<i>Qualified construction workers</i>	Refers to workers trained by SENA ¹ , applying the training modules developed by Construya Project. The said modules address punctual poor construction practices common among workers.
<i>Poor construction practices</i>	An in-depth study conducted by experts identified the most common bad practices applied by non-trained construction workers, leading to construction errors that ultimately affect housing conditions. See the Matrix of Bad Construction Practices in Annex 1.

METHODOLOGY

The methodology was developed jointly with the Program of Architecture of the Piloto University of Colombia, and it was led by Professor Carlos Agudelo.

It seeks to analyze the performance of trained master builders while they are executing a construction project. For this, the team in charge of the study made constant calls using the database of beneficiaries of the trainings. They asked whether

workers were carrying out or were about to start construction work, and their willingness to welcome engineers on site. The construction work also required specific characteristics (neighborhood of informal origin, single-family dwelling, linkage to the training taken by the master builder, acceptance of the owner to receive the visit). As a mean to facilitate the connection, this mechanism was promoted during the training courses held throughout the project, as well as through text messages sent to mobile phones of trained construction workers.

This methodology is naturally casuistic, as the application route is complex, not allowing scale. Despite this, and considering that there are not many similar exercises, this study has a relevant explicative and qualitative value, and we can expect that interventions of trained construction workers generate similar results to those presented here.

Finally, even when this method does not totally relieve the selection bias – in the sense that workers with certain characteristics respond to the call –, it is important to highlight that the sample keeps similar characteristics to that of the general construction workers.

GATHERING INFORMATION

The first step in the implementation of the evaluation methodology involves the gathering of information for each case. This is conducted mainly by students in their last semesters of the Architecture and Civil Engineering Programs by filling out an information-gathering tool (see annex 2) and by a detailed photographic record of the intervention made by the trained construction workers.

These students were trained in the use of the information-gathering tool, which was designed by the professors in charge of the impact assessment.

ANALYSIS

A second step entails the systematization, processing, and analysis of the gathered information, performed by the professor leading the study, and the support of Architecture and Civil Engineering professionals with extensive experience in livability conditions and seismic vulnerability areas. This data processing is done through an Excel interface, which links each case's report and assessment to an information consolidation database that serves as the basis for the reports shown herein.

ABOUT THE SAMPLE

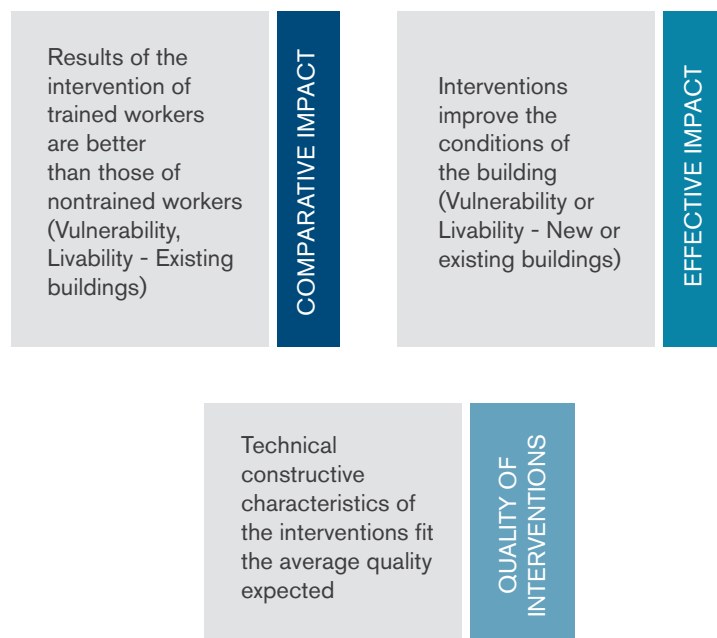
Results shown in this report are based on the revision of a number of cases that varies from year to year. In all the cases, it is not statistically representative but is considered as a solid casuistically exercise.

	2015	2016	2018
NUMBER OF CASES	34	80	60

For the impact calculation we consider those trained construction workers who a) participated in at least one full-fledge average forty hours course; or b) participated in at least three short average nine hours courses (acupunctures). Also, it was considered if the nature of their training was related to the work to be assessed.

ABOUT THE ASSESED DIMENSIONS

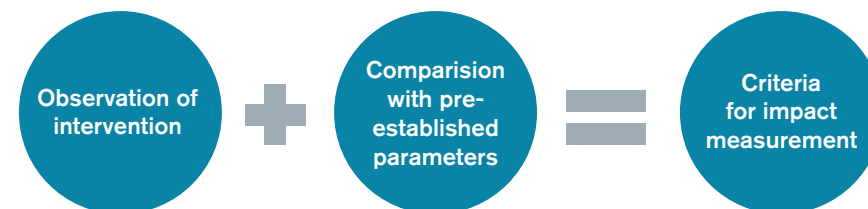
These evaluations intended to provide an overview of the impact that the Construya project had on the achievement of goals, primarily in terms of improving the living conditions of people in informally urbanized sectors. There are three dimensions that the project seeks to influence:



More details on the definitions of these three dimensions will be found in the correspondent sections. In this sense, the considerations to categorize the cases within the effective and comparative impact are:

	COMPARATIVE IMPACT	EFFECTIVE IMPACT	
SEISMIC RESISTANCE	Existing building	Existing building	New construction
	- Performance of the trained worker is better than a non-trained one, so the increase in vulnerability is less than in a comparable informal construction.	- An effective reduction of vulnerability is observed - The seismic resistance of the building is not affected	- The construction presents adequate conditions of seismic resistance
LIVABILITY	Existing building	Existing building	New construction
	- Performance of the trained worker is better than a non-trained one, so the livability conditions are less affected than in a comparable informal construction.	- Improvement in livability is observed	- The construction presents adequate livability conditions

For this purpose, the process implies a combination of observation and comparison expressed in the following graphic:



GENERAL CONSIDERATIONS

ON THE TYPE OF TRAINING

Construya has been promoting its partners to offer construction workers three types of technical courses, related to the following topics: Vulnerability, Livability conditions and Pathologies, with the latter falling into the category of seismic vulnerability. This information is relevant, as the assessment focuses on dimensions of the construction work related to the training or trainings received by the worker.

ABOUT EVALUATION CONDITIONS OFFERED

It is important to take into consideration that the evaluation sample for the assessed indicators is affected by the following aspects:

- a) A segmentation of evaluated interventions is given based on seismic vulnerability and livability conditions aspects in order to include indicators established by Construya. Consequently, the cases are distributed among those that deal with one topic or the other; thus, the actual sample for the analysis by

indicator is lower than the total of interventions visited. However, since it is a non-quantitative analysis, this factor does not affect the consistency of findings.

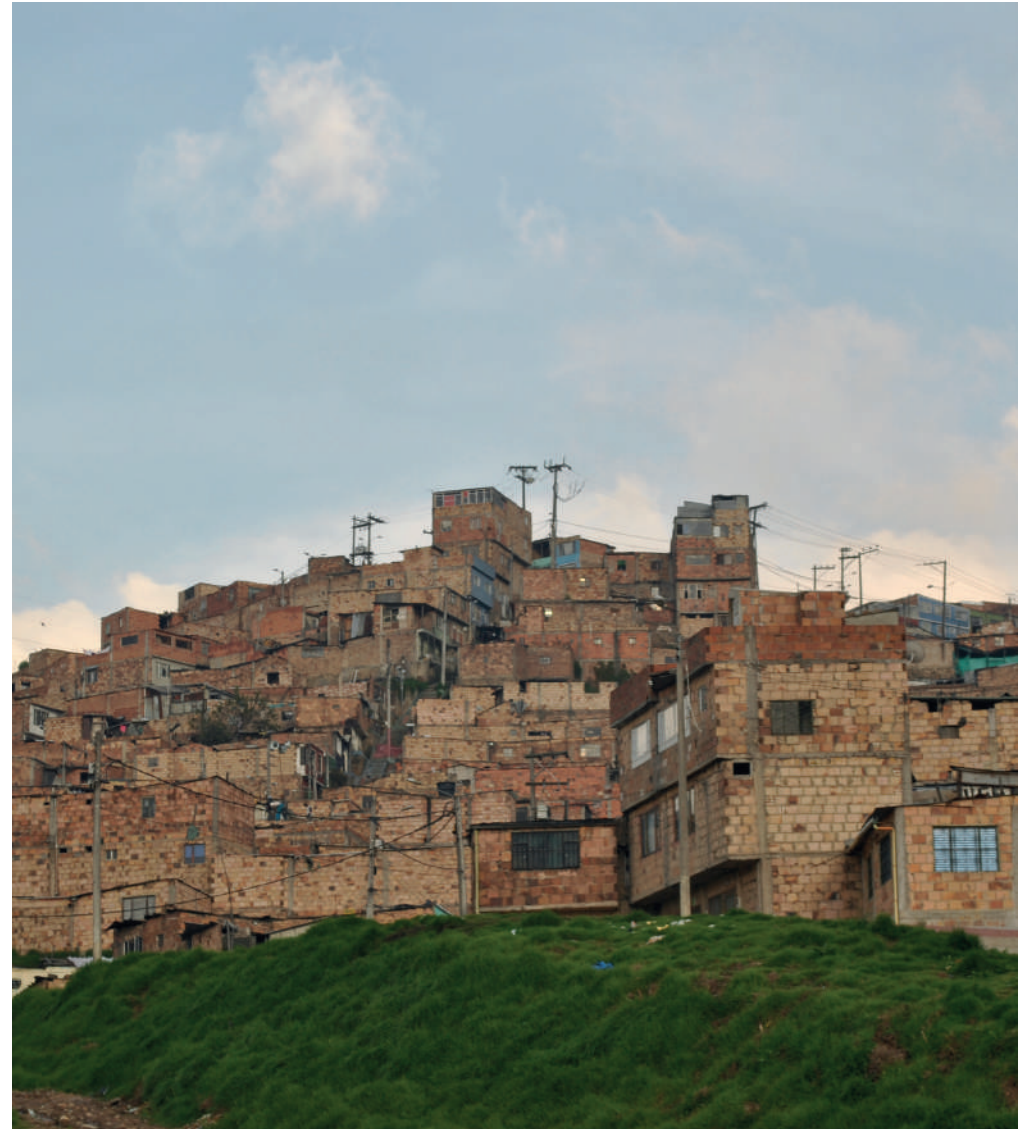
- b) The assessment of indicators depends on the coherence between the course passed by the trainee and the type of work he/she is executing. In this sense, it only evaluates aspects (seismic vulnerability and/or livability conditions) in which the individual had the knowledge and ability to properly execute the intervention, having in mind the course he or she participated in. For example: The seismic vulnerability aspect is not evaluated in a construction endeavor when the participant has only been trained in the topic of livability conditions. This condition tends to reduce the evaluation sample within one aspect or another.



GENERAL CHARACTERIZATION OF CASES EVALUATED

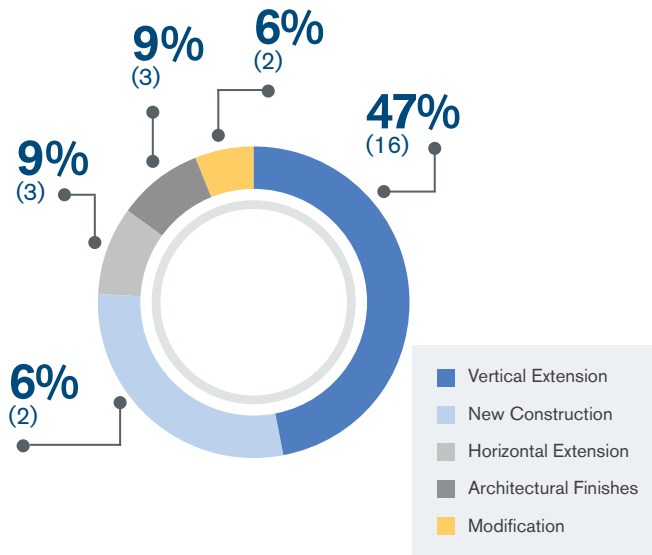
In all three studies, the category most analyzed was vertical extensions, which households most commonly request, followed by new constructions. Other categories as horizontal extensions, retrofits, reinforcement, etc., vary from year to year.

As for the courses preferred by the master builders, in 2016 and 2018, vulnerability-related subjects predominated, whereas in 2015, there was a more even distribution between vulnerability and livability topics.



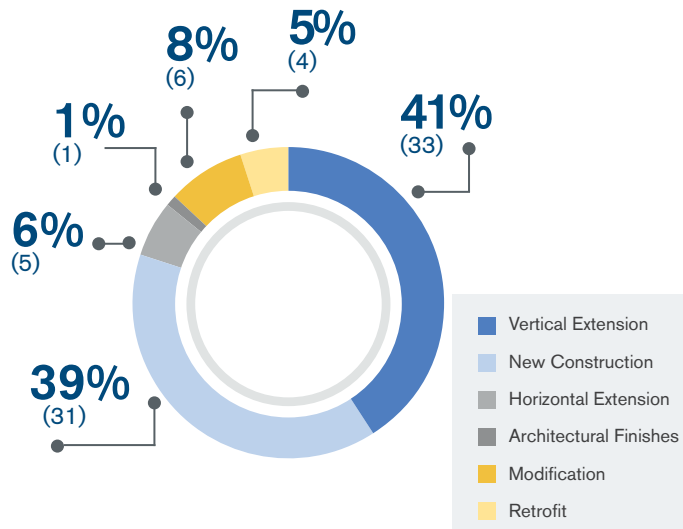
INTERVENTION TYPE BEING ASSESSED

2015



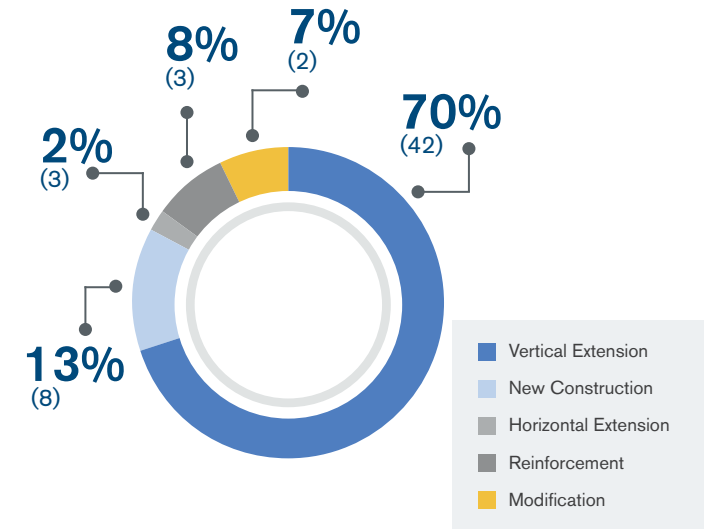
Vertical enlargement	16
New construction	10
Horizontal enlargement	3
Architectural finishes	3
Modification	2
TOTAL	34

2016



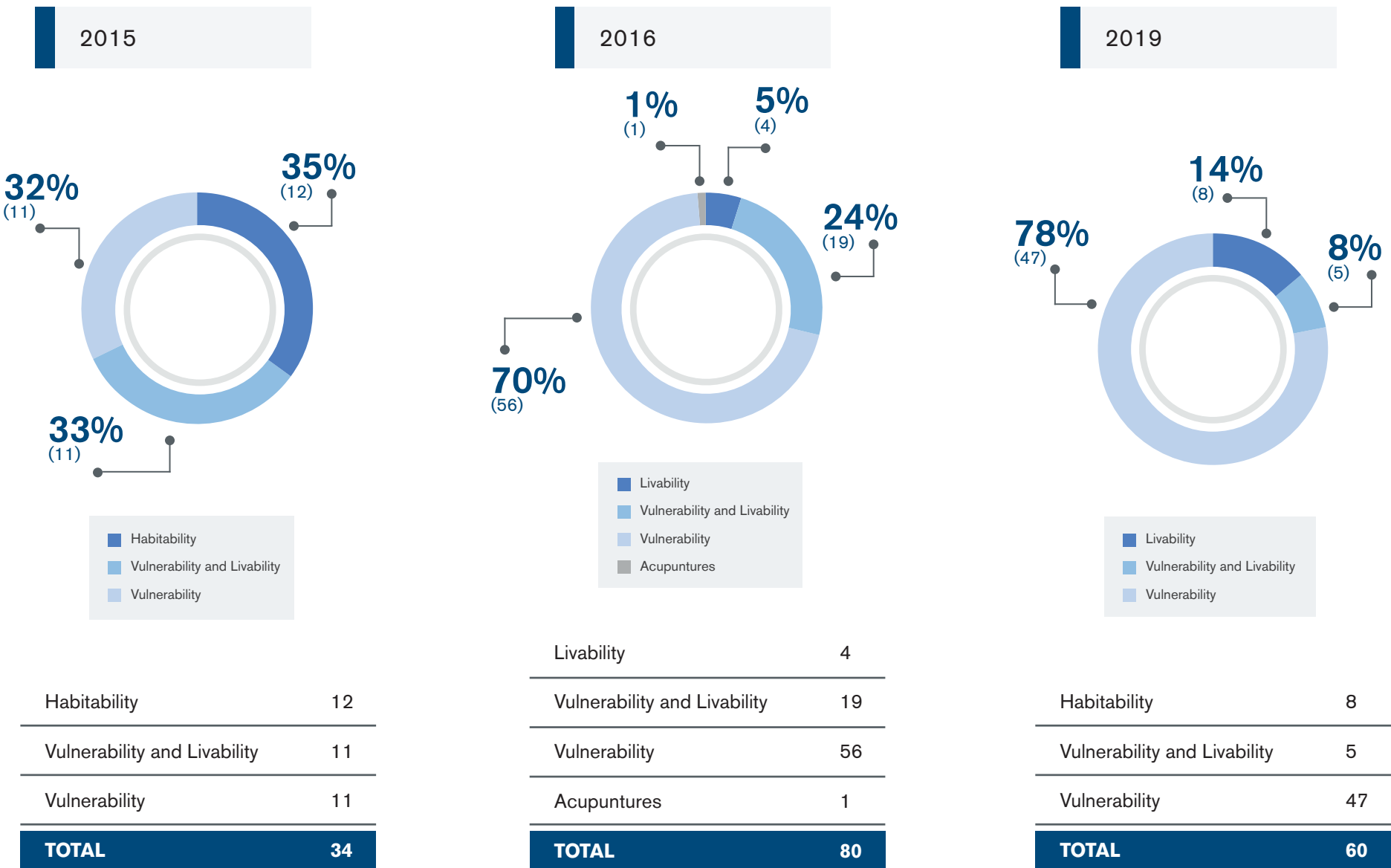
Vertical enlargement	33
New construction	31
Modification	6
Horizontal enlargement	5
Retrofit	4
Architectural finishes	1
TOTAL	80

2019



Vertical extension	42
New construction	8
Horizontal extension	1
Reinforcement	5
Modification	4
TOTAL	60

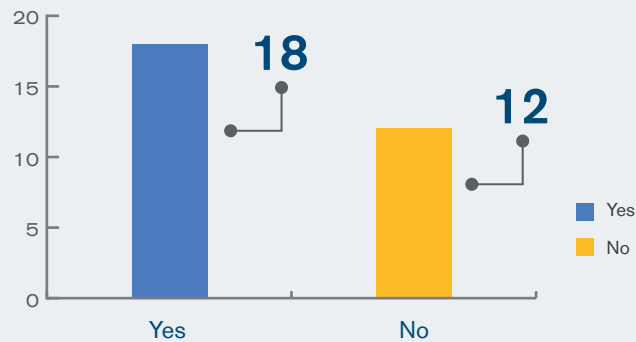
TYPE OF TRAINING TAKEN BY ASSESSED WORKERS



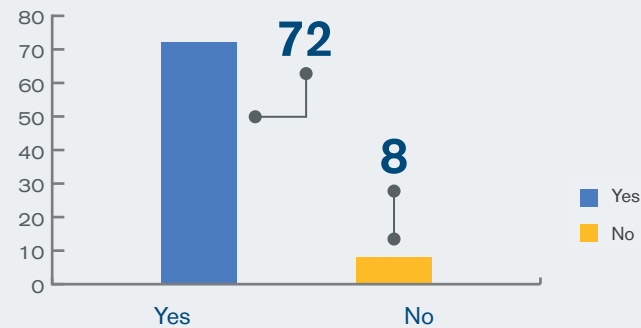
APPLICABILITY OF ASSESSMENT BY CASE TYPE

2015

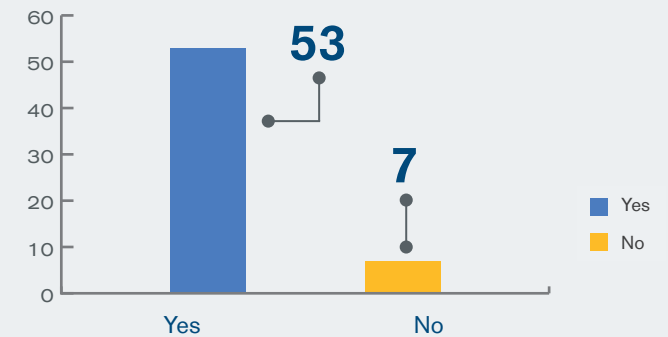
Cases that applied for seismic vulnerability evaluation



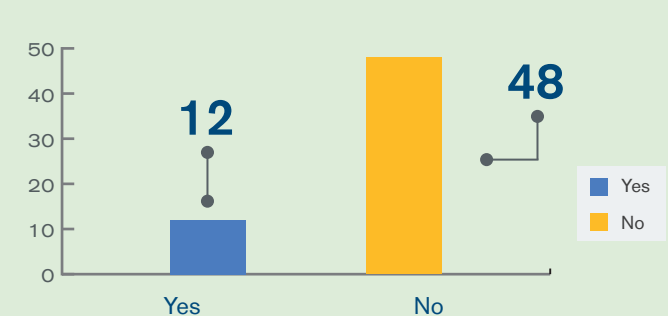
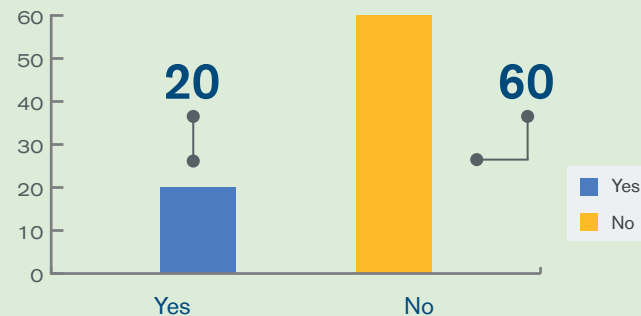
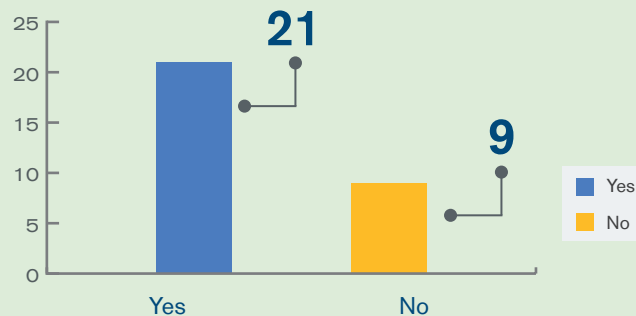
2016



2019



Cases that applied for liveability evaluation



EVALUATION OF THE COMPARATIVE IMPACT

This indicator intends to establish whether the qualified construction worker's performance differs from the work commonly executed in informal sectors by non-qualified personnel.

To make the comparative analysis, we assess the occurrence of poor construction practices on the work site versus the most common poor practices present in interventions conducted by untrained workers (See Annex 1). This list of bad construction practices was elaborated by the project, methodology based on a study developed by experts in 2001² and is also the tool used for designing the content of the training modules promoted by Construya. The analysis of the comparative impact is done separately for vulnerability and habitability issues, being the parameter that in cases exceeding 70% of common poor practices, the work of the construction workers will not differentiate from the work of the non-trained worker.

The results show better performance in most trained workers, increasing the percentage from year to year. In the vulnerability-focused cases the results are higher (75% on average), compared to the livability-focused ones, that remain at 63% on average of the three studies.

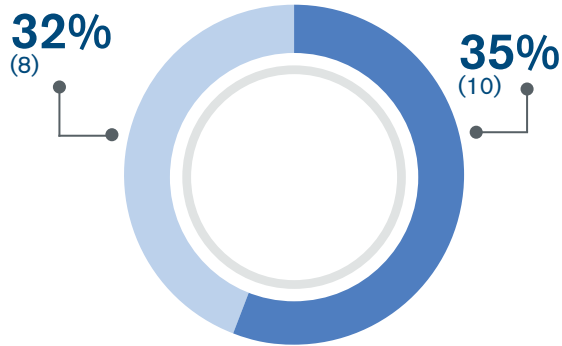
² Estudio de Vulnerabilidad Sísmica y Reforzamiento Estructural de las construcciones típicas de treinta tipologías de vivienda, pertenecientes a las familias con ingresos inferiores a 2 SMLMV en la localidad de Ciudad Bolívar de la ciudad de Bogotá D.C. Alcaldía Mayor de Bogotá e I.P.I., Octubre de 2001



EVALUATION OF THE COMPARATIVE IMPACT

2015

Vulnerability



■ Better than untrained builders
■ Similar to untrained builders

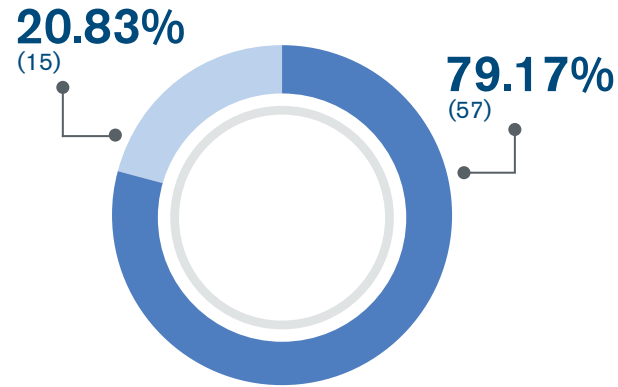
Better than untrained builders 10

Similar to untrained builders 8

TOTAL 18

2016

Vulnerability



■ Better than untrained builders
■ Similar to untrained builders

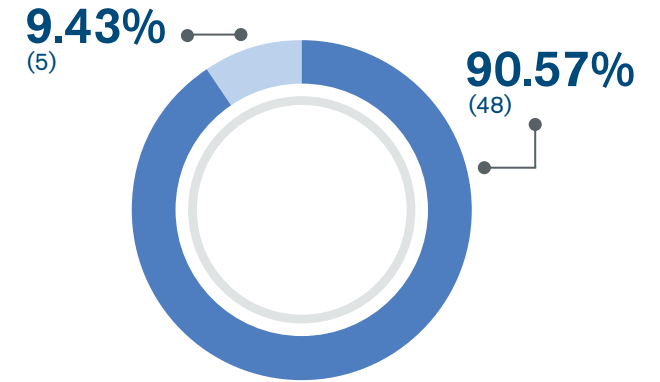
Better than untrained builders 57

Similar to untrained builders 15

TOTAL 72

2019

Vulnerability



■ Better than untrained builders
■ Similar to untrained builders

Better than untrained builders 48

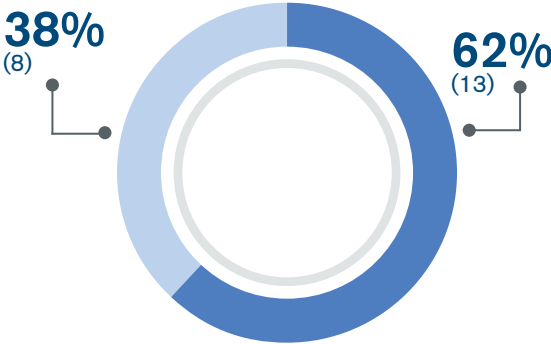
Similar to untrained builders 5

TOTAL 53

EVALUATION OF THE COMPARATIVE IMPACT

2015

Livability



■ Better than untrained builders
■ Similar to untrained builders

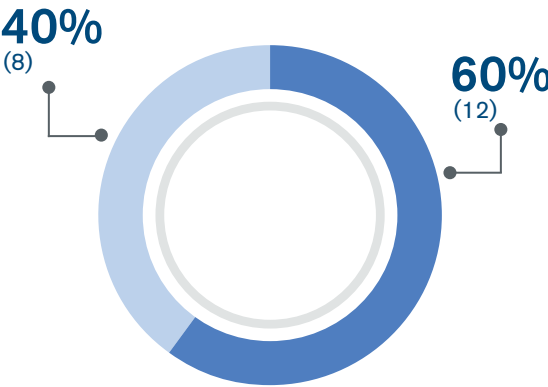
Better than untrained builders 13

Similar to untrained builders 8

TOTAL 21

2016

Livability



■ Better than untrained builders
■ Similar to untrained builders

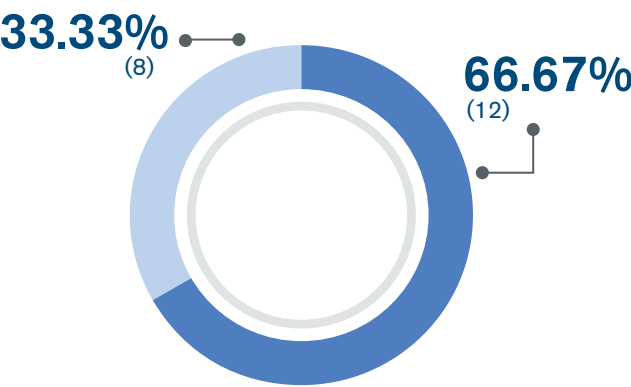
Better than untrained builders 12

Similar to untrained builders 8

TAL 20

2019

Livability



■ Better than untrained builders
■ Similar to untrained builders

Better than untrained builders 12

Similar to untrained builders 8

TAL 20

EVALUATION OF THE EFFECTIVE IMPACT

In this dimension, improvement is reflected in more suitable conditions for residents of the intervened informal houses through:

- a) the reduction or not increasing of physical vulnerability; and/or
- b) the improvement or not affectation of livability conditions of dwellings, related to comfort and functionality.

For all purposes, the following categories were considered to assess the response to initial seismic-resistance and livability conditions:

It is worth mentioning that the possibility of having a positive influence over vulnerability conditions of informal dwellings is limited, for reasons such as the structure of the self-build housing units, reduced owner investment, terrain conditions. In this sense, even not affecting the initial conditions may be considered a positive state of affairs, as opposed to works carried out by untrained workers, which usually lead to an increase in negative vulnerability conditions.



A similar analysis is valid for livability or habitability aspects. The usual tendency and situation are that the works affect the habitability of the dwelling, as they tend to reduce ventilation and lighting.

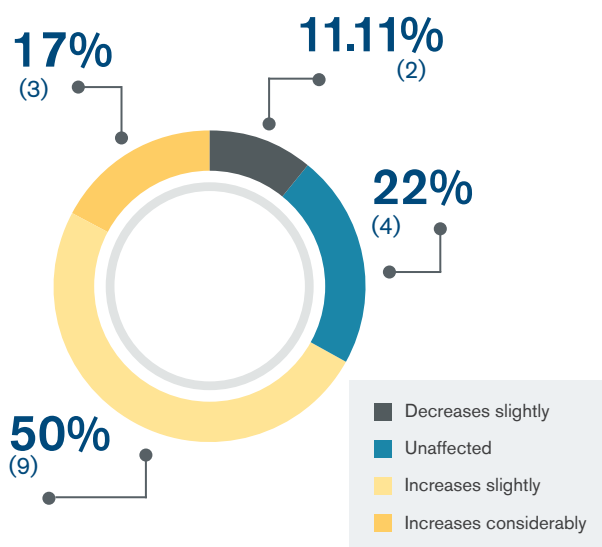
Regarding seismic resistance vulnerability, in the three impact studies we see that the number of cases with a considerable increase of seismic risk after the master builder's intervention are the least cases, but there were also few cases in which the master builder was able to considerably decrease the said risks. As anticipated, most of the cases were situated in the no effect / slightly decreased positions, which are also considered as a positive result compared to what would have happened if an untrained worker would have done the intervention.

As for livability aspects, results show that there were very few cases where conditions were considerably improved, and the majority of interventions were able to avoid affecting dwellings conditions, or slightly improve the mentioned dimension.

EVALUATION OF THE EFFECTIVE IMPACT

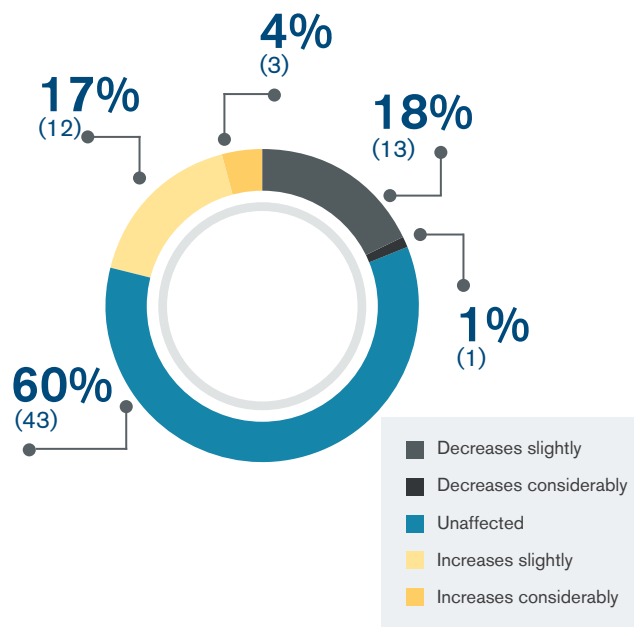
SEISMIC VULNERABILITY

2015



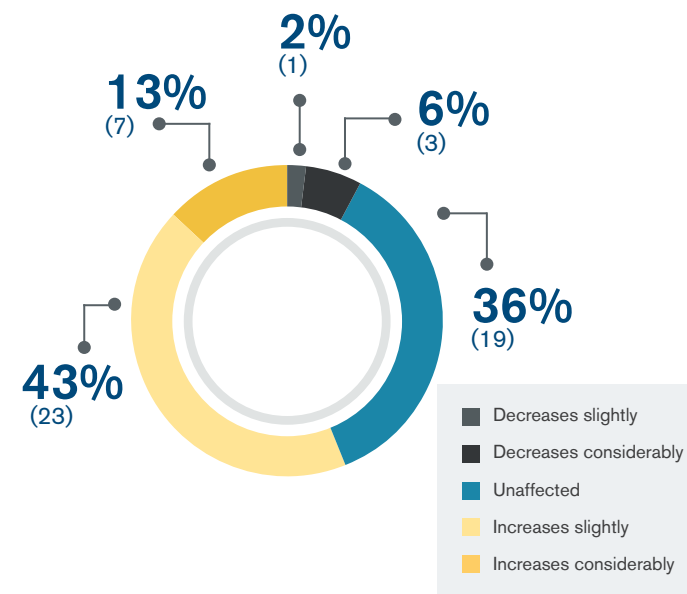
Decreases slightly	2
Unaffected	4
Increases slightly	9
Increases considerably	3
TOTAL	18

2016



Decreases slightly	1
Decreases considerably	1
Unaffected	43
Increases slightly	12
Increases considerably	3
TOTAL	72

2018

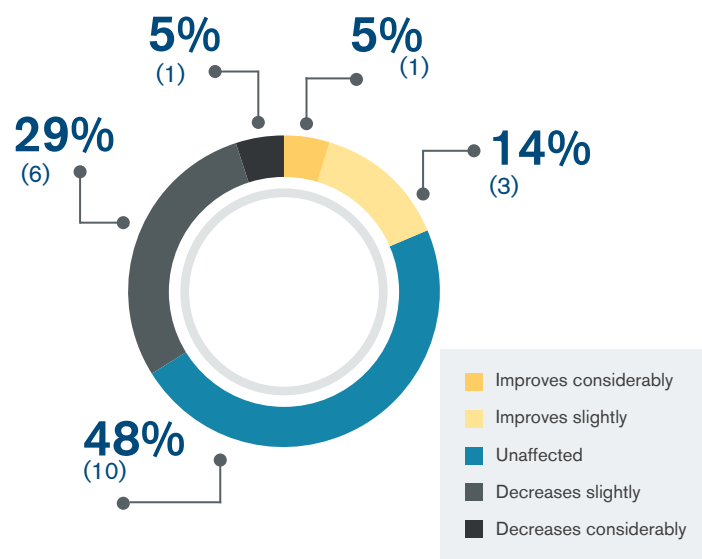


Decreases slightly	1
Decreases considerably	3
Unaffected	19
Increases slightly	23
Increases considerably	7
TOTAL	53

EVALUATION OF THE EFFECTIVE IMPACT

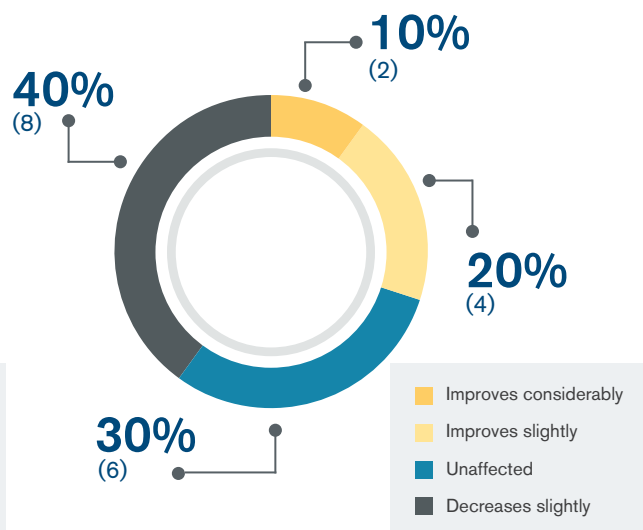
LIVABILITY CONDITIONS

2015



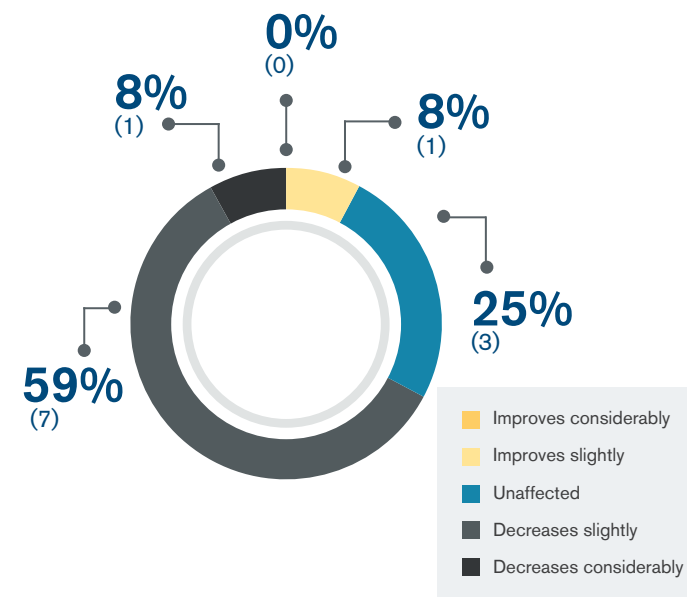
Improves considerably	1
Improves slightly	3
Unaffected	10
Decreases slightly	6
Decreases considerably	1
TOTAL	21

2016



Improves considerably	2
Improves slightly	4
Unaffected	6
Decreases slightly	8
TOTAL	20

2018



Improves considerably	0
Improves slightly	1
Unaffected	3
Decreases slightly	7
Decreases considerably	1
TOTAL	12

QUALITY OF INTERVENTIONS

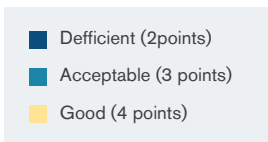
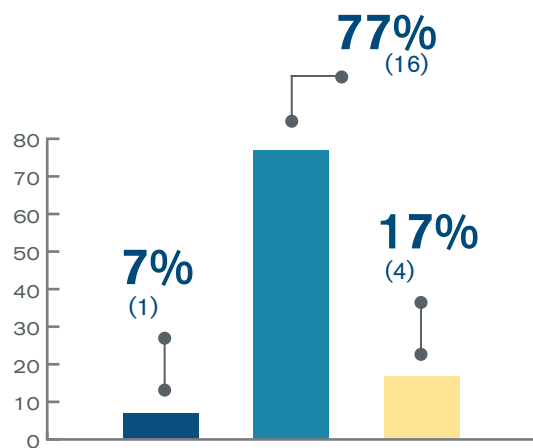
This indicator is separate from the influence over dwellings' vulnerability and livability conditions and focuses on the assessment of the technical-constructive characteristics of the interventions. This means that the intervention is globally qualified based on the compliance with acceptable conditions in terms of technical construction parameters; e.g. whether specific activities were properly carried out (proper application of the mortar, cladding, concrete casting, etc.) even though built or intervened elements may work well or poorly in terms of seismic-resistance and related to livability conditions.

There are very few cases where the performance was deficient, and most of them were considered acceptable or good.



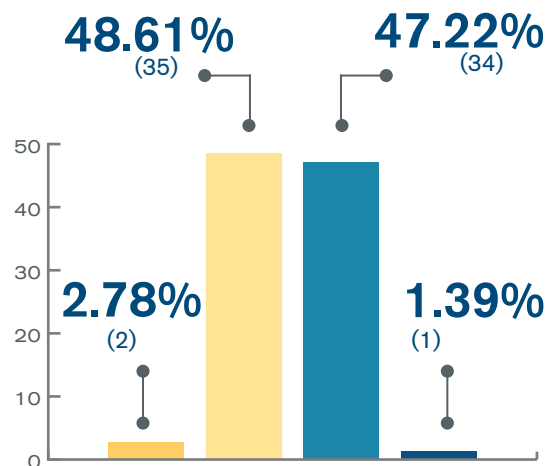
QUALITY OF INTERVENTIONS

2015



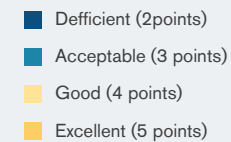
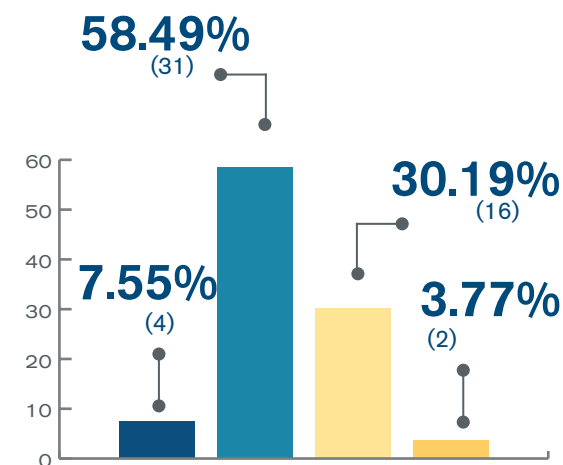
Defficient (2 points)	1
Acceptable (3 points)	16
Good (4 points)	4
TOTAL	21

2016



Defficient (2 points)	1
Acceptable (3 points)	34
Good (4 points)	35
Excellent (5 points)	2
TOTAL	72

2018



Defficient (2 points)	4
Acceptable (3 points)	31
Good (4 points)	16
Excellent (5 points)	2
TOTAL	53

CONCLUSIONS

The results of the three studies show a similar tendency, validating the project's theory of change. Improving the capacities of the master builders has a positive impact, as in most cases, it allows not affecting or reducing the damage to dwellings. This occurs more frequently than when the master builders have not been trained to apply better construction practices.

On the other hand, the methodology designed is complex to apply. It requires a database of trained workers and a team to contact several of them to find ongoing interventions. After that, the acceptance of the homeowners and the worker himself requires a negotiation. That's why the methodology is difficult to replicate if no implementing platform or project is in place.

ANNEXES (in Spanish)

1. Bad construction practices matrix
2. Case information gathering form.
3. Case systematization and evaluation Interface.

