Social Contribution of Housing on Vulnerable Populations: A Case Study for the Region of La Araucanía

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Abstract. Within the framework of social sustainability, the studies that measure the contribution of houses allocated to the country’s most vulnerable population are limited. This article presents a case study that assesses the contribution of a social housing project to social sustainability in the Region of La Araucanía, Chile. Here, the degree of social contribution for the Amuley Ruka project in Pitrufquén, Region of La Araucanía is determined. In this study, a pre-post assessment was used by triangulating the data obtained in field visits, interviews and document reviews. Thus, appropriate indicators were adjusted to measure multiple evaluation criteria and the measurement scales were standardized. All this makes it possible to determine the vulnerable situation of the beneficiaries, the effects on the context and the criteria to improve. The results obtained clarify the partial and total contribution of the social housing project. It is detected that the criteria “Connectivity and access” and “Family support” do not present significant differences resulting from the project. In addition, the criteria “Community Health and Safety” and “Recreation infrastructure” show a reduction in their contribution with respect to the social housing intervention.

1. Introduction

At the moment infrastructure projects have very little consideration for the social aspects in assessment and planning. This is because the projects are not developed with an approach to social sustainability, nor is the importance of this as a benefit for people understood [1]. Authors like Sierra et al. [2] have implemented a methodology to determine the contribution of social sustainability considering the social effects of infrastructure planning, design and construction.

Although assessment methodologies and studies with approaches to social sustainability have been developed, nowadays there is no evidence of real cases implemented in Chile that determine the social contribution of a housing project, nor has how to adapt sustainability criteria to a specific context been discussed. In recent studies like the Barra case (2019), different criteria are presented for the evaluation of the social contribution in houses in the Region of La Araucanía. These criteria are related to several aspects of housing and the neighborhood where there is a social housing project, serving as tools to assess the living conditions that exist within a neighborhood, as well as identifying cultural elements, diversity among the residents, infrastructure needed for disabled people, conditions in agreement with the legitimacy of the project, among others [3].
This article seeks to determine the degree of social contribution of social housing for families in the country’s most vulnerable 40% from a case study applied to the Amuley Ruka project in Pitrufquén, IX Region of La Araucanía. To this end, this article presents the theoretical background to position the case study, then the research methods and the results are given. Finally, the discussion and the conclusions are provided.

2. Theoretical Background
There are studies that address the concept of social sustainability and relate it to the understanding of fairness, the eradication of poverty and to ensuring that all the social strata benefit from the country’s economic growth [4] [10]. Barra (2019) posits different criteria that can measure the social sustainability of a housing project. From this study a list of fourteen criteria was obtained that address specific subjects to do with housing and the neighborhood, applicable to the context of the case study.

3. Methodology
3.1. Selection of case study
The following criteria were used to choose the case study:
- The project must belong to Chile’s housing selection solidarity fund according to Supreme Decree N° 49, which is allocated to the most vulnerable population with no borrowing capacity [5].
- The geographic coverage of studies must be accessible to the research group. The project must be located in the Region of La Araucanía.
- Accessibility to information about the project according to availability of public offices of the Housing and Urban Planning Service (SERVIU) for La Araucanía.
- The project must be in the megaproject category. As per Supreme Decree N° 498, a megaproject is designed for a maximum of 600 people and where a maximum of 160 applicants participate in several calls [6]. This will permit significant results to be obtained for a population set.
- The project must be recent, with no more than a year since its delivery. This enables the interviewed/surveyed beneficiaries to remember the living conditions prior to receiving their current house.

Figure 1. Social criteria for the planning of a social housing project. Source: Barra, 2019.
3.2. “Amuley Ruka” case study
According to the case study selection criteria, the project chosen was “Amuley Ruka”, located in Pitrufquén, Region of La Araucanía. With an ethnic orientation, this megaproject is called “Amuley Ruka”, which in Mapudungun means “Returning home”. The project benefits 305 people through the construction of 80 one-story houses and basic urbanization services.

3.3. Research stages
Figure 2 illustrates the research process in three stages. First is the selection of criteria applicable to the case study. Then, the indicators and their measurement parameters are identified. Finally, the information from a preliminary measurement is reviewed and the variations are standardized. The overall result of all criteria determines the degree of social contribution of the project. Figure 2 provides the timeline of this study associated with each stage of the research.

![Figure 2. Research stages. Source: Prepared by authors.](image)

3.3.1. Input

3.3.1.1. Social criteria for housing projects
In principle the social criteria were obtained from the study by Barra (2019). Indicators were established that can be applied to the context of the case study and the data obtained from these indicators can be measured, prior to delivery of the project and after a year of operation.

3.3.1.2. Project background
The technical and administrative background of the Amuley Ruka project in Pitrufquén included plans, technical specifications, overall budget, calculation reports and assigned complementary subsidies. This information was contributed by the project consultants and contractors.

3.3.2. Stage 1
In the first stage of the research process the most suitable indicators to measure the assessment criteria in the case study were established. This stage lasted approximately 3 working weeks.
3.3.3. Stage 2
In this stage, the way to measure each indicator identified in stage 1 was determined. Care was taken to establish an objective measurement system that could comparatively standardize the previous results with the later results. To do this, assessment instruments like surveys, field visits and document review were used. Figure 3 shows the measurement strategies corresponding to each indicator. The situation before the project is indicated as “Pre” and the evaluation after a year of operation is indicated as “Post”.

Figure 3. Indicator measurement strategies
Surveys collect background on the living conditions and capture the respondent's impression. Prior to their implementation, they were validated by experts, with the support of 7 specialists and 8 respondents who were part of the sample. This made it possible to adjust the logistical techniques of consultation and to improve the formulation of the questions.

To determine the sample \( n \) of beneficiary families, Equation 1 is used, based on the method by Vallejo [7]. The sample \( n \) of people surveyed corresponds to the beneficiaries of the Amuley Ruka project in Pitrufquén, which is 80 families.

\[
n = \frac{N \times Z^2 \times p \times q}{D^2 \times (N - 1) + Z^2 \times p \times q}
\]

**Equation 1.** Determination of the universe of people to survey.

\( N \): Sample of people to survey  
\( D \): Sample error (+-6%)  
\( Z \): Factor obtained from normal distribution (1.96)  
\( pq \): Factor of variance (50%)

Thus, a sample of 62 families was obtained for the survey, with a 95% confidence level. The surveys were applied by the research team to the heads of the household to be more accurate in the questions related to expenses and living conditions in the home.

3.3.4. **Stage 3**

In this subsection the results of the measurements from Stage 2 are processed. In addition, the standardization of the measurement of each criterion and its respective indicators appears. In Figure 4 -Multicriterion assessment structure- indicators are linked to social criteria. These indicators are standardized according to a standard quantitative measurement scale that defines the degree of impact for each social aspect.
| Social Criterion | Indicator | Standardization |
|------------------|-----------|-----------------|
| Identity and Culture in the neighborhood | Diversity in the neighborhood | Point scale from 1-4. 4 being the greatest contribution. Evaluates the diversity index. |
| Recreation infrastructure in the neighborhood | History of recreation infrastructure | Point scale from 1-4. 4 being the greatest contribution. Evaluates recreation infrastructure. |
| Consideration of public opinion | Participation of beneficiary and legitimacy of the project | Point scale from 1-4. 4 being the greatest contribution. Evaluates the legitimacy of the beneficiary with the project. |
| Comfort inside the house | Outward appearance and state of preservation of the house | Point scale from 1-4. 4 being the greatest contribution. Evaluates the energy demand of the house. |
| Improvement in family economic availability | Savings on energy | Point scale from 1-4. 4 being the greatest contribution. Evaluates energy demand. |
| Spaces for family development | Savings on transportation | Point scale from 1-4. 4 being the greatest contribution. Evaluates increased transportation spending. |
| Integration of the design in the context | Occupancy condition of the house | Point scale from 1-4. 4 being the greatest contribution. Evaluates the occupancy condition of the house. |

Municipal ordinance operates the same way as any other sector in Pitrufquén; therefore, there is no significant variation in the social contribution.

Point scale from 1-4. 4 being the greatest contribution. Evaluates the stability of the board.

Point scale from 1-4. 4 being the greatest contribution. Evaluates actions taken by the committee.

Point scale from 1-4. 4 being the greatest contribution. Evaluates the capacity of basic services.

Point scale from 1-4. 4 being the greatest contribution. Evaluates the energy demand of the house.

Point scale from 1-4. 4 being the greatest contribution. Evaluates bothersome noise.

Point scale from 1-4. 4 being the greatest contribution. Evaluates disruption to the landscape.

Point scale from 1-4. 4 being the greatest contribution. Evaluates degree of overcrowding.

Point scale from 1-4. 4 being the greatest contribution. Evaluates increased transportation spending.

Point scale from 1-4. 4 being the greatest contribution. Evaluates spending on energy consumption.
3.3.5. Output

3.3.5.1 Social Contribution

Following Jeon (2014), the rate of contribution to the post-project situation in all its variations to social contribution is calculated. The contribution rate is the quotient between the post-project situation and the highest assessment on the standardization scale. The average social contribution of all the criteria and their respective indicators will reflect the degree of total contribution of the project [8]. Thus, the degree of contribution of the case study project is 68.65%. Figure 5 shows the contribution of the project to each social criterion represented by thirteen axes. The added area of the contribution hub of each axis determines the social contribution of the project. Each axis is measured on a qualitative scale of four percentage points.
4. Discussion

During the development of the case study, different observations and important points also arose that are detailed next. In the current prioritization processes for social housing projects it was clear that land possession or acquisition is a key element that determines the selection [9]. Land acquisition is one of the most important problems in social housing projects as this determines the location, access to services and most of the indicators mentioned in this study. If the aspects related to the location of the project are not addressed within the framework of social sustainability, it is highly likely that the contribution of a project will be low based on the criteria of this study [1].

From the results of the contribution, the criteria “Community Health and Safety” and “Recreation infrastructure” were the only criteria that reduced the social contribution compared to the conditions without a project. This is because most of the people lived in the central area; therefore, the change of residence moved them away from services and recreation areas. This reflects the effect of social housing projects in positioning themselves in peripheral areas. Although Pitrufquén is not a large city, this issue can be found on a larger scale in metropolitan areas.

The criteria “Improvement in economic availability”, “Connectivity and access” and “Family support” remained steady with respect to their contribution. Indeed, a large part of the population sample already belonged to the commune of Pitrufquén, so the indicators associated with these criteria did not detect any differentiation. Regarding the “Improvement in economic availability” and residential complex, no significant changes were demonstrated in energy-related expenses despite having new houses that comply with the current energy regulations and adequate insulation.

The criteria “Leadership of the board” and “Motivation for family wealth” are connected, since the organization for the PPPF (program to protect family property) subsidies depends on the same board. The criteria mentioned obtained 100% social contribution. Similar studies such as that by Martinez et
al. (2015)[10] present criteria comparable to this assessment. In this case the different types of housing do in fact determine the importance of social interaction with respect to population density.

The results of this study are valid considering the following limitations. The case study had some differentiation conditions, limited by the proximity of the beneficiaries' pre- and post-assessment residence. In other words, as most of the beneficiaries are from Pitrufquén, some indicators of the criteria did not show any variability. In addition, due to the small number of D.S. N°49 megaprojects in the Region of La Araucanía, the number of projects that fulfilled the selection criteria for the case study was limited. This reduced the data sources.

5. Conclusions

The degree of social contribution of social housing for families belonging to the most vulnerable 40% of the country was determined in the case study of the Amuley Ruka project in Pitrufquén, Region of La Araucanía, Chile. The resulting degree of social contribution was 68.65%. The social contribution of the project was determined by an analysis of multiple social criteria selected from the study by Barra (2019). The criteria suitable to the study context were: Community health and safety, Neighborhood integration, Integration of the design in the context, Spaces for family development, Improvement in economic availability, Identity and culture in the neighborhood, Recreation infrastructure, Consideration of public opinion, Comfort inside the house, Connectivity and access, Leadership of the board, Family support and Motivation for Family Wealth.

For these criteria indicators were determined to standardize on measurement scales, allowing the comparison of the situations “Before the project” and “After delivery of the current house”.

Within the framework of social sustainability, this study is one of the few that addresses an implementation to determine the social contribution in support of decision-making in a specific case study. This makes it possible to continue exploring studies that address the assessment of infrastructures in different contexts, mainly in regions with other demographic characteristics. The option to seek out methods to improve the standardization of the data used in this study or to develop specific methodologies for the assessment of social housing projects is also possible. This study can serve as a model to be replicated in other case studies, and it shows potential improvements in the social housing design and planning processes to contribute to the sustainability of a context in Chile.

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