# Adaptability and Resilience through Post-Occupancy Evaluation and Co-Production: The Brazilian Case

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**Abstract**
The current social and climatic changes require urgent revision of urbanization strategies around the world, to reduce environmental and social impacts, as well as to develop the resilience of built environments. Regarding affordable housing in Brazil, the poor condition of its architecture and planning increases the social and environmental vulnerability, especially affecting the dwellers of the social housing complexes.They are forced to make adaptations in their buildings, which are frequently unable to be modified, leading to the inefficient use of resources as well as risks to safety. Additionally, the marginal location of these complexes cause physical and social segregation, expanding the environment's negative effects. Despite all these difficulties, families benefited by social programs keep adapting to their scenarios, surviving the unexpected, and (re)inventing themselves according to their needs. It demonstrates their resilience, which is considered as an adaptive capacity or the faculty for recuperation from impacts (natural, social, physical). Thus, the focus of this paper is to present the research in progress named Adaptability and Resilience in Social Housing Complexes through Post-Occupancy Evaluation and Co-Production[1], developed by the study groups [MORA] housing research of FAUeD/Federal University of Uberlândia and [People, Environment and Performance] from the SSoA, University of Sheffield/TUoS. This project studies a Brazilian social complex named Shopping Park, where advanced Post-Occupancy Evaluation (POE) and Co-Production techniques have been applied. The aim is to explore knowledge about social housing complexes, identifying aspects to improve in future projects. In addition, through the Co-production technique, data have been collected which can also support the proposition for immediate improvements at the neighborhood in order to develop their resilience. Finally, the established partnership between academics and non-academics can reach significant public benefits, encouraging an environment of empowerment and engagement.

**Keywords:** Resilience; Adaptability; Social Housing Complexes; Post-Occupancy Evaluation; Co-Production.

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## 1. Resilience as an Answer

Current social and climatic changes and their unpredictable effects have required an urgent revision of urbanization strategies around the world. Thus, it is known that there is a need to reduce the environmental and social impacts, as well as to develop resilience in buildings and communities.

The term resilience has several meanings according to the area of study. It can refer to the characteristics of an object, system, or a particular location. Considering this case study — research at a social housing community — resilience is defined by the ability of a system to absorb changes, self-organize and increase its capacity for learning and adaptation (Cumming, 2011). In other words, it is the ability of a community to adaptively respond to change rather than simply returning to a pre-existing state (Maguire & Cartwright, 2008).

The term resilience is often used where natural disasters and/or absence of natural resources are common. However, this research focuses on a resilience study in Brazil's social housing complexes, which frequently have to overcome socioeconomic and also environmental difficulties. In order to have a better understanding of historic social housing issues in Brazil, it is necessary to comprehend its accelerated urban growth, which happened between 1940 and 2010. According to UN-HABITAT (2010), during that period the urbanization rate in Brazil increased from 40% to over 85%, which means about 165 million

people were leaving rural areas and moving to cities. That caused a housing shortage, since the demand of housing was higher than the government could offer. Consequently, several Brazilian cities experienced a spreading and peripherization process, which has affected people's quality of life.

One attempt to solve the country's huge housing shortage and at the same time stimulate economic growth was the creation of the program Minha Casa Minha Vida (My House, My Life) in 2009 through a partnership between the Brazilian government and the private sector. One of the strongest points of this project was to offer about 3.4 million housing units for low-income families up to 2014. There is no doubt that the program has improved partially the country's housing shortage. However, it has failed to provide to the Brazilian people the quality cities that they desire (Hehl, 2014). This lack of quality can be easily identified by some common characteristics at the Minha Casa Minha Vida allotments — such as the low-quality architecture, the inefficient urban integration, the lack of adequate infrastructure and amenities (public transport, sanitation, and public facilities), and the standardization of building types and sizes (inappropriate to the family contingent). In addition, a spatial and social segregation is often apparent because the settlements are usually located on the outskirts of the cities, where land is cheaper. Thus, public-private partnership for the promotion of social housing has certain inconsistencies. In other words, the design and planning processes that try to solve the Brazilian housing deficit have been driven by loud voices, seeking profit and focusing only on the immediate needs of humans.

The focus of this paper is to present the research in progress named Adaptability and Resilience in Social Housing Complexes through Post-Occupancy Evaluation and Co-Production, developed by the study groups [MORA] housing research of Faculty of Architecture and Urbanism and Design/Federal University of Uberlândia in Brazil and [People, Environment and Performance] from the School of Architecture, University of Sheffield in England. The analysis focuses on exploring knowledge about social housing complexes identifying aspects to improve in future projects through advanced Post-Occupancy Evaluation (POE) and Co-production techniques. However, this paper will concentrate on demonstrating the Co-production methodologies and its potential. This is because this technique has been showing that a partnership between academics and non-academics can achieve significant benefits, encouraging an empowerment and engagement environment, mainly for the residents of the social complexes, consequently increasing the local resilience.

## 2. Learning Objectives

The main objectives related to the research are:

- To explore the Co-production methodologies in order to promote empowerment, engagement and immediate improvements at the social housing complex studied, seeking to increase the local resilience;
- To provide detailed guidelines for more adaptable and resilient upcoming housing projects in a local context, proven through a real case study on POE in association with Co-production techniques;
- To put into practice the developed methodology for the evaluation of resilience in areas of social housing complexes through Post-Occupancy Evaluation (POE) and Co-production methodologies;
- To consolidate an international academic collaboration in order to exchange knowledge related to Post-Occupancy Evaluation (POE) and Co-production methodologies.

## 3. Post-Occupancy Evaluation and Co-production: Tools for Resilience

Advanced Post-Occupancy Evaluation (POE) and Co-production methodologies were applied at Shopping Park neighborhood between July and August 2016, in order to seek deeper information about this social housing complex. According to Villa & Ornstein

(2013), POE consists of a set of methods and techniques for quantitative and qualitative evaluation of the building performance after its occupation. POE has a role in different case studies, on different areas, notably promoting the improvement of design processes, construction, and use of built environments. The relevance of POE in achieving high quality in architectural projects has already been consolidated by many studies in civil construction in the national field (Elali & Veloso, 2006; Ornstein, Villa & Ono, 2011; Villa & Ornstein, 2013; Voordt & Wegen, 2013), and in the international field (Leaman, Stevenson, Bordass, 2010; Preiser & Vischer, 2005; Mallory-Hill, Preiser & Watson, 2012). It is given that the adoption of several methods in POE is based on the possibility of collecting different types of data, which allows reducing possible erroneous results (Lay & Reis, 2005; Zimring, 2001; Bordass, Leaman & Eley, 2006).

There are significant advantages in trying building evaluation methodologies with unconventional approaches. After all, they allow overcoming the measuring of physical performance, dealing also with different perceptions of characteristics that interfere with the user behavior (Elali & Veloso, 2004; Lay & Reis, 2003 & 2005; Rheingantz, 2009). One of the alternative techniques that became popular in the academic scenario is Co-production. Co-production has its premise that the researcher is impartial. This person works as a facilitator on production and management of space involving all parties, including the community, which is the direct beneficiary. The instrument has emerged in response to a social, political and economic context in companies and governments that cannot respond to contemporary urban challenges in a timley manner.

According to Petcou and Petrescu (2015), Co-production is not only about an unconventional path to face unmet public demands, but also a way to provide effective access to the city. The citizens' right to the city means the right to the urban land, and moreover, the right to participate in its development, use, and management. Thus, the partnership between academics and non-academics, through co-productive work methodologies, can reach significant public benefits. The generation and dissemination of knowledge matters, while it enables new possibilities of interaction with contemporary social and environmental issues.

The boundaries between knowledge production and effective action must be broken, promoting a reconciliation of academic and non-academic communities. According to Campbell and Vanderhoven (2016), research must be a collaborative and interactive process of shared learning. There is no hierarchy of knowledge forms, while prevail a great interdisciplinary, and, overall, the main goal is effective action. Traditional research approaches are overcome, while non-academic communities no longer take a passive role at the play.

From this, the group experienced two sessions of Co-production at Shopping Park neighborhood, complementing the Questionnaires and Walkthrough sessions, which are conventional POE techniques. An aim is to establish a solid partnership between academics and non-academics. All instruments were first applied simultaneously, willing to reach a specific sample of the neighborhood. Through POE instruments and Co-production, it was possible to get acquainted with the local reality, providing quantitative and qualitative information about their vulnerabilities and, moreover, their potentialities, here understood as resilience demonstrations.

It is possible to extend the adaptive capacity and resilience of the built environment in question. This experiment can promote a real and practical improvement on life quality to residents benefited by social programs in Brazil, starting with Shopping Park neighborhood. In other words, the purpose is to immediately improve the quality of local life in the existing social housing complexes, encouraging minorities to make changes, instead of providing detailed guidelines for upcoming projects more adaptable and resilient.

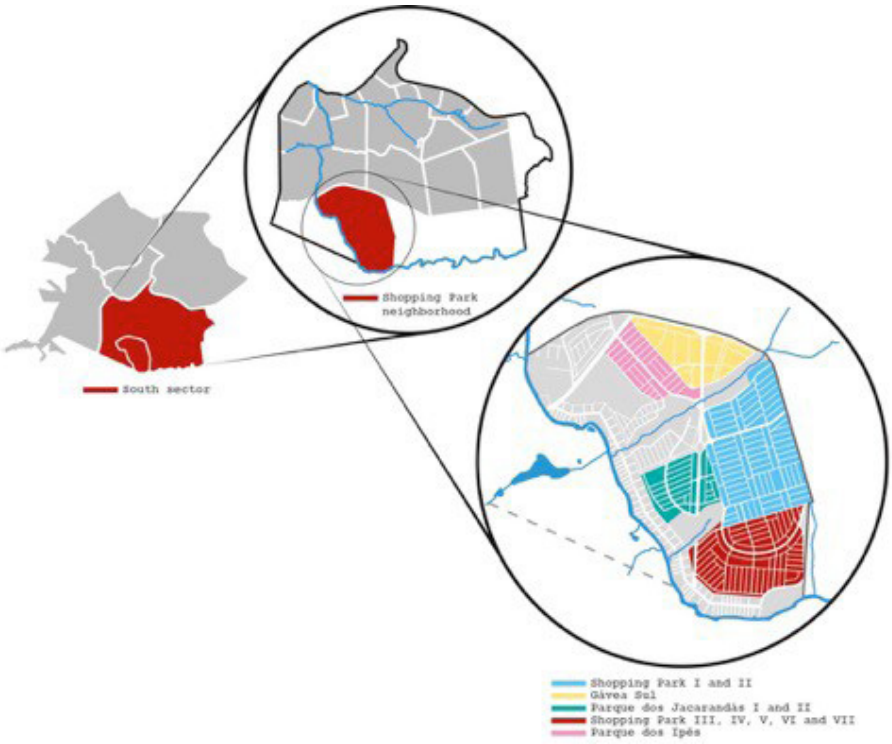
## 4. Case Study: The Shopping Park Neighborhood

The Shopping Park neighbourhood is located at Uberlândia city at Minas Gerais State in Brazil (figures 1, 2). Shopping Park is located at the south sector of Uberlândia; it is considered an Integrated Neighborhood composed of the following allotments: Parque dos Ipês, Shopping Park I and II, Gávea Sul, Parque dos Jacarandás I and II, Residencial Xingú, Tapajós, Sucesso Brasil, Vitória Brasil, Villa Real and Villa Nueva.

As the social housing units are the focus of this research, the area of study is the one identified in red, involving five of seven allotments. These seven allotments became the first area in Uberlândia destined to produce over 3.000 housing units from the Minha Casa, Minha Vida Program, within the income bracket 1 (0 to 3 minimum wages) during the 2010-2013 period.

Figure 1. – Uberlândia Location. Source: Authors, 2016


Figure 2. Sector, Neighborhood and Allotments division. Source: Authors, 2016.



Unfortunately, three years after the construction, the housing complex shows clear signs of inefficiency and failure in comparison with the original purpose of the program. The initiative of giving people a "dignified living" fell under a mix of various constructive, social and environmental issues. For example, the location is very excluded, because is far from the city center and also because there are few bus lines, which means restricted public transportation (figure 3).

However, the resilience of the environment and the human beings seems to coexist within cracked walls, bumpy roads, and streams clogged with litter (figure 4). Thousands of people inhabit this space and search each day for ways to make it better. Despite the deprived conditions of its houses and facilities, families are actually happy to live there. In fact, all these perceptions were found by the application of POE and Co-production techniques. Also, during its application, teamwork could identify the community resilience and power, making their voices heard in order to obtain improvements to the neighborhood (figure 5).

Figure 3. Shopping Park Neighborhood and Uberlândia town and Bus Lines Map. Source: Authors, 2016.

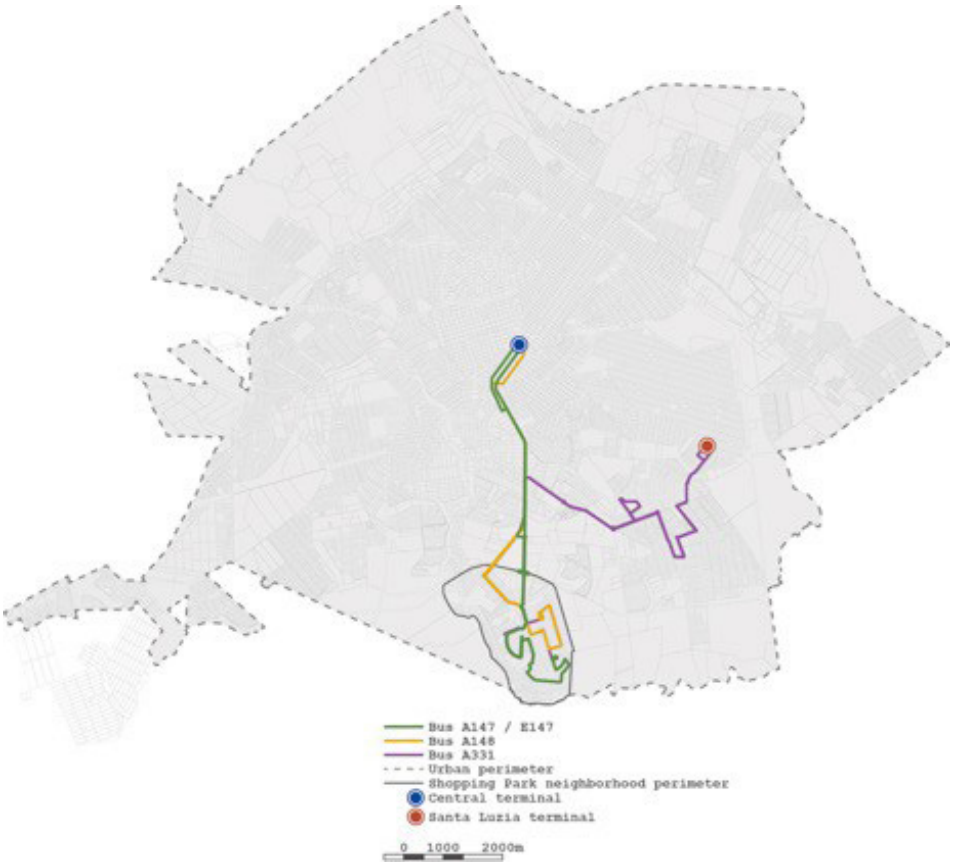


Figure 4. Photos: Shopping Park's failure. Source: Gollino, 2015 (first); Arantes, 2015 (second); Correio Journal, 2013 (two at the right).

Figure 5. Photos: Shopping Park Neighborhood Quarters and Housing Units. Source: Google Maps

Chart 1. Tools and Techniques: Evaluation at Shopping Park Neighbourhood.
Source: Authors, 2016.

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| **Questionnaire** | **DESCRIPTION:** Quantitative method that seeks to collect data from a series of questions answered by users. A highly recommended method when there are a varied number of people involved in an evaluation process. Its main advantages are: being a quick method; the possibility to work with larger groups of respondents and/or vast areas; impartial answers, which mean anonymity allows safety and a great freedom of response; and greater uniformity in the evaluation. |
| | **MEANS:** Digital |
| | **SAMPLE:** 40 houses located in an allotment of 200 houses (20% of the whole community) |
| | **DATE/PLACE:** July 5 to 11, 2016 — 40 residences in a block located at Shopping Park's Neighbourhood |
| **Walkthrough** | **DESCRIPTION:** Quanti-qualitative method of analysis based on quality concerns for measuring and descriptive and qualitative identification of positive and negative aspects of environment, also allowing to check its current situation. The analysed themes are: i) Surroundings, ii) Allotment, iii) Housing. |
| | **MEANS:** Script on paper and textual and photographic recording. |
| | **SAMPLE:** Representative lots were chosen considering some variants, such as the solar orientation and the different geographical positions of the allotment. |
| | **DATE/PLACE:** July 8 and 11, 2016 — 4 residences in the same block located at Shopping Park Neighbourhood |
| **Co-production** | **DESCRIPTION:** Qualitative and participative evaluation method where the researcher keeps himself impartial, working as a facilitator on production and management of space by involved parties. According to Petcou and Petrescu (2015), it is not only an alternative way to face unmet public demands, but also a way to provide effective access to the city. |
| | **MEANS:** Script on paper, textual and photographic recording and group dynamics. |
| | **SAMPLE:** 8 people at the 1st Co-production and 10 people at the 2nd — invitations through brochures and WhatsApp messages, for those who have participated on Questionnaires and Walkthroughs. |
| | **DATE/PLACE:** July 9 and August 7, 2016, at the Center of Unified Arts and Sports (CEU). |

### 5. Knowledge that Matters: Making Voices Heard

At this stage, the group had already experienced two sessions of Co-production at Shopping Park neighborhood. One was shaped as a Collective Coffee, and the other as the Second Meeting of the "Renew Shopping Park" group. The first experience of Co-production had as its main purpose to present the research in progress to the community of Shopping Park neighborhood and its main aims and methodology. Through questions as "What do you need?", "What is missing here?", "What would you like to have here?", the residents were encouraged to reflect about their neighborhood, the housing unit and the relationships between dwellers, suggesting locations in the housing complex for the urban elements that are missing there.

Figure 6 shows the urban elements at the Shopping Park neighborhood. Suggestions refer mainly to the installation of new commerce, health and education facilities, and leisure and rest facilities in the neighborhood. At this meeting a name was chosen to identify the project among the community, "Renew Shopping Park — Integrated Solutions for the Neighborhood." In the second Co-production, the aim was to continue the process of understanding the needs and potentials of the Shopping Park community, evolving to the new question, "What is your favorite place in the neighborhood?"

Figure 6. Location of urban elements proposed by residents. Source: Authors, 2016.

Most participants first placed their opinion in relation to their needs and lacks. Thus, the needs identified in the first Co-production were strengthened. After that, the next question was "What is your favorite place at the neighborhood?", and cited sites were: My Street, The Centre of Unified Arts and Sports (CEU), the River and the High School. Overall, negative aspects prevailed over the positive, and some suggestions were made for facilities at each one of these cited places. Despite the cited problems, it was agreed that the CEU is currently the most important reference point of meeting to the residents in that region, pointing to the need for its renewal.

Figure 7 shows the favorite places of the residents at the Shopping Park neighborhood, as well as its positive and negative aspects, and suggestions for facilities at these locations. Comments predominated on the "My Street" element, such as the perception of its negative aspects, highlighting the dissatisfaction of residents regarding their current housing situation. Their difficulty to glimpse positive aspects when many other problems call more attention was noted.

Figure 7. Positive and Negative Aspects and Suggestions for the Favorite Places at Neighbourhood, Source: Authors, 2016.

Realizing the predominating negative feeling of the residents in relation to their neighborhood, it was agreed that the third Co-production ought to focus on the choice of effective qualification actions. Based on the results of the two first Co-productions, Questionnaires and Walkthroughs, five possible interventions were identified on a small scale to improve their life quality. They are: building an Ecologic Park, creating a recycling point, constructing ecological bus shelters and/or the improveing of CEU's square.

Figure 8. Collective Discussion at the First Co-production. Source: BORTOLI, 2016.

Figure 9. Collective Discussion at the Second Co-production. Source: BORTOLI, 2016.

Thus, the plan is to submit tfor discussion these possibilities among dwellers at the next Co-production experience, making their voices effectively heard. After all, some recommendations for the tool are the importance of strengthening the brand of the group "Renew Shopping Park", in disclosures and during the next Co-productions, and the importance on maintaining an always-on and positive communication with the locals, through WhatsApp and in person.

## 6. Considerations

Both Co-production and Post-Occupancy Evaluation benefited from the cross-check. After the application of the diverse tools, one can point out some highlights: Despite the mistakes on the original project, the community has become spontaneously more resilient. For example, more than 90% of the houses have been improved by expansion or refurbishment, without any help of the government. However, Co-production sections point out there is still much to do to achieve a fully-realized notion of the power residents have. Putting people together to discuss their common interests showed researchers how unknown they were to each other — and at the same time, how equal their problems were. For example, we noticed that acoustic problems have affected every house. Other highlights from the Co-production session included registering residents in a WhatsApp group in which they can talk to each other, offering their services and products (important income generation), complaining about neighborhood problems, invitations for parties and events, etc. We noticed after the group discussions and during the co-production sessions that the community is now stronger and more clear about the common problems they fight against.

To summarize, considering all these aspects, future actions have been defined and led by the community. It shows the importance of the Co-production methodologies in improving the engagement and empowerment of the Shopping Park dwellers. Thus, it can help develop a resilient future.

## 7. Acknowledgements

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