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Co-production and Resilience in a Brazilian Social Housing: the case of Shopping Park Neighbourhood

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Abstract: Current rapid social and climatic changes require urgent revisions of urbanization strategies globally, to reduce environmental and social impacts and develop the resilience of built environments. The poor condition of the architecture and urban situation of affordable housing in Brazil substantially affects the inhabitants of these developments. Despite this, people keep adapting their habitats, surviving the unexpected, and (re)inventing themselves according to their needs. This demonstrates their resilience, which is considered as an adaptive capacity to recuperate and regenerate from impacts (natural, social, physical). This paper presents the methods and results of the research "Adaptability and Resilience in Social Housing developments through Post-Occupancy Evaluation and Co-production[1]" as a project between a Brazilian and a UK University and a local community. This project engages with a Brazilian social neighbourhood named Shopping Park, where advanced Post-Occupancy Evaluation and Co-production techniques have been applied, aiming to co-produce knowledge about this social housing development. Data collected enables improvements on Shopping Park neighbourhood and future projects, in order to develop the resilience of families in social housing programmes and minimise social and environmental impacts derived from this sort of development in the future.

Keywords: Resilience; Adaptability; Co-production; Social Housing; Community; Post-Occupancy Evaluation.

Introduction

People are familiar with dealing with disturbances in the natural course of life around the world for many centuries, but there are distinctively modern phenomena underway now conditioning those events: urbanization, globalization, and climate change (Rodin, 2015). The current social and climatic changes require revision in urbanization strategies worldwide. Accelerated urbanization causes urban problems such as housing shortages, inefficiency of transport systems, inadequate disposal of waste and environmental depredation, among others. Climatic disasters are increasingly large, affecting urban systems (physically and socioeconomically) and involving major human and environmental losses. Such disasters

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originate from a junction between the climatic event, predatory human activity and the vulnerability of what is exposed, namely the urban systems (IPCC, 2014).

In developing countries, the low quality of architecture and urbanism increase the social vulnerability, which afflicts particularly people struggling to purchase their own house, who end up living in precarious conditions. In an attempt to meet this deficiency, the low standards defined by government housing programmes, such as the Minha Casa, Minha Vida (MCMV) in Brazil, has led to the provision of inadequate housings for its inhabitants. Self-made interventions at the houses by residents, without any planning or technical assistance, risk their safety, waste resources and excessively burden the family income. Relating to the MCMC Programme, it is a government initiative to try solving the housing deficit by targeting a specific segment of the population, divided into social housing (0 to 3 minimum wages) and medium income range (until 10 minimum wages).

According to Villa et al (2013), the usual peripherization of these housing developments makes people dependent on motorised transport in order to access their workplace, educational and health facilities, among others. This scenario increases the negative effects of climate change due to the high rate of waterproofing the soil and the extensive use of non-renewable energy sources (Rubano, 2008; Rolnik, Nakano, 2009). These factors end up socially, economically and environmentally weakening people who benefited from these government programmes, making them more vulnerable to any impacts.

The resilience in social housing developments is related to the adaptability of the housing units to the impacts experienced. Their resilience is verified when the reaction to the imposed adverse conditions overcomes a state of perturbation. This resilience is further defined by the ability of a system to absorb changes, self-organize and thrive by increasing its capacity of 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). Resilience, however, needs attention in a context of accelerated world population growth, which reproduces unsustainable urbanization models.

Case Study

This paper presents the first results of a research project named “[RES_APO 1] Method of analysis of the Resilience and Adaptability in Social Housing Complexes through Post Occupancy Evaluation and Co-production”, developed by the MORA housing research group from FAUeD, Federal University of Uberlândia/UFU and the People, Environment and Performance research group from The University of Sheffield School of Architecture. In order to understand resilience in social housing, it is necessary to first know the vulnerabilities and potentialities that characterize a specific study area. Thus, as a main contribution, this work discusses the resilience in Brazilian social housing developments based on a real case study involving co-production with residents and other actors

The *Shopping Park* neighbourhood is just south of Uberlândia city at Minas Gerais State in Brazil (Figures 1, 2). *Shopping Park* was chosen as the study area as the first site in Uberlândia chosen to produce over 3.000 housing units from the MCMV Programme, within the income bracket 1 (0 to 3 minimum wages) during the 2010-2013 period. Post-Occupancy Evaluation (POE) and Co-production techniques emerged as appropriate methodological tools to obtain socio-environmental and behavioural data as well as information about vulnerabilities and potentialities of the study area. The objective was to produce a concise database from the performance using a variety of tools, as summarized on Table 1. The

overall aim was to outline the scenario of resilience at *Shopping Park* neighbourhood as well as to develop methodological procedures applicable to another contexts, in order to evaluate and improve their local resilience.

Figure 1. Uberlândia Location. Source: Authors, 2016

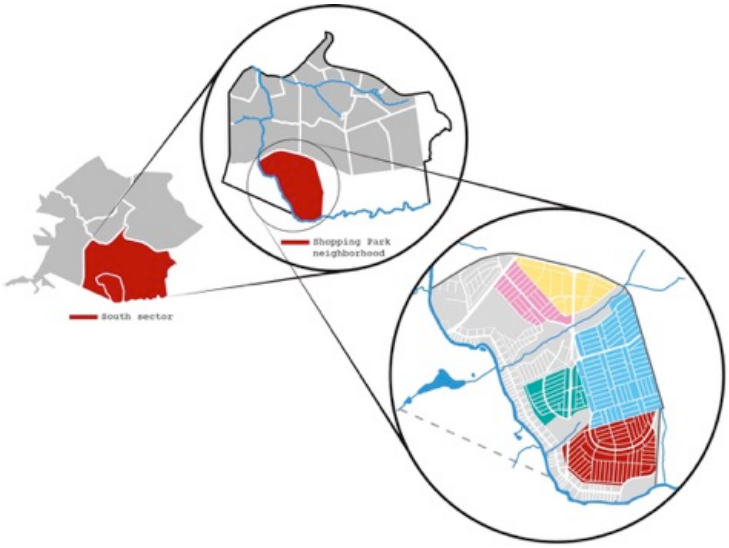

Figure 2. Sector, Neighbourhood and Allotments division. Source: Authors, 2016.

Table 1. Used tools on evaluating Shopping Park Neighbourhood. Source: Authors, 2016.

DIGITAL QUESTIONNAIRE
Description: Quantitative method collecting data from a series of questions answered by users. Recommended when there are a variety of people involved in an evaluation process. Its main advantages are: being quick; deals with a larger group of respondents and/or vast areas; impartial answers; anonymity allows safety and a great freedom of response; and greater uniformity in the evaluation. **Means:** Digital, through tablets taken to the study area.
WALKTHROUGH
Description: Quanti-qualitative method of analysis based on measuring and descriptions, and qualitative identification of positive and negative aspects of current environment. Includes measurement of climatic features, evaluating temperature, lighting, ventilation and acoustics on the unit scale. The analysed themes are: i) Surroundings, ii) Allotment, iii) Housing. **Means:** Script on paper and textual and photographic recording.

CO-PRODUCTION
Description: Qualitative and participative evaluation method where the impartial researcher works as a facilitator to co-produce management of space by all stakeholders. An alternative way to face unmet public demands and provide effective access to the city (Petcou and Petrescu 2015). A co-productive partnership between academics and non-academics can generate significant public benefits. **Means:** Script on paper, textual and photographic recording, meetings and group dynamics.

Developing the Tools and Techniques

Three central elements were analysed in the case study: (i) BUILT ENVIRONMENT (building complex, taking into consideration the scales of the district, neighbourhood and unit, and the relation of impact between the built and natural environments; (ii) AGENTS (agents that interfere with the local social dynamic); and (iii) USERS (residents of the complex). These elements were divided into 5 categories: general characteristics, climatic and natural order, physical-architectonic order, physical-urbanistic order and socioeconomic order.

From that division the most suitable tools were developed to collect information for each category. As an example, the physical-architectonic order was subdivided in 10 aspects to be evaluated: Design, Construction System and Materials, Maintenance, Services, Internal Layout, Adaptation and Refurbishment, Adaptation for Commerce, Comfort, Privacy and Previous Housing. For each one of these aspects, the required information was listed, for example “what are the main pathologies of the house?” or “what materials do the dwellers use on renovations?” on the Construction System and Materials aspect. The Questionnaire aimed to answer the first question while the Co-production would address the second one. Based on that mapping customized POE and Co-production tools were developed in order to collect information to properly portray the study area.

The evaluation as a whole intended to study the social, functional, behavioral and environmental issues of the built environment. Given the significant differences and specificities of the aspects to be analysed concerning resilience, the elected tools have been conceived to work complementarily. This multiple methods approach aimed to adjust any variances and inconsistencies in the obtained data as well as to strength conclusions when convenient or discard those less representative. This is because information collected through a single technique is usually seen as suspicious or even to present dubious results, since all methods have positive and negative points, and their applications depend on the characteristics of the problems addressed in the object in question (Marans and Ahrentzen, 1987).

Co-production is a relative new approach to address social, environmental and economic challenges. It can question and change the power relationships within the contemporary built environment, its production, governance and maintenance, to enable more sustainable and resilient communities (Stevenson & Petrescu, 2016). It goes much further than ‘user involvement’ or ‘participatory design’ and engages directly with the principle of equal partnership. This transforms the dynamic between those who use our built environments and those who produce it, where all stakeholders pool different types of knowledge and skills, based on lived experience and professional learning.

The specific contribution of co-production as a method allowed the research team to present their initial findings to the local residents in the case study neighbourhood as well as other activists working in the area, and to gain their insights into the findings in relation to their own concerns. Co-production requires careful facilitation to ensure that all voices are

heard and treated as equally important. The use of mapping as a technique to capture stakeholders concerns in a neighbourhood is a powerful facilitation tool, providing everyone with the chance to stake out their issues and priorities, and to then debate and prioritise these collectively via the mapping exercise itself.

POE and Co-production at Shopping Park Neighbourhood

Three years after completion, the case study housing development shows clear signs of inefficiency and failure, contrasting to the original purpose of the government programme. The aim of giving people a "dignified living" failed under different constructive, social and environmental issues. Despite this, the resilience of the environment and the human being seems to coexist within cracked walls, bumpy roads, and streams clogged with litter (Figure 3) with thousands of people inhabiting this space and seeking ways to make it better. In other words, despite the deprived conditions of its houses and facilities, families are actually happy to live there (60% are happy about their neighbourhood).

Figure 3. Photos: Shopping Park's failure. Source: Gollino, 2015 (first); Arantes, 2015 (second); *Correio* Journal, 2013 (two in the right).

In order to evaluate the resilience of *Shopping Park*'s residents, questionnaires were completed in 40 selected houses located in a pattern allotment of 200 houses - a good sample of 20%. The questionnaire was organised in five main aspects (related to the 5 categories previously mentioned): family characteristics, surroundings characteristics (neighbourhood), allotments' characteristics, housing characteristics and, finally, energy efficiency and sustainability.

From the application of Walkthroughs in four houses previously interviewed, reaching a 10% sample, the intent was to carry out an analysis supported by normative attributes (benchmarks), allowing the verification of the current environmental situation. The categories analysed were: i) Surroundings; ii) Lot; iii) House Unit, under sorted aspects as accessibility, urban furniture, vegetation, privacy, dimensions, sectorisation and performance of climatic features indoor, among many others.

Three Co-production workshops took place at Shopping Park neighbourhood. The first was entitled "Collective Coffee", the second as "II Meeting Renew Shopping Park" and the third as "III Meeting Renew Shopping Park". In each co-production session of 15 participants on average, new strategies were implemented in order to obtain information related to the main complaints of the residents in respect to the neighbourhood; the residents' favourite places in the neighbourhood; and the choice of effective actions to improve at the neighbourhood. Although participants expressed their willingness to improve their neighbourhood, with up to 48.6% unhappy about the amount and quality of available facilities, their complaints constantly focused on the housing unit issues. Most of the residents (82.5%) agree the main issue is the terraced house without acoustic insulation

between different houses and rooms, leading to the difficulty of 25% on get along with neighbours, and another 31.6% not satisfied in terms of privacy among residents.

The fact that the houses were the main source of problems of the neighbourhood suggested that the activation of resilience at *Shopping Park* neighbourhood should first happen through the resolution of some significant pathologies, as described next.

Co-production to Activate Resilience of Built Environment

During the evaluation process, key factors drew special attention following validation through at least two of the tools, with the Co-production sessions becoming the moment when these factors were highlighted. Moreover, the negative impact they cause extends to the environmental, social and physical spheres, signifying them as strategic issues to be studied as well as improved within the local community seeking increased resilience. They represent the main vulnerabilities and sources of potentialities in the housing units. These factors, in order of significance, were: poor acoustic perform, lack of green areas, high rates of soil sealing, waste disposal and the high costs involved on refurbishments. Table 2 summarises information collected about each factor in the evaluation process, endorsed in the Co-production sessions. Some positive aspects derived from the resolution of each issue are also listed, and are considered as attributes able to improve the resilience of the neighbourhood.

Table 2. Main Issues at Shopping Park Neighbourhood. Source: Authors, 2016.

POOR ACOUSTIC PERFORMANCE
Description: More than 48.7% of respondents of the questionnaire are dissatisfied with acoustic performance. If fact, 47.5% refurbished their houses in order to solve technical problems and another 45%, to improve privacy. Performance analysis has confirmed constant noise through the shared walls between homes, which are clearly audible in most homes. In the first Coproduction, some residents reported suffering from depression due to the lack of privacy. **Positive Impacts Post-Intervention:** Increased privacy would favour the improvement of relations between neighbours, such as a better performance of activities such as relaxing, sleeping and working.
LACK OF GREEN AREAS
Description: 67.5% of the inhabitants interviewed feel the lack of landscaped areas inside the lot (52.5% paved the external area), though most of them have chosen not to invest on its cultivation due to the difficulty of maintenance and / or lack of knowledge about gardening techniques, as well as due to the scarcity of financial resources (Co-production 1 and 2 outcomes). **Positive Impacts Post-Intervention:** The practice of gardening can promote a network of learning, exchanges and trading between neighbours, as well as the planting of seedlings can be done in order to promote evaporative cooling of the house.
HIGH RATES OF SOIL SEALING
Description: 52.5% of the units evaluated have the external area paved beyond the 80% allowed by law (and 67.5% enlarged the coverage), configuring a situation of fragility to floods and landslides, once there is no vegetation enough to stabilise the soil (50% of houses visited on walkthrough analysis). Additionally, the settlement of the allotment without correct stabilisation of sloping ground increases the vulnerability of houses, since there are several cases of structural collapse due to landslides (Co-production 1). **Positive Impacts Post-Intervention:** The replacement of cement paving by alternative more absorbent materials would guarantee the soil stability and improve the microclimate while allowing the evaporation of wet soil.

WASTE DISPOSAL
Description: 92.3% reported that they have changed something from the original design of the house. Self-build is currently a recurring practice in the neighbourhood. The Walkthrough revealed the presence of construction materials stored on the front and sides of the lots, as well as on the backs and sidewalks. 65% of those interviewed reported having witnessed neighbours depositing waste incorrectly in public areas. In the first Co-production residents complained about the presence of soil, sand and other construction materials attracting insects and rodents inside the house, impairing their hygiene and healthiness. Moreover, waste harms the general appearance of the neighbourhood, which disturbs 23.7% of the interviewees. However, it is estimated that 57.5% of the interviewees carry out the separation of recyclable waste and the oil from other organic waste. **Positive Impacts Post-Intervention:** The proper disposal of waste improves life quality by ensuring the maintenance of clean, healthy and habitable spaces. Moreover, the cooperation in the collection, storage, administration and treatment of recyclable and organic waste may be a source of monetization, and consequently, community empowerment.
HIGH COST INVOLVED ON REFURBISHMENTS
Description: From the Co-productions it became clear that frequently the refurbished houses have as a builder resident, reducing the labour costs, which is not the reality for most residents. It is a consensus among residents that the high cost involved often makes it impossible to carry out quality reforms compatible with their needs, and they end up using cheaper materials of inferior performance and low durability. The main target of interventions in the house refers to the construction of walls by 77.55% of the interviewees, followed by the expansion or creation of covered areas (57.5%) and paving of the external area (52.5%). The laudry, kitchen and living room are the spaces whose size less satisfy the residents, being the target of up to 40% of them on refurbishments. **Positive Impacts Post-Intervention:** The dissemination of alternative constructive technologies and materials could allow reduced building costs. Furthermore, cooperation on administration and execution of refurbishments, through sharing of skills and labour, may become a source of income for those willing to conduct Workshops, joint efforts, etc.

Conclusion

By applying POE and Co-production techniques guided by the concept of resilience at the Shopping Park neighbourhood, it was possible to confirm that there are already high rates of resilience and adaptability there. Despite all the adverse impacts experienced by the residents regarding their poor quality neighbourhood, block and housing unit, they keep adapting and seeking for alternatives to improve their built environment. However, this is only partially resilient since little is done to develop truly sustainable and replicable solutions, due to the residents being restricted in their ability to overcome fragilities in a palliative way.

What is lacking in the neighbourhood is collective engagement and knowledge about the vulnerabilities and potentialities of the whole area. The partnership between academics and non-academics aims to share information collected as well as personal skills in order to empower the community to resist the impacts that will be imposed over time and thrive when faced to a situation of precariousness, in the next phase of co-production. The evaluation process developed at Shopping Park neighbourhood enabled the Co-production sessions as environments for experimentation and opportunities to take a close look at the community and its more acute vulnerabilities. The initial approach has focused on the issues at the urban scale, and has highlighted a difficulty to enable wider community projects, since the individual housing unit is the main source of dissatisfaction. In fact, the next stage

of the research project intends to focus on the housing unit scale in order to activate wider resilience at *Shopping Park* neighbourhood.

In face of the obtained outcomes, it was realised that co-production can actually contribute to improve the resilience of place. Considering it, this research project will be continued and the co-production actions at Shopping Park defined in two subsequent stages (2 and 3) that will be carried out in 2017 and 2018. The academics are leading efforts to engage another stakeholders, such as NGOs and industry, working in the local area, in order to identify possible resources (e.g. building materials, re-used materials) to promote physical interventions to improve the housing in the first instance.

Small actions properly designed, and working directly with the residents themselves, can lead to big changes in the long term. After all, it is remarkable that simply carrying out a study with the community in fact have already improved people's perceptions and behaviours (Mallory-Hill et al, 2012) - after each Co-production session people presented more indepth information about their context. This confirms resilience as a natural and evolving attribute of human beings, sometimes needing encouraging to be fully reached, seeking to build more sustainable cities.

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