
AN ANALYSIS OF CONFIGURATION, LOCATION AND AVAILABILITY OF INCOME-GENERATING ACTIVITIES IN SOCIAL HOUSING

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Maria Cristina Dias Lay

Federal University of Rio Grande do Sul

Carina Hamm Oliveira

Federal University of Rio Grande do Sul

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Maria Cristina Dias Lay

*Federal University of Rio Grande
do Sul, Praça Carlos Simão Arnt
21 apto. 202, Porto Alegre,
Brazil - CEP 90450-110
cristina.lay@ufrgs.br*

Carina Hamm Oliveira

*Federal University of Rio Grande
do Sul, Praça Carlos Simão Arnt
21 apto. 202, Porto Alegre,
Brazil - CEP 90450-110
cristina.lay@ufrgs.br*

Abstract

The study looks at the spatial and social-economic impacts of home-based work on the function and design of low-income housing schemes. While attention has been paid to the shelter aspects of housing, less importance has been paid to the economic aspects of housing and to the dwelling as a site for work. This has resulted in the planning of urban neighbourhoods that lack the necessary spatial linkages to support income-generating activities and economic sustainability in low-income housing schemes. Methodological procedures consisted of post-occupancy evaluation and configuration analysis of five low-income housing schemes comprised of different dwelling types, located in the metropolitan region of Porto Alegre, Brazil. Data was collected through questionnaires, interviews, observations and physical measurements. Space syntax measures such as integration of axial lines and visibility graph were used to analyze the spatial configuration of home-based work. Findings indicate the most frequently adopted means of income generation used by residents, which include physical modifications in the dwelling and common areas in order to adapt these spaces to informal jobs. The type and quantity of modifications taking place are related to the degree of spatial flexibility, according to each dwelling type, which affected residents' satisfaction with appearance of the housing scheme. Dwelling location within the urban area and neighbourhood and its linkages to public infrastructure impact the characteristics of home-based work and the usage of the dwelling for income generation. The relationships investigated highlight the important role provision and adequacy of income generating activities play on performance evaluation and economic sustainability of low-income housing schemes. The paper is based on results of a comprehensive research carried out with the purpose of gathering feedback information to provide design guidelines for future social housing production and broaden policy makers' knowledge to plan for housing to meet the diverse income generation needs of low-income households.

Introduction

Arguments frequently found in the literature suggest that most qualitative problems that affect performance of housing schemes are originated by inadequacy of design, caused, *inter-alia*, by the lack of information design professional and decision makers have about future residents (e.g. Cooper, Marcus & Sarkissian, 1986).

Nonetheless, certain basic aspects related to social class of future users seem to be well-known, but tend to be ignored. For instance, it is acknowledged that lifestyle is influenced by socio-economic level, which establishes among other things dwelling location in the city, with areas occupied according to the different social classes (Santos, 1998). In Brazil, the distribution of services, local shops and amenities offered in those areas tend to be proportional to residents income: high-income residential areas are provided with a larger number and better quality of services and amenities, while low-income residential areas frequently fail to fulfil residents' basic needs (e.g. Lay & Basso, 1994). It is further recognized that higher income leads to higher mobility, and a whole range of activities can be performed in different areas of the city, while the opposite is also true: due to economic constraints, low-income population tend to stay near their residential area. Added to it the increase in unemployment, the need to invert this tendency and produce residential environments strategically prepared to offer work and generate income seems to be eminent (Servet, 1999).

Therefore, this study looks at the provision of adequate design attributes to allow for home-based income-generating activities in social housing, focusing on the spatial and social-economic impacts of home-based work on the function and design, at domestic and urban scale.

Morphological Characteristics, Identified Inadequacies and Limitation of the Existing Housing Stock

Brazilian social housing by itself is not just a housing issue, but arises from the conflicting economic situation of the population. If the major purpose of the government development policies is to reduce the inequalities in the Brazilian society and therefore to provide the very poor with the means not only to survive but to improve their living conditions, then housing improvement and provision programs must have a social role. As the housing deficit remains very significant, the quantitative aspects were emphasized over the qualitative ones, affecting the quality of the constructions has been negatively affected by the nature of the system of provision and by its overemphasized priorities for quantitative targets. Consequently, the design of most housing schemes was not appropriate for the satisfaction of user needs and aspirations.

Social housing built so far often has some common features that distinguish it from the rest of the urban area in which they are located. The attribute mainly identified as usually affecting public housing, is its artificiality – a 'cyst' in relation to its urban context (e.g. Motta, 1975; Lay, 1995). The spatial organization generally provided in low-income housing schemes is often characterized by low density, uniformity and dispersion, which imply high costs in infrastructure, maintenance and replacements, usually located on the urban periphery, sometimes built at many kilometres from the city centre, expanding the borders of the city. The repercussion of the number of standardized projects with similar problems, in its urban context, looked as damaging to neighbourhood residents and to the city as a whole (e.g. Lay, 1994). For example, uniformity and homogeneity among the buildings, and identical visual aspects have been reported as affecting orientation in the scheme, making it sometimes difficult for visitors not familiar with the area (e.g. Reis, 1999). Lack of possibility to control outdoor spaces or to modify and manipulate it according to residents' needs has also been claimed.

By the early eighties, it was noticed that the problems connected with quantitative aspects of mass housing production were related not only to the number of housing units produced, by also to the fact that the

poorest were excluded from the process of housing allocation (Batley, 1983). Therefore, just as political action should be taken in order to increase investments in housing stock provision and to improve the socio-economical situation of the large lower-income groups of the Brazilian population, also the shape and spatial structure of the subsidized housing provided in Brazil and its perceived performance needs to be further analyzed, in order to identify the relevant design factors requiring change, and the nature of change that will promote significant improvement in mass housing design: while attention has been paid to the shelter aspects of housing, less importance has been given to the economic aspects of housing and to the dwelling as a site for work. This has resulted in the planning of urban neighbourhoods that lack the necessary spatial linkages to support income-generating activities and economic sustainability in low-income housing schemes. Mainly conceived as dormitories for the low-income population, almost without community facilities related to health or education, transport system, or leisure, including shopping and basic facilities, added to the increasing absence of administrative control at federal and local levels, improvisation of new services and modifications of the units, increase in built area and occupation of communal open spaces have been carried out in order to revert this process, and residents tend to perform income-generating activities in the housing scheme. Examples of improvisation of new services and alternative solutions to improve living conditions introduced by residents in order to fulfil the needs of the target population have been observed in several schemes (e.g. Lay & Reis, 2004).

Economic Activities and Spatial Interchange

Shopping is a specific type of economic activity supposed to take place in urban space, which relies on a process of acquisition: the seller earns money by selling objects or services to customers and the buyer acquires an object or a service from the seller for some physical or social purpose (van Nes, 2005). Since the early years, sellers seek for an optimal location in order to reach as many customers as possible with the purpose of profit maximizing. A location's value for the seller thus depends on various parameters such as the types of objects and services offered, prescribed or natural limits for the objects' consumption, trends in society, changes in taste, the areas in which potential customers move and live. Consequently, as this economic activity is essentially related to the consumers' spatial behaviour in a built environment, it demands a certain special organization within the urban grid, in accordance with the identification of spatial configurable features of the urban street net that determinate the best location for shopping areas.

Early research shows that shops tend to locate themselves along the most spatially integrated streets (Hillier et al, 1993) and in streets with a high degree of connectivity to its vicinity (Hillier, 1999), further depending on global and local integration and local grid conditions (van Nes, 2005). Therefore, information about how inhabitants and visitors move through urban street nets seems to be essential for sellers in order to reach both types of customers through optimal public location.

This paper aims at identifying the spatial features related to the different types of income-generating activities taking place in selected low-income housing schemes with different urban location, street grid and dwelling type and clarifying these aspects through the study of configuration, location and availability of the types of income-generating activities informally introduced in social housing produced in Porto Alegre. It is based on results of a comprehensive research carried out with the purpose of gathering feedback information to

provide design guidelines for future social housing production and broaden policy makers' knowledge to plan for housing to meet the diverse income generation needs of low-income households. The limits and possibilities of the built environment related to residents satisfaction with the dwelling and with the housing scheme, provision of local shops and services, and possibilities of income generation are evaluated.

Methods

The study was designed in order to investigate the most frequently adopted means of income generation used by low-income residents, which include physical modifications in the dwelling and common areas carried out to adapt these spaces to informal jobs, and to identify the spatial features affecting resident decision-making on location and types of income-generating activities introduced in the housing scheme. Moreover, it evaluates the recent initiatives taken by public sector to meet residents' needs. Methodological procedures consisted of post-occupancy evaluation and configuration analysis of five low-income housing schemes comprised of different dwelling types, located in the metropolitan region of Porto Alegre, Brazil. Data was collected through questionnaires (180 respondents, with 30 questionnaire in each housing scheme), interviews, observations and physical measurements. Space syntax measures such as integration of axial lines and visibility graph were used to analyze the spatial configuration of home-based work. The selection of the sample was based on diagnostic explorations conducted in 78 housing schemes provided by local governmental housing policy for low-income groups located in the city of Porto Alegre.

Table 1:

Summary description of housing schemes

Housing scheme	Year of occupation	Number of units	Number of bedrooms	Dwelling type
Cavallhada	1984	1680 units	1 and 2 bedrooms	Block of flats with 4 floors
Jardim Planetário	1995	88 units	1 bedroom (12) 2 bedrooms (50) 3 bedrooms (26)	Row houses (12) Terrace houses (76)
Vila Tecnológica	2000	152 units	1 bedroom (44) 2 bedrooms (108)	Terrace houses (48) Row houses (73) Semi-detached houses (26) Detached houses (5).
Vila Progresso	2003	222 units	2 bedrooms	Terrace houses
Mário Quintana	1995	311 units	1 bedroom	Row houses (305) Semi-detached houses (6)

The five housing schemes selected included the pilot project (table 1), and are representative of the most frequently adopted dwelling types (blocks of flats up to four storey high, terrace, detached, semi-detached and row houses), with differences in size, configuration and site layout, location and available infrastructure. Since 1989, public authorities responsible for housing the very low-income groups in Porto Alegre relocated squatters in housing schemes built in areas that had been previously invaded by the same population. Occupation was established on subsidized basis, under a contract and symbolic monthly instalments. That is, dwelling units and the scheme site remain a local government property, but the residents can unconditionally live in it. Moreover, taking into consideration unemployment and the provision of income-generating activities in the residential environment, municipality in Porto Alegre recently built a pilot project with a new concept of social housing, where plots were fortuitously selected to perform home and work activities. Four out of the five housing schemes investigated are located in areas that had been previously invaded by the same inhabiting population, now living in the schemes, and the pilot project – Vila Progresso h.s. - is included in the sample.

Results

Results highlight the important role spatial configuration plays on location of local shops and services. Besides, evidence is provided about the importance of income generation activities in and/or near the dwelling, as a mean to provide job and income alternatives and to guarantee better living conditions to low-income residents. A short description of the main characteristics of each housing scheme illustrates how modifications carried out to accommodate income-generating activities introduced in each scheme were affected by dwelling type, dwelling location and spatial configuration.

Blocks of Flats

Cavallhada is a very large housing scheme (approx. 7.000 residents) located in the southern part of Porto Alegre, at 12 kilometres from city centre, surrounded by small scale farms, low density middle and high-middle income residential areas, and industrial sites. Level of segregation is confirmed by global integration values presented in table 2. Originally, site configuration was characterized by buildings surrounded by communal open spaces provided to all residents, including circulation system, recreation fields and parking lots. Since its construction, local shops and services were not provided and infrastructure was poorly provided in the site, resulting in informal initiatives to fulfil those needs along the years. Gradually, most open spaces were invaded by illegal constructions used for a variety of purposes, such as small shops, services, garage or other space room, with narrow spaces remaining for circulation purposes.

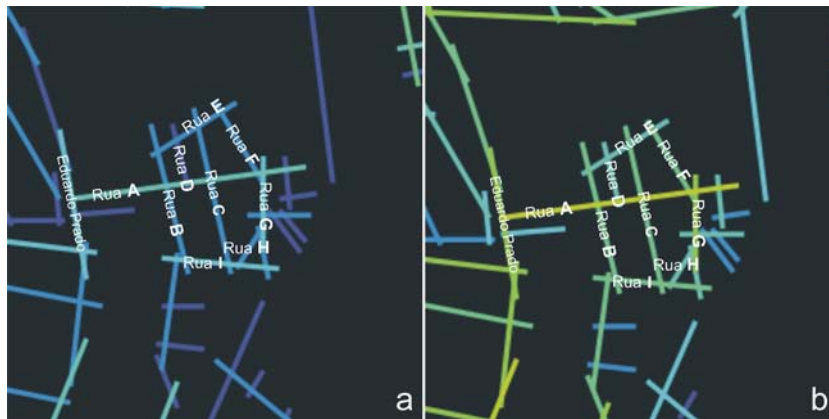


Figure 1:

Axial map – connectivity and local integration (R3) in Cavallhada h.s.

Table 2:

Syntactic measures - Cavallhada h.s.

Street	Global Integration (Rn)	Local Integration (R3)	Connectivity
Street "A"	0.752162	2.20047	7
Street "B"	0.680319	1.66667	3
Street "C"	0.680319	1.66667	3
Street "D"	0.676498	1.34439	2
Street "E"	0.618565	1.38737	4
Street "F"	0.677170	1.60372	3
Street "G"	0.678966	1.98622	5
Street "H"	0.637435	1.47249	3
Street "I"	0.660142	1.79252	5
Eduardo Prado	0.840969	2.05908	5

According to the values obtained in the analysis of the axial lines, these are classified in: segregated (values of 0 up to 1); integrated with values above 1 up to 1.66; integrated with values above 1.66 up to 2.5; strongly integrated, with values above 2.5.

Location of illegal constructions is spread all over the site and is not related to the different levels of integration of the street grid or connectivity (figure 1 and table 2). Although the fact that the more integrated the line, the greater the potential of movement and the

more segregated (or less integrated) the line is, the lower its potential of movement and, therefore, of accessibility, might have affected the type of income-generating activities provided. After open spaces are invaded, overall maintenance of the site is poor and possibilities of adequate recreational activities is eliminated, creating barriers that affect circulation and reduce visibility, promoting occurrence of crime and violence in general. As result, the streets were appropriated as recreation and social spaces, and circulation of cars occurs simultaneously with ball playing, biking and other recreational activities.

Terrace, Detached, Semi-Detached and Row Houses

Jardim Planetário housing scheme

The h.s. is centrally located in the city, limited by well integrated main streets (with values above 1.66 indicated in table 3 and figure 2), surrounded by great diversity of amenities and services, good infrastructure.

Figure 2:

Axial map – connectivity and local integration (R3) in Jardim Planetário h.s.

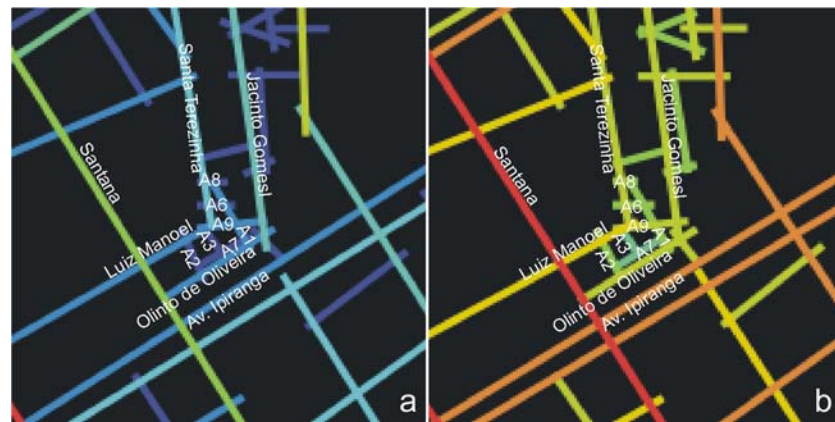


Table 3:

Syntactic measures – Jardim Planetário h.s.

Street	Global Integration (Rn)	Local Integration (R3)	Connectivity
Luiz Manoel	1.88427	2.93758	5
Santa Terezinha	1.72206	2.64076	9
Dr. Olinto de Oliveira	1.69072	2.61727	5
Street 1	1.41417	1.86497	5
Street 2	1.49355	1.96162	3
Street 3	1.24325	1.41662	2
Street 6	1.38627	1.72976	2
Street 7	1.23481	1.38737	3
Street 8	1.38627	1.72976	2
Street 9	1.55278	2.35229	5
Jacinto Gomes	1.68656	2.69054	11

Predominantly formed by terrace houses, typical site configuration consists of rows of houses facing each other, inserted in a physically defined plot separated by a circulation route 5-6 metres wide, shared by pedestrian and vehicles, adversely affecting privacy inside the dwelling unit. The communal open space located in the centre of the scheme was preserved, and a significant number of alterations were introduced in the dwellings (terrace and row houses) all over the scheme, either to improve living conditions or to perform income-generating activities.

Vila Tecnológica housing scheme

Located in the outskirts of the city, the housing scheme is surrounded by others low-income residential areas, industries and storage buildings. The scheme was formerly intended to experiment new low-cost technologies and is formed by a diversity of dwelling types. Residents are the most dissatisfied with location of the scheme in relation to the main road Frederico Mentz (figure 3, table 4), where

public transport is available (two others schemes investigated are located in the same area).



Figure 3:

Axial map – connectivity and local integration (R3) in Vila Tecnológica h.s.

Table 4:

Syntactic measures – Vila Tecnológica h.s.

Street	Global Integration (Rn)	Local Integration (R3)	Connectivity
Street A	1.23006	2.66189	6
Street B	1.03387	1.77460	3
Street C	0.89602	1.40284	3
Street D	0.89602	1.40284	3
Street E	0.78510	0.88702	2
Street F	1.03351	1.76417	3
Street G	0.89794	1.74952	5
Street H	0.92633	1.89620	5
Street I	0.88868	0.94787	2
Street J	1.03351	1.76417	3
Street L	1.03314	1.75363	3
Street M	1.03643	1.80970	3
Street N	1.03278	1.71447	2
Voluntários da Pátria	1.07720	2.13334	5
Frederico Mentz	1.50798	3.65832	27

Modifications were mainly introduced in the dwelling units or in the plot (private open spaces) of row, detached and semi-detached houses. Common open spaces were preserved.

Vila Progresso housing scheme

Located near Vila Tecnológica (surrounded by others low-income residential areas, industries and storage buildings), this is the most recently occupied housing scheme investigated. This pilot project is formed by terrace houses, and follows the typical configuration, with rows of houses facing each other, inserted in a physically defined plot separated by a circulation route 5-6 metres wide, shared by pedestrian and vehicles. This inflexible dwelling type tends to preserve its original characteristics, but ten plots were provided with extra area in order to accommodate small shops and services managed by residents, located in Diretriz 607, the street in the scheme with higher integration and connectivity values. Consequently, configuration and standardised facades are preserved.

The scheme is connected to the main road (Frederico Mentz, in figure 4), where public transport is available, through Diretriz 607 and Dona Teodora Street (table 5)

Mário Quintana housing scheme

Located near Vila Progresso and Vila Tecnológica, this housing scheme has a population of approx. 1.500 residents. Is formed by row and semi-detached houses, and presents the largest amount of modifications introduced in the dwelling units (94% of ground floor units were transformed into two floor houses, doubling the original area) and is the second in number of modifications introduced in common open spaces (after Cavahada h.s.).

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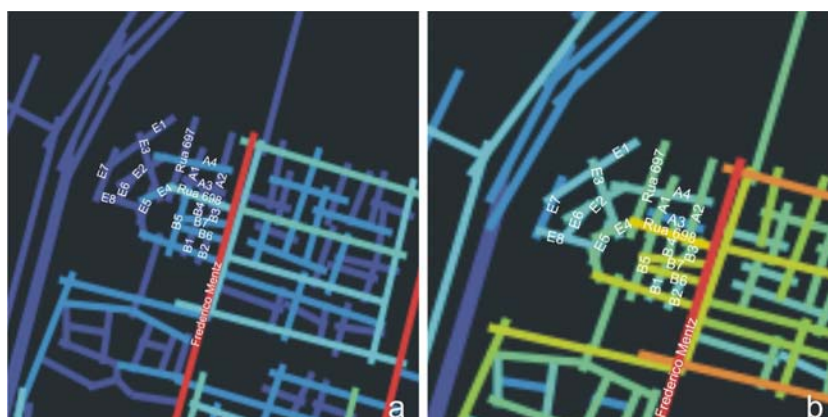
Axial map – connectivity and local integration (R3) in Vila Progresso h.s.



Syntactic measures – Vila Progresso h.s.

Street	Global Integration (Rn)	Local Integration (R3)	Connectivity
Diretriz 607	1.173750	1.945090	6
Street A1	0.991292	1.069710	1
Street A2	0.991928	1.212340	2
Street A3	0.991928	1.212340	2
Street A4	0.991292	1.069710	1
Street A5	0.991292	1.069710	1
Street A6	1.169310	1.727690	2
Street A7	0.988125	0.626884	1
Street A8	0.858881	0.766192	2
Dona Teodora Street	1.430540	2.815680	6

Axial map – connectivity and local integration (R3) in Mario Quintana h.s.



Syntactic measures – Mário Quintana h.s.

Street	Global Integration (Rn)	Local Integration (R3)	Connectivity
Street A1	1.04018	1.76018	3
Street A2	1.04018	1.76018	3
Street A3	0.88606	0.97929	2
Street A4	0.89239	1.54055	4
Street B1	1.03009	1.52981	2
Street B2	1.03009	1.52981	2
Street B3	1.03713	1.65437	2
Street B4	1.03701	1.65437	2
Street B5	1.04325	1.92612	4
Street B6	1.23575	2.42821	4
Street B7	1.23575	2.42821	4
Street 698	1.25473	2.65570	8
Street 697	1.04274	1.81683	3
Street E1	0.77709	1.02079	2
Street E2	0.77965	1.48647	3
Street E3	0.89239	1.46661	3
Street E4	1.04530	1.93840	4
Street E5	0.89503	1.50000	3
Street E6	0.69288	1.13657	2
Street E7	0.69085	0.98558	2
Street E8	0.78519	1.29893	3
Frederico Mentz	1.55304	3.60969	25

Apparently, they look as terrace houses, with differences in internal layout and plot occupation. Location is very satisfactory in relation to access to public transport, limited by the main road Frederico Mentz (figure 5), with high global integration and very high local integration (table 6) and highly connected.

Common open spaces located between streets B6, B7 and 698 (the three more integrated lines) were invaded with illegal constructions and are occupied with small shops and services. Configuration was altered and appearance of the scheme was adversely affected by modifications introduced in the schemes. Similarly to Cavilhada h.s., appearance of buildings and open spaces, security and satisfaction with the living environment are negatively evaluated.

The data showed in table 7 was collected through questionnaires. 28% out of the total sample of 180 respondents living in each dwelling type (30 respondents/h.s.) perform income-generating activities in the dwelling/plot.

Table 7:

Income-generating activities introduced inside the dwelling

Related Activities	Semi-detached house	Terrace house	Flat	Totalsample
Handcraft making	5.4%	4.6%	3.4%	4.5%
Childminding	1.8%	1.5%		1.1%
Cosmetic goods	8.9%	4.6%		4.5%
General repairs	1.8%	1.5%	1.7%	1.7%
Beauty saloon	1.8%	1.5%		1.1%
Smalls goods	12.5%	4.6%		5.6%
Food preparation		6.2%	3.4%	3.4%
Bar/bakery/corner shop/ grocery	7.2%	4.6%		3.9%
Storage paper		4.6%		1.7%
Gas retailer	1.8%			0.6%
Electronic goods storage and repair			1.7%	0.6%
Textile products			3.4%	1.2%

Relationships between income-generating activities, physical modification and dwelling type

The relationships between modifications in the dwelling unit and in the common areas of the housing schemes, implementation of income generation activities and its effects on resident satisfaction with the housing scheme were investigated. The type and quantity of modifications taking place were identified. 61% of respondent introduced internal modification in the dwelling unit, while the larger number of alterations were made in row and semi-detached houses (79.6%), followed by terrace houses (73%) and flats (28.2%). From those, 39.3% of residents in row and semi-detached houses; 29.2% of residents of terrace houses; and 15.3% of residents of flats perform income-generating activities in the dwelling. Therefore, it can be assumed that besides only part of internal modification was carried out to adapt the dwelling to those activities, some of the activities do not require physical modifications.

Evidence supports the assumption that the type and quantity of modifications taking place are related to the degree of spatial flexibility, according to each dwelling type. It indicates that residents living in detached and semi-detached houses tend to introduce larger number of physical modifications in order to perform income-generating activities inside the dwelling than residents in terrace houses and flats. Moreover, this finding confirm previous results (e.g., Lay & Reis 2003), where the number of modifications in the dwelling units and illegal occupation of communal spaces for this purpose illustrate inadequacy of planning on provision of basic needs in social housing, as well as indicates efforts made by low-income population to achieve job and

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income. Therefore, if in one hand results provide positive indicators, on the other hand the volume of illegal constructions for generating these jobs opportunities adversely affected satisfaction with overall visual appearance of housing schemes, provoking dissatisfaction with environmental performance, related with dissatisfaction with the dwelling unit (Spearman coef.= .298 sig 0.000), perceived level of security (Spearman coef.= .315 sig 0.000), and the aesthetic result consequences of modifications carried out.

Relationships between spatial configuration and location of income-generating activities

It was found that, independent of urban scale, dwelling type or spatial configuration, the different types of income-generating activities informally inserted in the housing schemes can be generally grouped in two categories concerning their location patterns. The first group relates to the visible linear pattern of shops, which tend to be located along the most integrated and connected street. The second group relates to non-visible income-generating activities, located in less integrated and connected parts of the housing schemes (figure 6). Activities under this category are carried out inside the dwelling, i.e. in the living room, or in a room specifically modified for this purpose. Yet, if activity requires systematic presence of costumers (such as hairdresser, selling of cosmetic goods), it will be usually performed in the more integrated room (the living room). Other activities that do not demand the presence of customers (such as frozen food preparation, handcraft production) tend to be performed in an adapted room (for example, bedroom).

Figure 6:

Example of dwellings with non-visible (a) and visible (b) activities



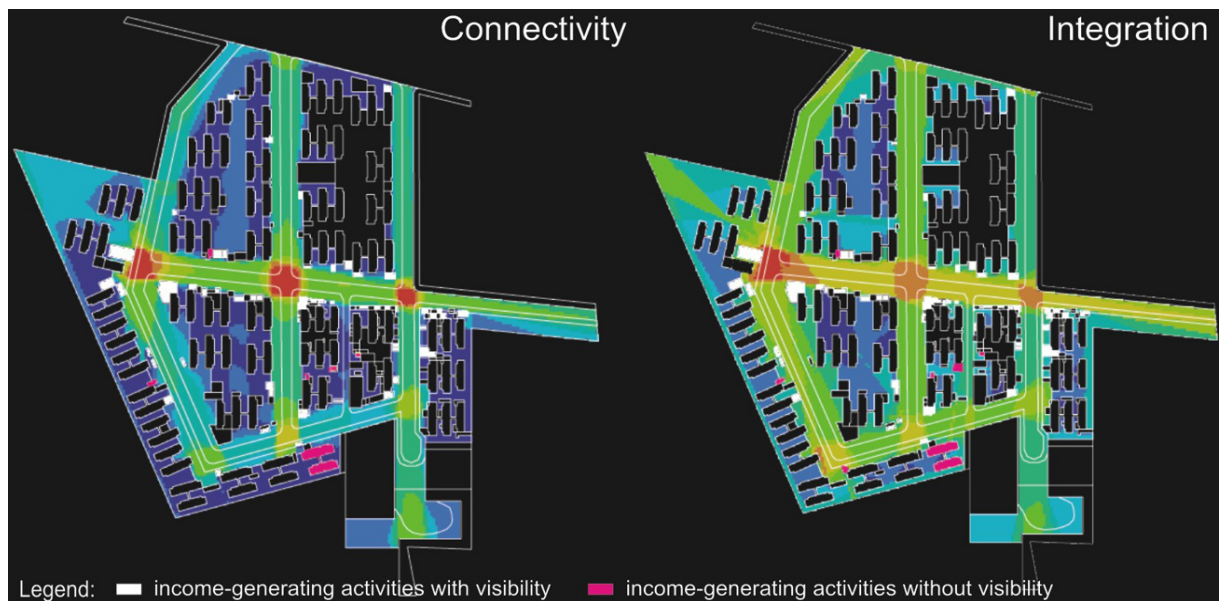
Analysis of dwelling location within the urban area and neighbourhood indicates that its linkages to public infrastructure appear to impact the characteristics of home-based work and the usage of the dwelling for income generation.

The number of shops or services generated in each category varied according to demand and the scale of the urban areas they intend to serve, on the flexibility of dwelling type and on the characteristics of the urban context. A comparative account of income-generating activities distribution allowed for a classification of the various types and sets out in what ways they came into being. The location patterns are compared with configurative analysis of the street grids in the areas in which the housing schemes are located.

Examples are shown below, with analysis of visual integration and visual connectivity maps of Cavalhada (figure 7) and Vila Progresso (figure 8) housing schemes.

Figure 7:

Location of visible and non-visible income-generating activities and visual integration and connectivity in Cavalhada h.s.

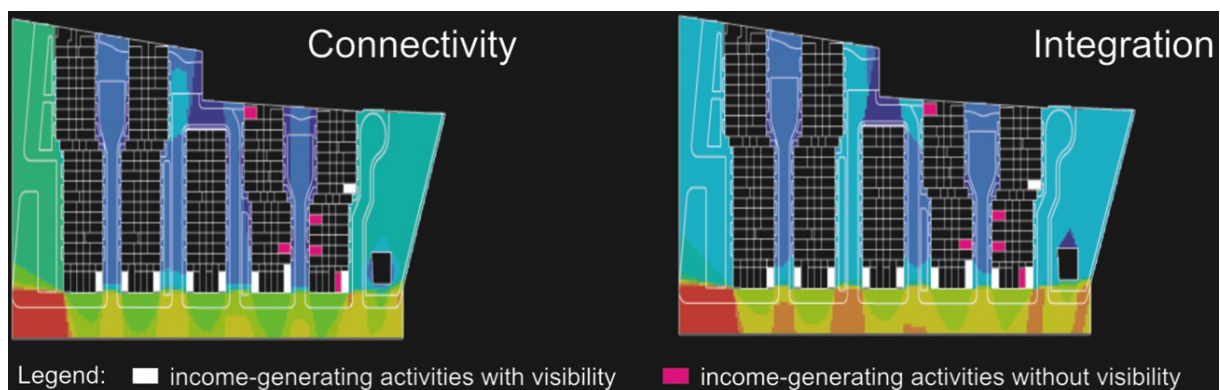


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In Cavalhada, although income-generating activities were spread in the site, concentration of visible activities (i.e. those that are visible from the outside, such as bars, services and others exemplified in figure 6 b), tend to occur at the more visually integrated and connected streets, and the opposite is also true. That is, non-visible activities (i.e. those that are not visible from the outside of the dwelling unit, such as handcraft making) do not need to be located at the more visually integrated and connected streets of the grid.

Figure 8:

Location of visible and non-visible income-generating activities and visual integration and connectivity in Vila Progresso h.s.



In Vila Progresso, formal location of plots provided for performance of income-generating activities is located in the more visually integrated and connected streets. The same occurred with the informal visible activities introduced by residents, reinforcing this line of movement. The non-visible activities identified through questionnaires (important to note that only 30 dwellings belonging to the sample of are registered on the map) present random location regarding visual

integration and connectivity. These activities rely on social contacts, more than in location itself.

Regarding the influence of dwelling type on performance of income-generating activities, results indicate that: 1) residents living in terrace houses are less able to perform visible income-generating activities than residents living in row and semi-detached houses, unless formal spaces are provided; 2) despite the location in the scheme, residents living in apartments, located in segregated areas, tend to introduce more visible than non-visible income-generating activities, mainly through illegal occupation of common open space; 3) affected by unfavourable access conditions, residents living in flats above the ground level tend to introduce non-visible activities (inside the dwelling) that do not require the presence of customers (for example, preparation of food and delivery, handcraft work).

Conclusions

Results show that, even in informal conditions such as the ones present in social housing in Brazil, the way people buy goods and services and the way sellers try to reach their potential customers seems to depend on the spatial configuration of an urban grid. Similarly to studies carried out about the influence of location and spatial configuration of the urban grid on performance of formal shopping areas (i.e. Van Nes, 2005), this paper illustrates how the location of different types of informal income-generating activities by residents was instinctively influenced by the degree of connectivity to streets grid on a micro scale, and degree of local integration of streets. That is, low-income residents (predominantly illiterates or with poor education) understand what are the necessary locational characteristics needed to successfully perform income-generating activities that require visibility. Moreover, it was verified that certain types of informal income-generating activities occurring within the domestic space of the dwelling are predominantly located in less connected and integrated streets, depending on density of the surrounding area's street grid and social framework, rather than visibility.

Similarly to the city scale, where the main streets and the area shopping streets are located along the highly locally integrated streets, low-income residents tend to instinctively locate visible income-generating activities along these streets. Consequently, residents living along the more integrated streets are more able to perform visible income-generating activities and improve their economic situation than those living in less integrated and less connected areas in the scheme.

Evidence provided indicate that part of household income generation in social housing in Porto Alegre originate from informal entrepreneurial activities carried out in the dwelling, resulting in a number of physical modifications in the dwelling as well as the creative usage of space and occupation of common areas. It is highlighted the importance of location of income generation activities in and/or near the dwelling, as a mean to provide job and income alternatives and to guarantee better living conditions to low-income residents. Finally, it can be argued that the provision of adequate design attributes to allow for home-based income-generating activities calls for an ample discussion on the findings. This contribution is meant to help to base guidelines for good practices in the design of social housing.

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