>The Influence of Physical Changes in Communal Open Spaces on Performance Evaluation of Housing Schemes

Lay, Maria Cristina D.
Federal University of Rio Grande do Sul, Brazil;
Post-Doctoral Fellow at the Faculty of Architecture, University of Sydney
Reis, Antônio T.
Federal University of Rio Grande do Sul, Brazil;
Post-Doctoral Fellow at the Faculty of Architecture, University of Sydney

ABSTRACT
The study investigates the relationships between physical characteristics of communal open spaces in residential environments, types of outdoor appropriation, resident satisfaction with visual appearance of buildings and outdoor spaces, and their effects on community formation, level of maintenance and performance evaluation of housing schemes. Methodological procedures adopted in the post-occupancy evaluation of twelve housing schemes, comprised of four storey blocks of flats, terrace, detached, semi-detached and row houses, located in the metropolitan area of Porto Alegre, Brazil, included questionnaires, interviews, observations, physical measurements, and GIS. Results indicate that, despite dwelling type, physical attributes of the schemes investigated, such as spatial definition, territorial control, adequacy of spaces for child's play and for large-scale socialising and overall visual appearance, when satisfactory, positively affected residents' attitudes and motivations to improve the scheme through physical changes and maintenance, and consequently affected social and user-environment interaction. Accordingly, discontent with the spatial arrangements on the site, conflicting uses caused by the nature of the semi-private and semi-public spaces, poor visual appearance and maintenance, were some of the factors identified as adversely affecting residents´ emotional attitudes toward the scheme and other residents, encouraging residents' motivations for dysfunctional behaviour, social conflict and further neglect. Variations on the effects of physical characteristics and type of appropriation of communal opens spaces were identified among the housing schemes formed by the different dwelling types.

INTRODUCTION

A body of research carried out since mid 60´s (e.g. Gans, 1968; Coulson, 1980; Darke, 1984; Cooper Marcus & Sarkissian, 1986) indicates that most of the qualitative problems that affect performance of housing schemes are originated by inadequacy of design, inconsistent with the basic requirements needed to support and satisfy aesthetically and functionally user needs and values, caused, inter-alia, by the lack of information design professional and decision makers have about future residents. It is further argued that inadequate design limits performance and affects use opportunities in the built environment, further affecting environmental quality. As Gehl (1987) remarks, activities such as walking, standing, sitting, seeing, hearing, talking, playing or other community activities, which make outdoor residential environments particularly attractive and meaningful to be in, are also the most sensitive to the quality of the physical environment.

Performance evaluation of housing schemes implemented during the last decade in Brazil (e.g. Lay, 1992; Reis, 1992; Reis, 1996; Reis & Lay, 1996; Lay, 1996; Lay, 2001), show differences on environmental quality and possibilities of appropriation, with frequent neglect of communal open spaces, both in terms of physical and social performance. Results obtained from these investigations corroborate many studies in the literature which show site layout and visual appearance as major factors influencing spatial behaviour and overall satisfaction (e.g. DoE, 1972; Francescato, 1979).

Legibility of site layout, which results from how the site is organised and how the buildings and spaces are located and related to each other, affect the ways spaces are used (Lay, 1998). That is, despite spatial behaviour or user satisfaction cannot be determined by design, it can establish a number of physical and spatial qualities that can support or inhibit patterns of behaviour, consequently affecting the intensity of contact among residents.

The network of social relationships is regarded as essential to residents' effective integration in the community they live, and territorial behaviour is part of a system that allows social organisation take place, promoting neighbourhood interaction and community formation (e.g. Wallace, 1952; Porteous, 1977). Norcross (1973) and Byron (1972), among others, note the adverse effects the lack of recognition of territorial responsibility over communal open spaces might have on overall maintenance. The perceived image of the housing scheme is strongly affected by the type of appropriation of open spaces, where negative attitudes towards the scheme can encourage negative behaviour, such as bad use and negligence on maintenance of common built and open spaces, and vice-versa (Lay & Reis, 1994).

Moreover, it is argued that perception of visual appearance is intrinsic to the process of image making. Lynch (1960) highlights the important role physical and symbolic components play in supporting or inhibit the creation of positive place image, further affecting user evaluation of residential environments by making the built environment more or less attractive, easy to understand and use. Therefore, visual appearance does not exclusively relate to formal and aesthetic qualities: even when architectural elements present an attractive composite structure, it does not constitute a sufficient condition to guarantee perception of positive visual appearance. Residents tend to evaluate visual appearance based on their perception of attributes that express or not their values, preferences and social aspirations, which are related to specific characteristics of buildings and open spaces, and overall maintenance (Reis, 1999).

The collection of claims in the literature reviewed suggest the hypothesis that there is a relationship between physical characteristics of communal open spaces, spatial behaviour and visual appearance, which influences and is influenced by community formation and resident attitudes towards the scheme. This relationship is investigated in this study, highlighting the important role provision and adequacy of communal open spaces play on performance evaluation of housing schemes. The paper is based on selected results of a recently completed comprehensive research supported by the National Financial Institution (Caixa Economica Federal), responsible for the production of low-income housing schemes in Brazil, carried out with the purpose of gathering feedback information to provide design guidelines for future housing production (Lay & Reis, 2002).

METHODS

The survey was designed in order to understand the influence quality of the outdoor residential environment has on types of outdoor appropriation, community formation, level of maintenance and performance evaluation of housing schemes. The means and methods of measuring the variables were investigated and tested through post occupancy evaluation of twelve housing schemes composed of four storey blocks of flats, terrace houses, and detached/semi-detached/row houses. It must be emphasised that, while in most countries mass housing schemes are in public ownership, in Brazil, since the National Housing Programme was established in 1964, the dwellings and the communal spaces are privately owned and maintained by the residents, acquired on a subsidised basis from the National Financial Institution.

The multi-methods techniques used for data collection consisted of a combination of physical measurements, observations of behaviour, observation of physical traces, interviews and questionnaires. Detailed physical and photographic surveys were carried out in each of the twelve sites, in order to measure modifications and permanence of relationships among spaces. Open spaces were analysed according to type of use, physical attributes and space hierarchy definition. Outdoor behaviour was systematically observed during two weeks, and data was recorded and analysed through behavioural mapping procedure (138 behavioural maps). A total of 111 focused interviews were administered with the objective of understanding issues related to people's attitudes toward their residential environment and social behaviour which could not be fully understood through the other methods. 374 questionnaires were responded by a sample of residents selected according to dwelling location in the scheme, and degree of visual and functional accessibility between the dwelling and the communal open spaces. The non-parametric data collected through questionnaires allowed the exploration of relationships between the variables, by means of statistical analysis (cross tabulations, Kruskal-Wallis test one way of variance, and Spearman rank correlation were applied). The size of the sample varied in each scheme, affected by the size of the scheme and the number of residents available to respond the questionnaire. The minimum of 30 subjects was achieved in ten out of the twelve schemes. In the two smallest schemes (with 52 and 40 housing units), sample size was reduced to 20 and 24 (approx. 50% of dwelling units), which might have

influenced to a certain extend results of non-parametric statistical tests, concealing statistical significance or potential correlations in the two schemes.

The data analysis provided measures to asses how strongly user evaluation of environmental performance was related to types of appropriation of outdoor spaces and physical characteristics of the residential environment. The information gathered from physical measurements and behavioural maps were crossed with GIS spatial analysis procedures. The graphic descriptions obtained allowed visualisation and quantification of described spatial characteristics.

The selection of the sample was based on diagnostic explorations conducted in 32 housing schemes provided by governmental housing policy for low income groups located within the metropolitan area of Porto Alegre. The housing schemes selected 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 and site layout, comparable in time of completion/occupation and resident socio-economic characteristics, located in similar urban areas deficiently provided with recreational public facilities, local shops and services. Although resident socio-economic characteristics were comparable in range, it was noted variance of household income among residents of each dwelling type, increasing from block of flats to terrace houses and detached/ semi-detached/row houses.

Housing Schemes	Description	Time of occupation
	BLOCK OF APARTMENTS	
LOUREIRO DA SILVA	416 units with two bedrooms, distributed in 26 blocks four storey high, with 16 apartments each (4 units per floor)	December/ 1985
ANGICO	96 units with two bedroom, distributed in 6 blocks four storey high, with 16 apartments each (4 units per floor)	January/1985
CAVALHADA	352 units with two bedroom, distributed in 9 blocks four storey high, with 12 apartments per floor 96 units with one bedroom, distributed in two blocks four storey high, with 48 apartments each (12 apartments per floor)	February/1984
SAPUCAIA DO SUL	1152 units with two bedroom, distributed in 36 blocks four storey high, with 32 apartments per floor (8 units per floor)	April/ 1981
GUAJUVIRAS – (sector A)	432 units with two bedroom, distributed in 27 blocks four storey high, with 16 apartments each (4 units per floor) 144 units with one bedroom, distributed in 12 blocks four storey high, with 12 apartments each (3 units per floor)	January/1987
	TERRACE HOUSES	
JOÃO VEDANA	48 two bedroom terrace houses.	October/ 1986
VALE VERDE	151 two bedroom terrace houses.	March/ 1991
SANTO ALFREDO	40 two bedroom terrace houses.	April/ 1996
SÃO JORGE	52 two bedroom terrace houses.	April/ 1996
	DETACHED/SEMI DETACHED/ROW HOUSES	
4ª U.V. RESTINGA	416 semi-detached houses with two and three bedroom	October/ 1980
GUAJUVIRAS (sector B)	236 detached houses with two and three bedroom	January/1987
COSTA E SILVA	550 detached and row houses with two and three bedroom	February/1981

Note: Guajuviras housing scheme is formed by 10 sectors, but only sectors A (blocks of apartments) and B (detached houses) are part of the sample.

Sampling selection

Table 1: Summary description of housing schemes

RESULTS

The data generated enabled to examine how the physical environment supports or interferes with behaviours taking place in communal open spaces, especially the side effects the settings have on relationships between individuals or groups, which might affect level of maintenance and modifications introduced by residents in buildings and open spaces. In order to test the working hypothesis, the results focus on the relationship between physical characteristics of communal open spaces and types of outdoor appropriation, emphasising the impact (positive and negative) quality of open spaces has on community formation, and its effects on resident satisfaction with visual appearance and performance evaluation of housing schemes, as follows.

Physical characteristics and appropriation of communal open spaces

The process of appropriation of semi-private and semi-public open spaces was undertaken by two means: 1) by use, to perform recreational, social and functional activities; 2) by occupation with illegal or formal constructions. A short description of the main physical characteristics and site layout of each housing scheme highlight intensity of occupation and use of open spaces. It illustrates how type and intensity of appropriation affected and was affected by the physical characteristics of open spaces, as well as by the pre-existing (before physical modifications took place) and present relationships between outdoor spaces and buildings in each scheme. Increase in built area occurred predominantly in communal open spaces without clear physical definition of spatial hierarchy and spaces originally provided for circulation and parking (in the case of blocks of flats and terrace houses), and in private open spaces (in the case of detached/semi-detached/row houses).

HOUSING SCHEME	Total Built area (sample)					
	Original built area		Existing built area		Increase in built area	
	m^2	%	m^2	%	m^2	%
Loureiro da Silva	5330,0	19,0	7616,7	27,2	2286,7	42,9
Guajuviras (sector a)	6774,7	13,37	15694,5	31,0	8919,7	131,7
Angico	1192,0	22,2	1631,7	23,3	439,7	36,9
Sapucaia	11613,5	18,2	21316,0	33,5	9702,5	83,5
Cavalhada	4743,0	21,9	9758,7	45,1	5015,7	105,8
Santo Alfredo	728,0	31,1	1210,3	51,8	482,3	66,25
São Jorge	729,0	32,2	833,8	36,7	104,8	14,4
Vale Verde	3020,8	30,2	4458,0	44,6	1437,2	47,6
João Vedana	836,0	28,3	1075,0	36,4	239,0	28,6
Restinga	17426,1	12,3	50350,9	35,1	32924,8	188,9
Guajuviras (sector b)	8199,5	8,8	19519,8	21,0	11320,3	138,0
Costa e Silva	22331,3	15,7	53548,1	37,7	31216,8	139,8

note 1: calculations were made with GIS, considering the total sampling data.
note 2: the total built area refers to built area at the ground level only.
note 3: % figures refers to occupation rate of open spaces with built area.

Table 2: Increase in built area
the total sampling data.

The table below shows the increase in built area and the occupation rate in each of the housing schemes investigated.

Blocks of Apartments

The five schemes composed of blocks of flats presented significant increase in occupation rates (from 45,1% in Cavalhada, to 23,3% in Angico). Originally, site layout in each setting was characterised by buildings surrounded by communal open spaces. With some variations, groups of buildings were provided with ambiguous semi-private spaces, while semi-public spaces were provided to all residents, including circulation system, recreation fields and parking lots. Private open spaces were not provided. Nonetheless, the lack of clear physical definition of spatial hierarchy in the schemes generated problems in the effective appropriation of communal open spaces. Residents tended to create new categories of social spaces that altered the relationships of the components of the settings, resulting in intensive invasion of communal open spaces by illegal private constructions (used for a variety of purposes, such as garage, space room, and small shop), abandoned spaces and conflicting uses. The consequences of occupation with illegal constructions can be summarised as follows:

- when semi-private spaces are invaded by constructions, the potentially secure, visible and accessible type of space where recreation of small children could take place is eliminated, and conditions and opportunities for social contact among residents decrease. Consequently, due to the lack of adequate space, socialising and recreation of small children tend to occur at the entrance to the buildings, adversely affecting privacy inside ground floor flats, provoking disagreements among residents. After open spaces are invaded, maintenance of the remaining outdoor space and building is poor, while where illegal construction did not occur, use of semi-private spaces is intense, and level of maintenance of open spaces and buildings are satisfactory.
- when illegal constructions are made as an extension of ground level apartments, besides eliminating gathering spaces, the structure of the building can be jeopardised.
- when semi-public spaces are invaded by constructions, the consequences assume higher proportions, affecting security, visual appearance and the image of the scheme. It results in total or partial elimination of possibilities of recreational activities to all residents, creates physical barriers that affect circulation and reduce visibility, promoting occurrence of crime, and violence in general.

Recreation facilities - Sapucaia

Residual open space - Angico

Playing fields - Loureiro da Silva

Figure 1: Examples of semi-public spaces in housing schemes with blocks of apartments

Out of the five schemes, there are two schemes with remaining semi-public space and recreation equipment available for the different age groups. In Sapucaia, semi-public spaces were recently renovated by the municipality, with adequate playing equipment, sitting spaces and good paving. Maintenance is very good, and spaces are intensively used. Nonetheless, all semi-private spaces were invaded by constructions (increase in 83.5% of ground built area). In Loureiro da Silva, invasions occurred in semi-public and semi-private spaces (increase in 42.9% of ground built area). But semi-public play ground areas and playing fields were partially preserved, and are intensively used by residents and non-residents, despite its bad upkeep and overall degradation, as alternative recreational facilities do not exist nearby. These spaces are surrounded by illegal constructions made in the original car parking area, and are perceived as insecure by the population.

In Guajuviras (sector a) and Angico, adequate spaces for socializing or recreation were not provided. In Guajuviras, left over spaces and parking lots were invaded by illegal constructions. In this scheme, most constructions were intended to supply the total lack of local shops and small services in the area. Recreational and social activities tend to occur in the remaining circulation spaces between the formal and illegal buildings and on the streets. In a few cases, residents defined a semi-private space around their building, limited by railings, which was not invaded and was well preserved and used. This scheme presents the highest increase in built area (131.7%). Its occupation rate increased from 13.37% up to 31%. Angico is the smallest scheme among the five. The increase in built area (36.9%) refers mainly to constructions in the parking lot, and a reduced number of extensions of ground floor apartments. Children tend to play in the circulation areas and next to the entrance to buildings, and conflict among residents are frequent. Due to the lack of adequate communal open spaces, walkways are also used for recreation purposes and socializing.

In Cavalhada, illegal construction is intense, and occupation rate increased from 21.9% up to 45.1%. In this scheme, extensions are not restricted to ground floor apartments, and most semi-private spaces were invaded by illegal constructions, with narrow spaces remaining for circulation purpose. The only semi-public space provided for recreation is intensively used, but it is too small and inadequate to supply the needs of the total population. The streets were appropriated as recreation and social spaces, and circulation of cars occurs simultaneously with ball playing, biking and other recreational activities. Adults gather in local bars inserted in some of the illegal constructions.

Terrace houses

The four housing schemes composed of terrace houses had the smallest original area of communal open spaces available for recreational and social purposes, with and average occupation rate of 30%, before new constructions were introduced in the site. After constructions were added, built areas vary among the four schemes, showing a wider range of occupation rate (from 51.8% in Santo Alfredo to 36.4% in João Vedana). Differently from schemes with block of flats, the increase in built area resulted from formal constructions (such as enclosed barbecue area, or a communal room for social gathering) made by the group of residents, for communal use, and increase of private built area in the back yard of each house. Typical site layout consists of rows of terrace houses facing each other, inserted in a physically defined plot,

Recreation facilities - Vale Verde

Circulation route - Santo Alfredo

Circulation route - São Jorge

Figure 2: Examples of communal outdoor spaces in housing schemes with terrace houses.

separated by a circulation route 5-6 metres wide, shared by pedestrians and vehicles, with controlled entrance. The number of rows varies according to the shape of the plot, and the size of the scheme. The terrace houses usually have a minimal private open space at the back, and rarely have a small recess at the front, in order to preserve visual privacy inside the dwelling, which is a major concern among residents. Privacy is adversely affected by the intense traffic and activities performed in the narrow circulation routes, and by the excessive proximity between rows of dwellings. Communal open spaces are scarce, and are shared and maintained by all residents. When spaces for social gathering and recreation are provided, they are usually inadequate and insufficient. For this reason, the circulation routes and parking areas are also used for children recreation. Many residents avoid the use of communal open spaces, while others restrain themselves to sit in front of their dwellings.

Among the four schemes, Vale Verde is the largest, with the highest household income among the twelve schemes. Overall maintenance is very satisfactory, and reflects strong community organisation. Railings surround the scheme, and a private guard hired by the community controls entrance. The main increase in built area refers to occupation of private back yards and the construction of a gathering space at the back of the plot, near the playground area. Despite the level of control, this area is perceived as insecure, due to reduced visual access, and most recreation activities occur in the circulation routes, near the entrance to the dwellings.

With similar size and comparable layout, Santo Alfredo and São Jorge are close to each other, separated by a contention wall. The schemes consist of two double rows of terrace houses, separated by a 5 metres wide circulation route, and two entrance alleys at the back of each row, limited by contention walls that delimit the plots. Due to topographic characteristics of each site (site in Santo Alfredo in levelled, site in Sao Jorge is sloped, with steps), circulation routes in each scheme are used differently. In Santo Alfredo, the parking area is located at the back of the plot, and the route is simultaneously used by pedestrian and vehicles. In Sao Jorge, the parking area is located at the front of the plot, facing the street, so that the route is exclusively used by pedestrian. Considering these differences, one might infer that performance in Sao Jorge might be more satisfactory than in Santo Alfredo, as security for pedestrian is better in the former one. Nonetheless, as a considerable portion of land at the back of the plot in Sao Jorge is a too deep slope to be used, residents do not have enough space to have a playground area, or a social gathering place, as residents in Santo Alfredo do. Maintenance was more satisfactory in Santo Alfredo, and a variety of improvements were made in the site, which showed more intense appropriation of communal open spaces than in Sao Jorge.

The 28.6% increase in built area in João Vedana refers mainly to constructions of individual garages in the parking lot, equivalent to 1/3 of the ground built area of the dwellings, but still inadequate, considering the total number of residents with vehicles. The communal open spaces are reduced to the circulation route. Social gathering among adults is scarce. The remaining open space at the back of the plot is unusable and dangerous, with poor sanitation, original to the site. Residents in Joao Vedana do not have the

necessary economic resources to recuperate this peace of land, consequently, no action towards improving the scheme has been taken since its occupation.

Detached, semi-detached and row houses
The three schemes composed of detached, semi-detached and row houses presented the lowest original occupation rates (between 8% and 15%) among all schemes, however the increase in built area reached between 138% and 188,9%. All new built areas were constructed in private open spaces (front and back yards). Original plot occupation and aesthetics patterns were modified, with variations on types and intensity of intervention according to economic resources of households. In order to compensate the lack of small services and local shops in the area, many of the dwellings were modified in order to fulfil this need, being converted into mixed use dwellings.

Site layout is characterised by blocks subdivided into private lots, with streets (road and sidewalk) on all four sides. The limits between the scheme and the surrounding area are not physically demarcated. Hierarchy of open spaces inside the scheme is clearly defined, with private yards (private spaces), sidewalks (semi-private) and streets (semi-public). Semi-public open spaces, with vegetation, playing field and recreation equipment, are frequently provided. Use of communal open spaces depends on various factors, such as perception of security, overall maintenance and adequacy of equipment provided. Despite clear spatial hierarchy definition, control is a major concern in this type of scheme. Perception of security was reflected in terms of fears for children's safety and fear of criminal activity from people living in the surrounding areas. When undesirable non-residents to the scheme use the recreation grounds, insecurity is perceived, and residents tend to avoid confrontation. Besides pedestrian circulation, sidewalks perform an important social role; therefore provision of adequate width, paving and vegetation is important. As they are located close to the dwellings, these are the spaces more frequently used by children and adults, leaving near by, strongly supporting community formation. In the schemes investigated, residents were not satisfied with width of sidewalks provided. Detached houses were originally provided with larger yards, more suitable for small children recreation and outdoor social gathering than semi-detached or row houses, who must rely on communal open spaces to perform such activities, when new built areas were inserted in the yards.
The two sectors investigated in Restinga (with semi-detached houses) and Costa e Silva (with detached and row houses), were provided with recreational communal spaces (two in each scheme) and centrally located in relation to a pre-determined number of dwellings. Maintenance of semi-public spaces was shared between the municipality and the resident association conceived in each scheme. In open spaces where insecurity was perceived, maintenance and use by residents declined. When spaces are controlled and security is satisfactory, maintenance and use are intense. Guajuviras (with detached houses) was not provided with recreational open spaces. Children and adults intensively use streets and front yards for all types of recreation and social gathering. The presence of vehicles is limited to residents circulation, and security is not adversely perceived in this scheme.

Recreation facilities - Restinga

Sidewalk and front yard- Guajuviras

Semi-public spaces - Costa e Silva

Figure 3: Example of communal open spaces in housing schemes with houses

Relationship between use and sense of community
The importance of adequate provision of communal open spaces in affecting positive performance evaluation and supporting community formation is confirmed through the identification of statistically significant relationships (Kruskal-Wallis and Spearman tests), which show that:
(residents who use communal open spaces tend to be more satisfied with the housing scheme than non-

users;
(there is a relationship between use of communal open spaces and the type and intensity of relations among residents in both directions: users of communal open spaces maintain better relationships among themselves them residents who do not gather socially with other residents, and when adverse relations exist among residents, communal open spaces tend to be misused. On the other hand, bad relations among residents can result from inadequacy or insufficiency of spaces provided for recreation and social gathering, which promote conflicts due to the need of alternative use of spaces that might affect privacy, excess of noise, or even material damage to private property.

(although a relationship between sense of community and dwelling type was not statistically identified, it is noted that residents of detached, semi-detached and row houses are better related among themselves than residents of blocks of apartments and terrace houses. This finding corroborate the statement above, as conflicts generated by inadequacy of open spaces are more frequent in schemes of blocks of apartments and terrace houses.

When type and intensity of relations among residents are correlated with satisfaction with the scheme, and satisfaction with the living environment (including the surrounding areas), it was found that relations among residents are important in affecting performance evaluation. Considering the total sample, correlation between these variables were identified (c=.2642 , sig.= .000 and c=.1791 , sig.=.001), indicating that the better are relations among residents, the higher is satisfaction with the scheme and the living environment, and vice-versa. Correlation identified in Joao Vedana and Guajuviras (houses) further support this assertion: bad relations among residents in Joao Vedana is correlated with dissatisfaction with the scheme (c=.5216, sig.=. 003), and the very good relations among residents in Guajuviras is correlated with satisfactory evaluation of the scheme (c=.5260, sig.=. 002). Moreover, relations among residents in Cavalhada, Sao Jorge and Vale Verde were correlated with satisfaction with the living environment.

Results further indicate that relations among residents and sense of community affect level of maintenance of communal open spaces and equipment: the better are the relations, the better the community is organised for provision and upkeep of outdoor spaces. That is, the lack of organisation and maintenance in the scheme highlights problems among residents, and indicates the impact of physical characteristics on sense of community.

The impact of environmental quality on resident satisfaction with the scheme
Level of organisation among residents, measured through questionnaires, interviews and observations of behaviour, is manifest in the external appearance of buildings and communal outdoor spaces. This becomes even more evident in schemes of blocks of apartments, where instead fulfilling the needs of the community through collective efforts, most modification were made by individuals actions, showing no consideration for others residents' opinion. Consequences are adverse in many respects, such as the neglected appearance of buildings, lack of open spaces to perform recreational and social activities, lack of maintenance of outdoor spaces, insecurity and inadequate circulation system, affected by lack of organisation of increased built areas.
The results indicate that neglected appearance of the scheme, including appearance of buildings and open spaces, might be affecting level of satisfaction with

Housing Schemes	Satisfaction with the scheme	Satisfaction with appearance of buildings	Satisfaction with appearance of open spaces	Satisfaction with quantity of open spaces
	mean rank (K-W)	mean rank (K-W)	mean rank (K-W)	mean rank (K-W)
Loureiro da Silva	193,40	197,37	174,48	193,80
Guajuviras (sector a)	194,06	185,84	182,97	159,89
Angico	167,95	180,67	153,03	177,60
Sapucaia	180,83	113,38	253,30	207,35
Cavalhada	**122,61**	**98,23**	140,47	141,23
Santo Alfredo	168,73	207,75	213,00	152,00
São Jorge	159,05	190,45	**116,10**	158,40
Vale Verde	225,20	214,63	**260,30**	177,60
João Vedana	131,70	131,02	125,67	**139,20**
Restinga	234,08	225,85	211,03	267,46
Guajuviras (sector b)	192,53	213,45	177,97	167,67
Costa e Silva	**255,53**	**284,63**	227,75	**273,89**

Table 3: Satisfaction with the scheme, appearance of buildings, appearance of open spaces, and quantity of open spaces.

the housing scheme and satisfaction with the living environment. Moreover, it was found that neglected appearance can affect resident self-esteem and promote social discrimination, affected by the resulting image of the scheme, as in Cavalhada. The consequences are further noted in the lack of motivation to preserve the housing scheme as a whole, including maintenance of communal open spaces, addition of improvements and maintenance of buildings (i.e. in Sao Jorge and Joao Vedana). On the other hand, positive evaluation of the housing scheme in Costa e Silva appears to be affected by the high level of satisfaction with appearance of the buildings and quantity of open spaces. The level of satisfaction with the scheme, appearance of buildings and open spaces and quantity of outdoor spaces available in each scheme are illustrated in the table below.

Level of satisfaction with building appearance vary significantly among the twelve schemes investigated (K-W, chi2=90.7660, sig.=.0000). In Costa e Silva, 75% of residents are satisfied with building appearance, while in Cavalhada and Sapucaia, with intense occupation of communal spaces by illegal construction and serious structural problems in the buildings, most residents are dissatisfied with building appearance. Moreover, satisfaction with appearance of communal open spaces are significantly different among the schemes (K-W, Chi2=67,6607, sig.=.0000). While residents in Joao Vedana and Sao Jorge are the most dissatisfied, residents in Vale Verde and Sapucaia are the most satisfied with appearance of communal open spaces.

From the exploration of relationships between level of satisfaction with the scheme, open spaces and building appearance, correlations were confirmed. Correlation between satisfaction with building appearance and satisfaction with the scheme (c=.4085, sig.=.000) in the total sample, reveals the effects building appearance has on resident satisfaction with the scheme. Correlation between the two variables were also individually found in schemes formed by houses (Restinga, with c=.3765 sig.=.024) blocks of apartments (Loureiro da Silva with c= .3681, sig.=.013; Angico with c=.5848, sig.=.001) and terraces (João Vedana with c=.5895 sig.=.001; São Jorge with c=.4859, sig.=.030). Correlation was found between satisfaction with appearance of open spaces and satisfaction with the scheme (c=.4085 sig.=.000) in the total sample, confirming the effects of quality of open spaces on housing scheme evaluation. Correlation between the two variables were found in schemes composed of blocks of apartments (i.e. Loureiro da Silva c=.3848 sig.=.009; Cavalhada with c=.4198, sig.=.015; Guajuviras with c=.5981, sig.=.000). These results indicate that while building appearance is an important attribute in affecting satisfaction with the scheme, despite dwelling type, appearance of communal open spaces is more important in affecting evaluation of schemes formed by blocks of flats.

CONCLUSION

The results highlight the important role outdoor residential environments play on type and intensity of appropriation, community formation, overall visual appearance and resident evaluation of housing schemes formed by different dwelling types: physical attributes such as spatial definition, territorial control, adequacy of spaces for child's play and for large-scale socialising, etc., when satisfactory, positively affected residents' attitudes. These positive attitudes had an effect on resident motivation to improve the scheme through physical changes and maintenance, and consequently affected social interaction among residents, which were further motivated to increase social and user-environment interaction. On the other hand, discontent with the spatial arrangements on the site and conflicting uses caused by the nature of semi-private and semi-public spaces and the sort of changes introduced, were identified as adversely affecting residents' emotional attitudes toward the scheme and other residents. These factors were assumed to encourage residents' motivations for dysfunctional behaviour, social conflict and further neglect. Moreover, it was confirmed that when ambiguous spaces exist, residents tend to modify physical definition of spaces, adversely affecting security, environmental comfort, overall visual appearance, legibility and orientation, self-esteem, relationships among residents and sense of place, all considered necessary conditions for adequate performance of residential environments.

REFERENCES

BYRON, J.B. 1972. Shared open space in Scottish private enterprise housing. Edinburgh, Architecture Research Unit, University of Edinburgh.

COOPER MARCUS, C. and SARKISSIAN, W. 1986. Housing as if People Mattered. Berkeley: University of California Press, Ltd.

COULSON, N.J. 1980. Space around the home: Do residents like what the planners provide? The Architects' Journal, December, Vol.24, 1245-1260.

DARKE, J. 1984. Architects and User Requirements in Public Setor Housing: towards and adequate understanding of user requirements in housing. Environment and Planning B: Planning and Design, Vol.11, 389-433.

Department of the Environment, 1972. The estate

outside the dwelling: reactions of residents to aspects of housing layout. Design Bulletin 25, London, HMSO.
FRANCESCATO, G. et al, 1979. Residents´Satisfaction in HUD-Assisted Housing: Design and Management Factors. Washington, D.C.: U.S. Department of Housing and Urban Development.
GANS, H.J. 1968. People and plans: essays on urban problems and solutions. New York: Basic Books.
GEHL, J. 1987. Life between buildings. New York: Van Nostrand Rheinhold
LAY, M.C.D. 1992. Responsive site design, user environmental perception and behaviour. Ph.D. Thesis. Oxford Brookes University, Oxford, England.
LAY, M.C.D. 1996. Relationships between site layout and spatial behaviour in low income housing schemes. In Evolving Environmental Ideals: Changing Ways of Life, Values and Design Practices, Proceedings of the 14th IAPS Conference, Stockholm, Royal Institute of Technology (KTH), 159-168.
LAY, M.C.D. 1998. Site layout, territorial organisation and social behaviour in residential environments. In Shifting Balances: Changing Roles in Policy, Research and Design, Proceedings of the 15th IAPS Conference, Eindhoven, University of Technology (EIRASS), 398-409.
LAY, M.C.D. 2001. Effects of dwelling type diversity on appropriation of outdoor spaces and community formation in housing schemes. In New World, Old Ideas..., Proceedings of the 32nd EDRA Conference, Edinburgh, Scotland.
LAY, M.C.D. & REIS, A.T. 1994. The impact of housing quality on the urban image. In Neary, S.J., M.S. Symes and F.E. Brown (eds.), The Urban Experience, London, Chapman and Hall, 85-98.
LAY, M.C.D. & REIS, A.T. 2002. Elementos de projeto que afetam o desempenho de conjuntos habitacionais - Recomendações de Projeto. Porto Alegre, Caixa Economica Federal /UFRGS.
LYNCH, K. 1960. The Image of the City. Cambridge, Mass: MIT Press.
NORCROSS, C. 1973. Townhouses and condominiums: Residents´likes and dislikes. Institute Special Report, Washington DC, Urban Land Institute.
PORTEOUS, J.D. 1977. Environment and Behaviour: Planning an Everyday Urban Life. Reading, Mass.: Addison-Wesley.
REIS, A.T. 1992. Mass housing design, user participations and satisfaction. Ph.D. Thesis. Oxford Brookes University, Oxford, England.
REIS, A.T. 1996. Illegal Occupation of Uncompleted Blocks of Flats: Effects on Residents' Satisfaction, Attitudes and Behaviour. In Evolving Environmental Ideals: Changing Ways of Life, Values and Design Practices, Proceedings of the 14th IAPS Conference, Stockholm, Royal Institute of Technology (KTH), 444-453.
REIS, A.T. 1999. Open Spaces of Housing Environments: Lack of Territorial Control, Maintenance, Use and Appearance. In T. Mann (ed.), The Power of Imagination, Proceedings of the 30th EDRA Conference, Orlando, Florida, 179-187.
REIS, A.T. & LAY, M.C.D. 1996. Security in Private and Semi-Private Housing Spaces in Brazil. In Public and Private Places, Proceedings of the 27th EDRA Conference, Salt Lake City, Utah, 117-123.
WALLACE, A.F.C. (1952). Housing and Social Structure.Philadelphia Housing Authority

ACKNOWLEDGEMENT
To CNPq and CAPES (Brazilian Research Institutions), for post-doctoral scholarships, and to CEF-Caixa Economica Federal (Brazilian National Financial Institution), for research financial support.