Affordable housing in Portugal and São Paulo Municipality: Comparison of space standards and socio-economic indicators

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Abstract:
This paper compares the space standards set for affordable housing in Portugal and in São Paulo Municipality (Brazil), and seeks explanations for differences in the socio-economic context of each territory. The Controlled Cost Housing (CCH) in Portugal and the housing built within the program My Home My Life (MHML) in São Paulo Municipality are studied. Three research questions are addressed: Which program has more demanding space standards? Which social-economic conditions explain the differences in space standards? How different space standards influence the users' satisfaction? To answer these questions, space standards, socio-economic indicators and the users' satisfaction are compared. Space standards compared the number and type of rooms, the internal floor area of dwellings, the size of rooms, and the size of furniture and equipment. The study has shown that space standards set for CCH are more demanding than those set for MHML program. For instance, a CCH dwelling has almost two times the gross area of a MHML dwelling with the same number of rooms. The housing deficit, the low income of poor households and the option to sell highly subsidized affordable housing are reasons that justify the low space standards in São Paulo Municipality when compared to Portugal. Although affordable houses are substantially smaller in São Paulo Municipality, the satisfaction level of dwellers with the size of dwellings is higher. Therefore, a direct link between space standards and users' satisfaction cannot be set. We conclude that different political options on how to provide housing to low income households directly influence the space standards set for dwellings.

Keywords:
Brazil, Portugal, Affordable housing, Space Standards

1 Introduction

In Portugal and Brazil, it is generally accepted that the main goal of housing policy is to ensure decent housing for all households. This can be achieved by facilitating access to property, by providing access to a rented house or by ensuring minimum conditions of habitability in existing housing.

Both to enable access to property and to create a housing rental stock, the State may support the construction of housing, usually called affordable housing. Its main objective is to provide decent housing at affordable prices for low income households. Therefore, minimum parameters are set to ensure that dwellings have a quality level suitable to meet, at least, the basic needs of dwellers within the lifespan of the construction. Maximum parameters can also be set to guarantee that housing cost is compatible with the economic capacity of low income households, as well as to guarantee a good use of funds invested.

The general requirements for adequate or decent housing have been internationally accepted (UN-Habitat, 1996): it should provide a safe, healthy, comfortable and functional environment, at an affordable cost. However, the performance demanded for each requirement often varies from country to country according to the prevailing cultural, social, environmental, technological and economic conditions.

To ensure functionality, a dwelling shall be large enough to meet user's needs in terms of living, cooking, dining, sleeping, bathing and storing household goods. Space standards set the conditions to fulfil these objectives and usually specify the overall area, size and dimensions of rooms, ceiling height and layout of dwellings.

This paper compares space standards set for the construction of affordable housing in Portugal and in São Paulo Municipality, and seeks explanations for differences in the socio-economic context of each territory. The case studies consist of the *Controlled Cost Housing* (CCH), in Portugal, and the housing built within the program *My Home My Life* (MHML), in São Paulo Municipality. The three research questions addressed are as follows:

1) Which program has more demanding space standards?
2) Which social-economic conditions explain the differences in space standards?
3) How different space standards influence users' satisfaction?

The following section explains the research methodology and Section 3 describes the two case studies. Section 4 compares the socio-economic indicators and Section 5 presents the results of the comparison between space standards. The results are discussed in Section 6.

2 Research methodology

The study was developed according to the following methodology:

1) Identification of the problem and definition of concepts;
2) Characterization of case studies;

3) Comparison of socio-economic indicators;

4) Comparison of space standards set by building regulations;

5) Cross analysis of socio-economic indicators and space standards;

6) Summary of key findings and discussion of results.

3 Case studies

3.1 Controlled Cost Housing

In Portugal, affordable housing is called *Controlled Cost Housing*. The State supports financially the construction of CCH through the *Instituto da Habitação e da Reabilitação Urbana* (Housing and Urban Rehabilitation Institute). CCH can be promoted by municipalities, housing cooperatives or private companies.

The main objective of CCH is to optimize the relation between cost and quality: dwellings should meet the occupants' needs and have a reduced cost, which is assessed from a long term perspective (construction, use and maintenance) (Portugal, 1985).

When completed, CCH may be sold or rented. There are no limitations of income to households buying or renting CCH, but a sold dwelling is subject to special rules determining the conditions of transferability for a period of five years.

Figure 1. Cover of building regulations for CCH and photos of two developments
(Source: Imprensa-Nacional Casa da Moeda and Marluci Menezes)

The CCH construction program was created in 1983 (Portugal, 1983). Between 1984 and 2004, about 126,000 dwellings were built, with an average of 6,300 dwellings per year (Coelho, 2006). In later years, the construction of CCH decreased. In 2008, only 1,500 dwellings were completed (OHRU, 2009).

A CCH development shall comply with all the legislation applicable within the location where it is built and shall also comply with specific building regulations for CCH (Portugal, 1985; Portugal, 1997).

3.2 Program My Home My Life

In São Paulo Municipality, there are several programs to support the construction of affordable housing. The program "*My house my life*" was launched in 2009 by the Federal Government of Brazil. This program is run by *Caixa Econômica Federal* (Federal Bank) and the developments can be implemented by public or private bodies, or in partnership.

The MHML program aims to reduce the housing deficit in Brazil. The initial goal was to build one million houses, and therefore facilitate the access to housing for low income households. In 2010, the initial objective was increased to three million houses. The priority of this program is to provide houses for households earning no more than 3 minimum wages, but, within this program, houses for households with incomes not exceeding 10 minimum wages are also to be built (Brasil, 2009).

Figure 2. Promotion poster of MHML program and images of two developments (Source: CEF)

The MHML program supports the construction of new buildings. When completed, houses are sold to households listed by local governments. Households have to meet the requirements of the program to apply for a dwelling, including having an income within a certain range (Brasil, 2009).

A housing development built under the program MHML shall comply with all the legislation applicable within the location where it is built and shall also comply with additional conditions set by the program (ABNT, 2000; CEF, 2009a; CEF, 2009b).

4 Comparison of social-economic indicators

4.1 Population and territory

Although the total population of São Paulo Municipality and Portugal is similar, the territory is quite different. In São Paulo Municipality, almost all the population is concentrated in a vast urban area. The area occupied by the São Paulo Municipality is about sixty times smaller than that of the Portuguese territory, and therefore the population density is about sixty times higher. The rate of annual population growth is also higher in São Paulo (Table 1).

Table 1. Population and territory indicators
(Source: INE, 2002; INE, 2008; GESP, 2009b; INE, 2009; IBGE, 2009)

	Year	Portugal	São Paulo Municipality	
Population	2001/2000	10.36	10.43	millions of inhabitants
	2008	10.60	10.99	
Rate of annual population growth	2008	0.17	0.95	%
Number of families	2001/2000	3.65	3.13	millions of families
Size of the families	2001/2000	2.84	3.51	persons
Area of territory		92,094	1,509	sq km
Population density	2008	115	7,283	inhab. per sq km

4.2 Housing stock

In 2000/2001, the housing stock of São Paulo Municipality was about 55 % of the housing stock in Portugal. There was a small deficit of housing per family in São Paulo Municipality and a surplus in Portugal. The number of dwellings per 1000 inhabitants and the number of dwellings per family was higher in Portugal than in São Paulo Municipality. The housing tenure was very similar in both territories (Table 2).

Table 2. Housing stock indicators
(Source: INE, 2002; IBGE, 2009; GESP, 2009b)

	Year	Portugal	São Paulo Municipality	
Housing stock	2001/2000	5.02	3.39	millions of dwellings
Dwellings per 1000 inhabitants	2001/2000	485	286	dwellings
Dwellings per family	2001/2000	1.37	0.95	dwellings
Housing tenure:	2001/2000			
- owner occupied		75.7	69.4	%
- rented		20.8	21.6	%
- other		3.5	9.0	%

4.3 Housing demand

In 2000/2001, the housing deficit in São Paulo Municipality doubled the one in Portugal. The number of unoccupied dwellings in Portugal was 30 % higher than in São Paulo. In both territories, the unoccupied dwellings were enough to cope with the housing deficit, although they might not have the location or be suitable to meet the housing demand (Table 3). The housing deficit in São Paulo is probably undervalued given that the number of dwellings per family is less than 1 (see 4.2).

Table 3. Housing shortage
(Source: INE, 2002; Fundação João Pinheiro, 2005)

	Year	Portugal	São Paulo Municipality	
Housing deficit	2001/2000	100	203	thousands of dwellings
Unoccupied dwellings	2001/2000	543	420	thousands of dwellings

Also in 2000/2001, the main deficiency of the Portuguese housing stock was its poor maintenance condition (Guerra et al, 2007; INE, 2002). In São Paulo Municipality, the poor urban planning, the lack of urban infrastructures and overcrowded dwellings were the main deficiencies (Fundação João Pinheiro, 2005).

4.4 Housing price

The price per square meter in the MHML program is about 40 % of the same value in CCH. Due to differences in price per square meter and in the overall area of dwellings, the price of a two-bedroom MHML dwelling is about 20 % of the same dwelling in CCH. The prices for flats and single family houses are different in the MHML program (Table 4).

Table 4. Housing prices
(Source: Portugal, 1997; Portugal, 2008b; CEF, 2009a)

	Year	CCH	MHML		
			Flat	House	
Price of two bedroom dwellings	2009	102,102	20,124	18,576	€
Price per square meter	2009	1,201	479	531	€

4.5 Family income

The gross domestic product (GDP) per capita of São Paulo Municipality is approximately 74 % of the same value in Portugal. The minimum wage in the State of São Paulo is approximately 45 % of the same value in Portugal. The annual income of the 20 % of the population of São Paulo Municipality with lower income is 12.7 % of the same value in Portugal. The annual income of the 20 % of the population of São Paulo Municipality with a higher income is 68.9 % of same value in Portugal. The percentage of the population below the poverty line is not comparable since the threshold adopted in Portugal is 2.59 times higher than in Brazil (including São Paulo Municipality) (Table 5).

Table 5. Family income
(Source: PNUD, 2003; Portugal, 2008a; INE, 2008; INE, 2009; IBGE, 2009; GESP, 2009a)

	Year	Portugal	São Paulo Municipality	
Annual GDP per capita	2007	15,400	11,375	€
Monthly minimum wage	2009	450	195 to 211	€
Annual income per person:				
- average of 20 % of the population with lower income	2007	3,667	466	€
- average of 20 % of the population with higher income	2007	22,310	15,364	€
Poverty line	2007	406	73,48	€

4.6 Housing affordability

In the MHML program, the monthly mortgage is 10 % of the gross household income, with a minimum value of € 19.35. The amortization period is 10 years (Table 6).

In CCH, households can buy a dwelling with their own savings and/or obtain financing (a loan) from a financial institution. Each household negotiates the loan conditions and the monthly mortgage varies according to their options. Alternatively, a household can choose to rent a dwelling. In the Social Renting Regime, the rent is estimated based on the household income and composition. For households with an income below 3 minimum wages, the rent is less than 20 % of their income (Table 6).

Table 6. Mortgages
(Source: Portugal, 1993; CEF, 2009a)

	Portugal		São Paulo Municipality	
	Buying	Renting*		
Mortgage per monthly gross income	Varies	< 20	10	%
Amortization of housing price	100	–	From 12.5 to 39.8	%
Amortization period	Up to 45	–	10	years

* Household with an income below 3 times the minimum wage in Social Renting Regime

4.7 Housing satisfaction

To compare dwellers' satisfaction with affordable housing, two studies of post occupancy evaluation were used. The study for Portugal was carried out in 2004. Sixteen CCH developments comprising 1,283 dwellings, distributed by the Portuguese territory and representing different types of promoters, were assessed. Data on dwellers' satisfaction level was obtained by questionnaire. From the total of questionnaires placed in the post-boxes, 304 of them were received back (Menezes and Martins, 2005).

In São Paulo, there is still no information on dwellers' satisfaction with their homes from MCMV program, since this program started in March 2009. Therefore, the results of a post-occupancy evaluation study of a housing development with identical spatial characteristics were used. The Jardim São Luíz comprises 2,301 housing units, but to assess dwellers' satisfaction a sample of 81 dwellings was chosen. Data on dwellers' satisfaction was collected, in the second half of 1997, with questionnaires being conducted by students (Romero and Ornstein, 2003).

Both studies assess dwellers' satisfaction in a four level scale (i.e., completely satisfied, mostly satisfied, mostly dissatisfied, and completely dissatisfied). Among the several questions asked on dwellers' satisfaction, both questionnaires include a specific question about the satisfaction level with the size of the dwelling.

According to studies analysed, there are many similarities in the way dwellers of affordable housing in Portugal and in São Paulo assess the spatial characteristics of their dwellings. Dwellers positively evaluate the size of the dwelling as a whole and the organization of rooms. However, their assessment is negative for the size of the kitchen and service areas. The level of satisfaction with the size of the dwelling expressed by dwellers of affordable housing in São Paulo Municipality is higher than that expressed by dwellers of affordable housing in Portugal (Table 7).

Table 7. Dwellers' satisfaction
(Source: Menezes and Martins, 2005; Romero and Ornstein, 2003)

	Year	Portugal	Jardim São Luíz	
Dwellers' satisfaction with the size of the dwelling	1997/2004	2.62	3.12	1 to 4

5 Comparison of space standards

5.1 Number and type of rooms

The number of bedrooms of a dwelling is different between CCH and MHML programs. CCH dwellings can have from no bedroom up to five bedrooms (Portugal, 1951; Portugal, 1997). All MHML dwellings must have two bedrooms (CEF, 2009a). In both programs a dwelling must also have a kitchen, a living room and a bathroom.

5.2 Area of dwellings

Floor area of CCH dwellings must be within a range set by minimum and maximum parameters. The floor area of flats set in MHML program is 71 % of the minimum floor area and 61 % of the maximum floor area set for CCH. The gross area of flats set in MHML program is 63 % of the minimum gross area and 53 % of the maximum gross area set for CCH (Table 8). In MHML program, flats are slightly larger than single family houses because they cannot be enlarged.

Table 8. Area of two bedroom dwellings
(Source: Portugal, 1951; Portugal, 1997; CEF, 2009a)

CCH				MHML				
Floor area		Gross area		Floor area		Gross area		
Min.	Max.	Min.	Max.	House	Flat	House	Flat	
52	61	67	79	32	37	35	42	m²

Naturally, the dwelling floor area per occupant set in MHML program is also substantially less than that set for CCH (Table 9). This parameter is calculated by dividing the floor area of a dwelling by the maximum or probable number of occupants.

Table 9. Floor area per occupant for a two bedroom dwelling
(Source: Portugal, 1951; Portugal, 1997; CEF, 2009a)

		CCH		MHML		
	Number of occupants	Min.	Max.	House	Flat	
Maximum	4	13.0	15.3	8.0	9.3	m²
Probable	3	17.3	20.3	10.7	12.3	m²

For MHML program, the floor area per occupant is 8.0 or 10.7 square meters depending on the number of occupants. It is important to take into account that in dwellings with less than 8.0 square meters of floor space per occupant the prevalence of pathological situations tends to increase. In dwellings with 8.0 to 14.0 square meters of floor space per occupant, dwellers' satisfaction tends to be negative (Pedro, 1999).

Figure 3 and Figure 4 present two-bedroom flats and houses from CCH and MHML program. Plans are at the same scale. Figure 5 shows the furniture and equipment included in each dwelling. The standard physical and use dimensions of furniture and equipment are as defined in Figure 6.

5.3 Ceiling height

For most rooms, the minimum ceiling height set by MHML program is higher by 0.10 m or 0.20 m than that set for CCH (Table 10). This difference seems appropriate since it makes possible to partly compensate for the less floor area of rooms in MHML program and to obtain an internal volume that is not too low.

Table 10. Ceiling height of rooms
(Source: Portugal, 1951; ABNT 2000)

	Living room	Bedroom	Kitchen	Laundry	Bathroom	Circula-tion	Storage		
							A>2.5 m²	A≤2.5 m²	
CCH	2.4	2.4	2.4	2.2	2.2	2.2	2.2	2.2	m
MHML	2.5	2.5	2.5	2.4	2.4	2.4	2.5	2.4	m

5.4 Size and area of rooms

The floor area of bedrooms in MHML program is 82 % of that set for CCH. The floor area of the living room, kitchen and laundry in MHML program is 60 % of that set for CCH. The floor area of the bathroom in MHML program is 44 % of that set for CCH. No area is set in MHML program for storage and circulation (Table 11).

Table 11. Floor area of rooms for two bedroom dwellings
(Source: Portugal, 1951; Portugal, 1997; Portugal, 2006; ABNT, 2000; CEF, 2009a; CEF, 2009b)

	CCH	MHML	
Bedrooms	19.5	16.0	m²
Living room, kitchen and laundry	24.0	14.4	m²
Bathroom	5.0	2.2	m²
Storage and circulation	7.5	–	m²
Total	**56.0**	**32.6**	m²

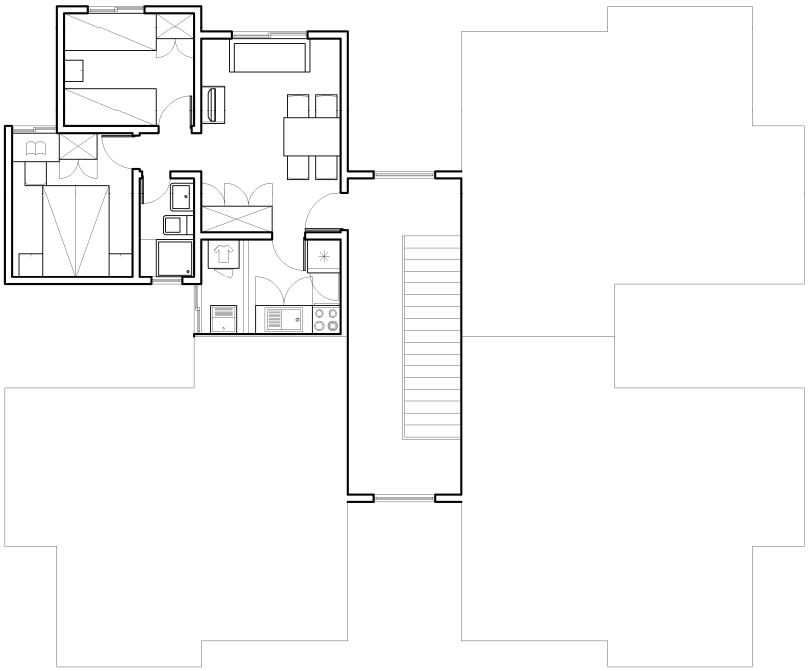
5.5 Furniture and equipment

The furniture and equipment that must be possible to include in a dwelling of MHML program is less than the one that must be possible to include in CCH (Figure 5) (Portugal, 1951; Portugal, 1985; Portugal, 2006; MSP, 1992; ABNT, 2000; CEF, 2009).

The standard physical and use dimensions of furniture and equipment set for MHML program are the same as or smaller than those set for CCH (Figure 6) (Portugal, 1985; Pedro et al., 2006; Pedro et al., 2011; ABNT, 2000; CEF, 2002; CEF, 2009b). The most significant differences consist of the furniture for the living room and the clear floor space for the kitchen, bathroom and foyer. In CCH, the clear floor space is larger to ensure the accessibility of disabled persons. It should be pointed that previous studies concluded that standard size of furniture set for affordable housing in São Paulo Municipality were smaller than furniture for sale in shops (Boueri, 2008).

Portugal - CCH
Location: Barranha/Matosinhos
Developer: Cooperativa Hazal
Year of construction: 1991
Designer: ENGIL

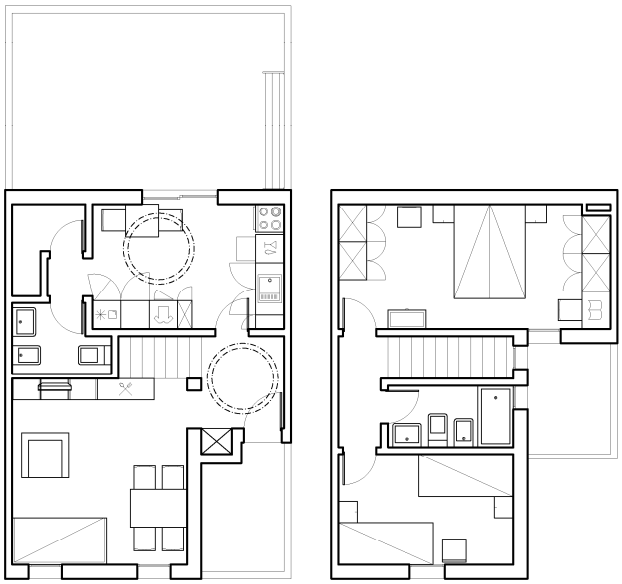
Floor area	
- Master bedroom	10,8
- Twin bedroom	9,8
- Living room	18,2
- Kitchen	7,4
- Service area	2,4
- Bathroom	4,0
- Storage	1,4
- Entrance	3,3
- Hall	4,2
- Dwelling	61,5
Gross area	
- Dwelling	75,0
- Common spaces	7,4
- Total	82,4



São Paulo - MHML
Location: Base design
Year of design: 2009
Designer: CEF

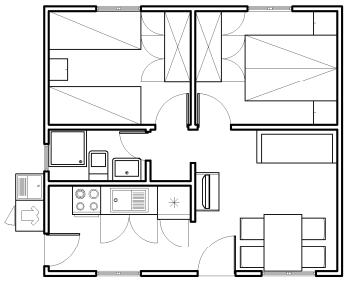
Floor area	
- Master bedroom	7,8
- Twin bedroom	6,6
- Living room	12,2
- Kitchen	3,9
- Service area	2,0
- Bathroom	2,5
- Hall	1,2
- Dwelling	36,2
Gross area	
- Dwelling	42,0
- Common spaces	4,2
- Total	46,2

Figure 3. Plans of two bedroom flats



Portugal - CCH
Location: Luz de Tavira/Tavira
Developer: CHE O nosso piso
Year of construction: 1992
Designer: GAT de Tavira

Floor area	
- Master bedroom	15,1
- Twin bedroom	8,7
- Living bedroom	14,7
- Kitchen	11,8
- Bathroom	3,5
- Toilet	2,8
- Pantry	2,1
- Entrance	4,0
- Hall	2,4
- Stair	2,6
- Dwelling	67,7
Gross area	
- Total	85,2



São Paulo - MHML
Location: Base design
Year of design: 2009
Designer: CEF

Floor area	
- Master bedroom	7,2
- Twin bedroom	7,2
- Living room	9,1
- Kitchen	5,4
- Bathroom	2,3
- Circulation	2,4
- Dwelling	33,6
Gross area	
- Total	35,9

Figure 4. Plans of two bedroom houses

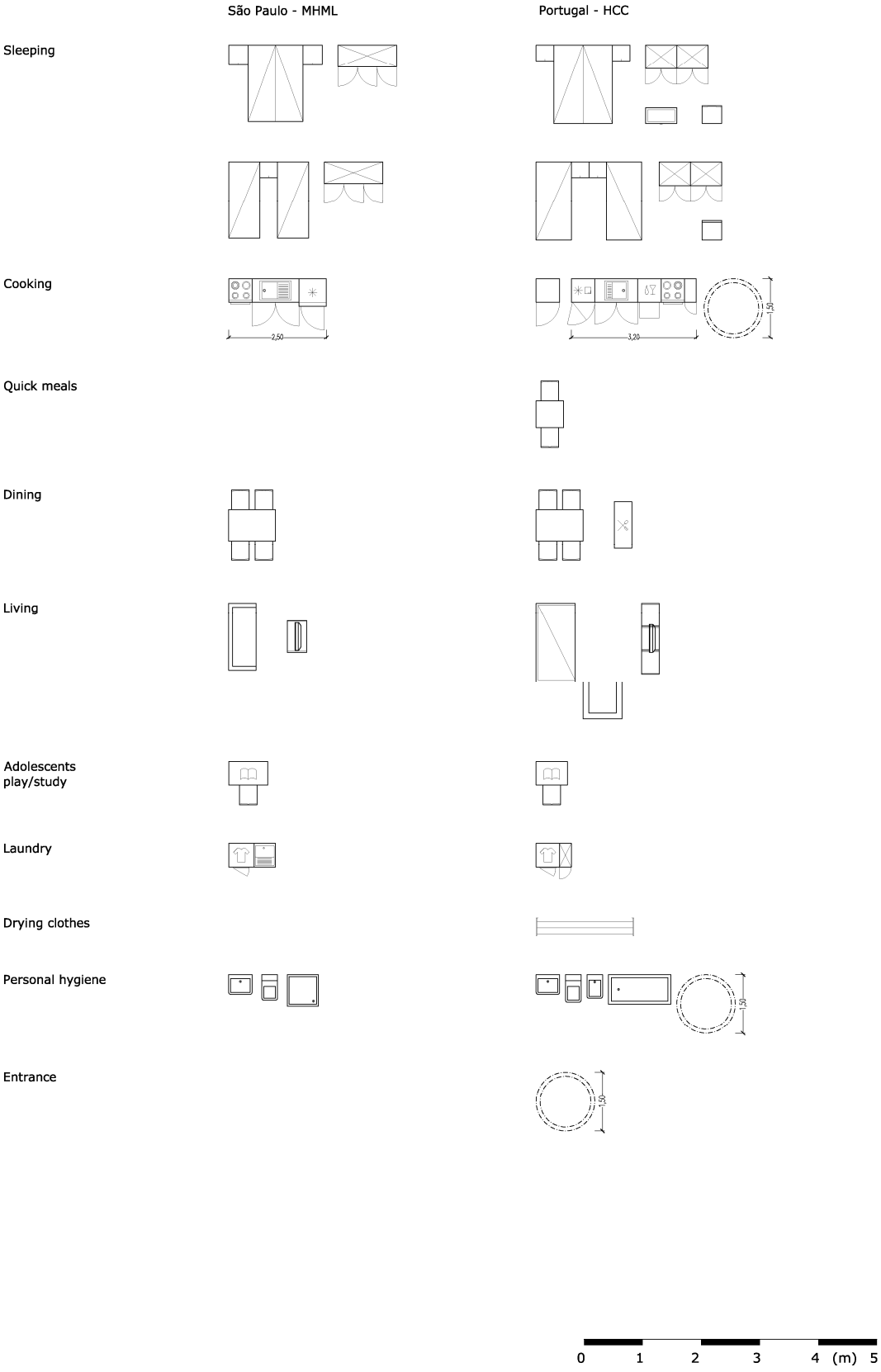


Figure 5. Furniture and equipment for a two bedroom dwelling

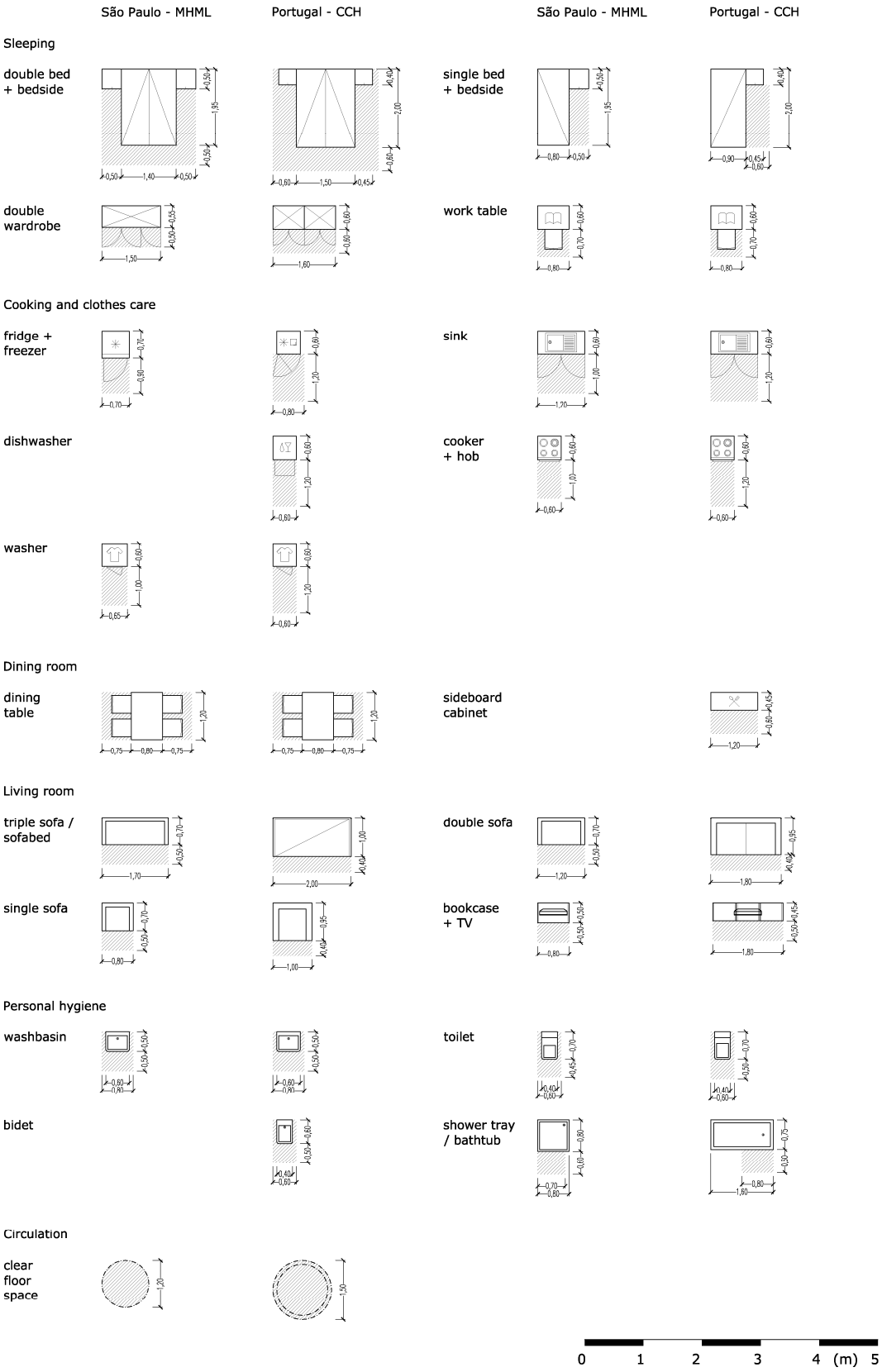


Figure 6. Physical and use dimensions of furniture and equipment

6 Conclusions and discussion

6.1 Results

Which program has more demanding space standards?

The space standards set for construction of CCH housing in Portugal are more demanding than those set for MHML Program in São Paulo Municipality.

Which social-economic conditions explain the differences in space standards?

Three main reasons explain the differences in space standards.

1. The housing deficit is still a problem in São Paulo Municipality, contrary to Portugal where there is a surplus. A greater demand for housing in São Paulo Municipality contributes to the acceptance of low space standards.

2. The income of poor population in São Paulo Municipality is substantially less than the income of poor population in Portugal. Therefore, low space standards of MHML program are a way to make the price of dwellings affordable for low income households in São Paulo Municipality.

3. The policy approach to provide housing to low income households is different. In MHML program, low income households buy highly subsidized housing. The non refundable investment of the Federal Government is more than half of the dwelling's price. In order to increase the number of households covered by MHML program, the cost of dwellings is minimized and, as a result, space standards are necessarily low. In Portugal, low income households may either buy or rent CCH. If households choose to rent affordable housing, the rent is estimated taking into account their income. Hence, the aim of affordable housing is to ensure adequate living conditions for dwellers throughout the lifespan of buildings.

How different space standards influence users' satisfaction?

Affordable housing in São Paulo Municipality has almost half the area of affordable housing in Portugal. However, according to studies analyzed, dwellers express a higher level of satisfaction with the size of dwellings in São Paulo Municipality. Therefore, a direct link between space standards and users' satisfaction cannot be set. The results suggest that dwellers of CCH in Portugal have higher expectations or different lifestyles than dwellers of affordable housing in São Paulo.

6.2 Discussion

The following paragraphs present an analysis of the relationship between space standards of MHML program and the main policy options for affordable housing in São Paulo Municipality.

1. The main aim of affordable housing policy is to ensure adequate housing for all households. Therefore, setting minimum requirements for housing should be based on a technical study of the occupants' physical, social and cultural characteristics. The following criteria should be used with decreasing order: current population needs, foreseeable evolution in these needs and limitations determined by economic viability. In MHML program, it appears that political motivations and economic constraints led

space standards to fall below the current population needs and their foreseeable evolution.

2. It is widely accepted that overcrowding can affect residents' mental and physical health (Wren et al., 2000; Sheridan, 2003; Carmona et al., 2010). The pressures arising from situations of overcrowding may lead to psychological distress, mental disorders and less ability to concentrate. Crowded conditions are also linked with increased interpersonal aggression, sexually deviant behaviour, as well as hygiene and accidents risks. Furthermore, cramped homes, which do not fulfil the occupants' needs, may lead to social cohesion issues (e.g. children who have no space at home to study and/or to play, hang around communal areas and housing estates) and to negative social behaviours (e.g. poor social control of children may give rise to violence and/or vandalism). These health and social problems have medium and long term costs for society. It can be argued that these costs may outweigh the additional public funding that would be needed to support the construction of better housing in MHML program.

3. Given the similarities between Portugal and São Paulo Municipality regarding how dwellings are used, the differences in space standards raise the following question: are space standards too demanding in Portugal or excessively lenient in São Paulo Municipality? To answer this question we should take into account that space standards specified for Portugal are similar to those set in several European countries, such as Spain and France (Pedro, 2009). Whereas the floor area per inhabitant set in MHML program is near the critical threshold below which the incidence of pathological conditions tends to increase. Therefore, we may argue that space standards set in MHML program only take into account the basic needs of present daily life.

4. MHML program sets the maximum selling price and the generic technical characteristics of housing (CEF, 2009a). The design of affordable housing in this program raises the challenge of finding solutions that, within the limit price, maximize the conditions offered to dwellers. Savings in construction costs could compensate for dwellings with larger areas. To reduce the construction costs various strategies can be adopted, such as: streamlining the design (e.g., minimize the water and sewage facilities), using more efficient construction procedures (e.g., modular dimensions and standardized components) or adopting more economical types of promotion (e.g., self built housing or evolutionary housing).

5. The booklet that sets the conditions for the application of MHML program includes, as an example, plans of a house and a flat. These examples can steer developers to pre-established solutions that are not adequate to the site conditions, population needs or local culture. For each development, a new design should be prepared taking into account the physical environment of the site and the social characteristics of the population. Beyond a proper integration, the research into new designs encourages diversity and innovation in architecture and construction.

6. A building has a long lifespan lasting in some cases for generations. It is not easy to foresee the change in users' needs. The flexibility of a dwelling facilitates its adaptation to the evolving occupants' needs, but strongly depends on its spatial characteristics. Very small dwellings have reduced flexibility. The space standards of MHML program only take into account the basic needs of present daily life. A desirable improvement in the quality of life of São Paulo's population may mean that, in the sort or medium-term, the dwellings presently being built will become obsolete.

7. MHML program defines the requirements to be met in dwellings. However, no requirements are set regarding the building and the neighbourhood, except for one specification about minimum distance between buildings. The urban plot is driven only by the spatial planning instruments applicable to the location, if any. Therefore, the quality of the urban plot may not be guaranteed.

8. In the MHML program, only two bedroom dwellings are planned to be built. This type of dwelling is adequate for a nuclear family with one child or two children, but it is not suitable for other types of families such as single persons, childless couples, families with more than two children and extended families. If dwellings fall short of households' needs, they tend to modify their environments in an attempt to minimize the shortcomings. These changes, when performed without the supervision of the authorities, may endanger the building's safety and compromise the building's image.

9. The Brazilian media reported that in several States of Brazil applicants interested in acquiring a dwelling within MHML program formed long queues at registration offices. According to some reports, some applicants spent the night in queues to ensure their position (Diário Popular, 2010). Other reports refer to queues with more than 1,500 applicants (Tribuna do Norte online, 2009). These reports prove the population's adherence to MHML program.

For households with an income not exceeding 3 times the minimum wage, the conditions to buy a dwelling within the MHML program are very attractive. The monthly mortgage is 10 % of the household income during an amortization period of 10 years. After this period, the household owns a dwelling having paid, depending on its income, between 13.3 % and 39.8 % of the property value. However, the MHML program requires a non refundable investment by the Federal Government of more than 60 % of the selling price of the building. Without enough return of the initial public investment it is difficult to have funds to continue building new developments. MHML program will probably fail to provide housing for all low income households, being thus debatable if it is a fair and efficient application of public resources.

10. Taking into account the previous paragraphs (indicated between brackets), the following improvements in MHML program were recommended (Pedro and Boueri, 2010):

- Increasing the total floor area of dwellings to include larger bedrooms, living room, and toilet, as well as to provide storage space (paragraphs 1, 2, 3);
- Counterbalancing the possible rise of dwellings cost, due to the increased area, with strategies to reduce the construction cost per square meter or the monthly mortgage (paragraph 4);
- Promoting and rewarding developments that achieve high quality and innovation (paragraph 5);
- Encouraging innovative spatial and construction solutions that are economic and adequate to the dwellers' needs (paragraph 6);
- Setting requirements on the quality of the neighbourhood that address parking spaces, accessibility, urban facilities and services, public spaces and green areas (paragraph 7);

- Enabling the construction of dwellings with one, two, three or four bedrooms and adjusting the program of each development to local needs (paragraph 8);
- Increasing the return on public investment with other economic models (e.g., subsidized rents, self built housing, evolutionary housing or by simply expanding the amortization period) (paragraph 9).

11. In view of constraints imposed by the MHML program, building houses rather than flats may be a better option. In houses, it is easier to design solutions that start with an initial core, where the essential functions take place, and evolve with the progressive addition of new rooms. Evolutionary housing may be a path towards building decent housing, adjusted to the dwellers' needs at a reasonable initial cost.

6.3 Limitations of the study

When analyzing the results it is important to consider the limitations of the methodology listed below.

1. Only space standards that apply to the dwelling were compared. There can be some compensation of space between the exterior and the interior of dwellings (e.g., the lack of enough leisure space within the dwelling may be counterbalanced by a large private outdoor space).

2. To compare the satisfaction level of dwellers, studies of post-occupancy evaluation of housing developments in Portugal and in São Paulo Municipality were used. The methodology used in both studies was identical, which enabled the comparison of results. In the study for Portugal sixteen developments were assessed. In the study for São Paulo Municipality only one development was assessed. This development is similar to other affordable housing developments in São Paulo Municipality, but results about the satisfaction level of dwellers may not be representative.

3. MHML program is meant to be applied in municipalities all over the Brazilian territory. The São Paulo Municipality has different characteristics from most other municipalities. Some inconsistencies detected in the regulatory framework governing MHML program in São Paulo Municipality may result from the specificity of the territory examined. The urban parameters of MHML program may be undefined due to the need of extending its implementation to the whole Brazilian territory.

6.4 Future developments

Only space standards were compared. To enable a more complete understanding of the quality level of affordable housing it is important to compare other requirements, such as safety, health and comfort.

Designers and developers of affordable housing have a practical knowledge resulting from designing, building and sometimes dealing with dwellers. It is important to know their opinion about space standards presently enforced in both territories.

Besides MHML program, other programs are being implemented in São Paulo Municipality to support the construction of affordable housing. As MHML program, these programs have manuals containing requirements or guidelines for housing developments (CDHU, 2008). The requirements for these programs may be compared

to understand how the new MHML program situates in the affordable housing being constructed in São Paulo Municipality.

A comparison of the affordable housing in Portugal and Brazil is particularly interesting since both countries share a common language and culture. However, extending this comparison to other countries could contribute to put the findings in the context of a more comprehensive framework.

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