



# How small can a dwelling be? A revision of Portuguese building regulations

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## Abstract

**Purpose** – The purpose of this paper is to study the minimum necessary net internal area of dwellings that should be established by Portuguese building regulations.

**Design/methodology/approach** – The following tasks are carried out: selecting the furniture and equipment necessary for each dwelling; determining the size of furniture and equipment and its typical arrangement; conceiving models of functional spaces; determining the net area of functional spaces and dwellings; comparing results with statistics on housing construction in Portugal and with mandatory area standards used in Portugal and ten other European countries.

**Findings** – The paper finds that the net internal area presently set by Portuguese building regulations should be increased by 5 to 15 percent. The net internal area figure obtained by the study is similar to mandatory regulations established by some other European countries.

**Research limitations/implications** – The study focuses on the net internal area of dwellings, although other space standards are also important to assuring the practicability of dwelling spaces; area standards were set on the basis of the current Portuguese situation and required adaptation when used in different social, cultural and economic contexts; area standards constitute a safety-net against unacceptable dwellings rather than good practice guidelines.

**Practical implications** – The results may be used to support a review of Portuguese building regulations and provide guidelines for the design of dwellings.

**Originality/value** – A methodology to determine area standards is presented and applied. Up-to-date information on furniture size and arrangements is collected. The comparison enables an understanding of how the results compare in a European context.

**Keywords** Standards, Housing, Buildings, Portugal

**Paper type** Research paper

## 1. Introduction

Residential space strongly influences the daily life of its users and is a determining factor for their quality of life and prospects for future personal development. In order to protect the comfort and well-being of future occupants, each dwelling should be adequate for the household which is likely to occupy it. The dwelling should therefore provide a safe, healthy, comfortable and functional environment, one that also provides aesthetic satisfaction.

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It is commonly understood that to ensure functionality, a dwelling should be big enough to meet the needs of its occupants for the activities of living, cooking, dining, sleeping, bathing and for the storage of household goods; it should also provide convenient access to adequate residential amenity space. Space standards establish the conditions to fulfil these objectives and usually regulate the overall area, size and dimensions of individual rooms, ceiling height and layout of dwellings.

The building regulations of several European countries include space standards for housing. In Portugal the space standards for new housing were established more than 30 years ago (Portugal Decree Law No. 38 382, 1951, ; Portugal Decree Law No. 650/75, 1975). No space standards apply to construction work in existing buildings.

The purpose of this article is to study the minimum net internal areas that should be established by Portuguese building regulations for existing and new dwellings. Four research questions are addressed:

- RQ1.* What is the minimum net area of dwellings adequate to current Portuguese living standards?
- RQ2.* How does the proposal for a minimum net area of dwellings compare to the requirements set by Portuguese building regulations?
- RQ3.* What would the impact be if the proposal was adopted as the minimum mandatory requirement?
- RQ4.* How does the proposal compare to the area requirements presently enforced in other European countries?

The methodology used to address these questions closely resembles studies carried out in other countries in the same field. The Portuguese experience will prove useful for other researchers.

The following section demonstrates the importance of space standards. Section 3 explains the research methodology and Section 4 addresses the results of the study on area standards. Section 5 presents the comparison of area requirements enforced in Portugal and other European countries. The results are discussed in Section 6.

## **2. The importance and definition of space standards**

Space standards were introduced to set minimum habitability conditions, but have progressively lost their importance in the building regulations of several European countries. Space standards, for example, have been criticized as being an archaic relic of habitability standards and a symptom of over-regulation that restricts individual freedom. However, they have proved to be positive indicators of housing quality. They are simple to determine and verify and provide valuable information about dwelling space (Sheridan *et al.*, 2003).

Space standards are a measure of the acceptable intensity of dwelling occupation in the context of the prevailing cultural, social, climatic, economic and technological conditions in a particular society (Chowdhury, 1985). These conditions change with time, meaning that space standards should be updated regularly.

The study and establishment of space standards is important for several reasons (Sheridan *et al.*, 2003; HATC, 2006; Wren *et al.*, n.d.; English Partnerships, 2007):

- There is strong evidence that pressures arising from situations of overcrowding may lead to interpersonal aggression, withdrawal from the family, sexually deviant behaviour, psychological distress or physical illness. Furthermore, small homes which do not support the needs of occupants may lead to social cohesion issues (e.g. children who have no space at home to study or play hang around communal areas and housing estates), negative social behaviours (e.g. poor social control of children may give rise to violence and/or vandalism).
- Dwellings have a long lifetime, lasting for generations. It is not easy to anticipate the evolution of users' needs and their implications for space standards. A dwelling's flexibility enables its adaptation to the changing needs of users, but depends greatly on its initial spatial characteristics. Smaller dwellings have limited scope for flexibility and do not support the needs of growing families and a wider range of choices.
- The space characteristics of a dwelling, established during design and construction, are difficult to change during the rest of its lifetime. Spatial changes, when possible, usually require costly construction work.
- Dwellings with spaces adequate for potential users are likely to be viewed as more desirable by home buyers or tenants and therefore accrue a higher real estate or rental value. Dwelling area strongly influences construction costs.
- Social, economic and technological changes have accelerated in recent years. These changes have implications for the use of the home and consequently for space standards.

The space standards for social housing, in particular, deserve special attention for two reasons (Portugal Ministerial Order No. 580/83, 1983; Portugal Written Ministerial Statement No. 41/MES/85, 1985):

- (1) One fundamental objective of social housing is to build quality dwellings at a reasonable cost. It is therefore important to optimize the cost/benefit relationship. The adequacy of the spatial characteristics of housing to the needs of occupants is a privileged way to optimize that relationship.
- (2) While the state supports the construction of social housing, its acquisition or rental represents a significant financial obligation for the occupants. To make the best use of available resources and assure the affordability of social housing it is important to build dwellings that will satisfy occupants' needs over the foreseen lifetime of the building and are not bigger than necessary.

Housing standards are usually lower than the aspirations of the majority of occupants, who have the education and economic capability necessary to choose the dwelling that best fits their particular needs. Why then is it necessary to establish space standards? Couldn't the housing market just regulate itself? Unfortunately, if this was the case, the poorer sectors of the community might not be able to afford a decent house. If the market was not regulated, some families could be lodged in less-than admissible conditions (Davies, 1992). It is therefore the role of the state to ensure that:

- unfit dwellings are either demolished or made fit to live in; and
- new dwellings fulfil occupants' needs at a level that is equal to or above the minimum level admissible in current development standards.

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Relevant studies to establish minimum space standards for housing have been developed in European countries for several decades (Klein, 1980; Griffini, 1948; Dreyfus and Tribel, 1961; Parker Morris Committee, 1961; Thiberg, 1970; Herbert *et al.*, 1978). The approach has become progressively more sophisticated over the years. Space standards have also been set in numerous design manuals (Neufert, 1970; Lamure, 1976; Tutt and Adler, 1979; Chiara *et al.*, 1992; Menghi, 1992). Later editions have updated some of these manuals. Recently, new studies were conducted to provide space standards which are up to date and adequate to the local context (Pedro, 1999; Boueri, 2005; HATC, 2006). These studies and design manuals were used as research literature for this study.

### 3. Research methodology

#### 3.1 Parameters

The criteria used to establish occupants' needs were the number of people expected to occupy the dwelling, a classification of residential functions and two levels of quality (basic and minimum).

The needs of households with one to nine occupants were studied. Large households were studied because, although the average size of households in Portugal is 2.8 persons, 45 percent of the dwellings completed in 2007 were designed for six occupants and 17 percent for seven or more occupants (INE, Statistics Portugal, 2002, 2008). By using the number of occupants, it was possible to study a gradual increase in users' needs. Dwellings with different combinations of single, twin and double beds may be used to fulfil the needs of the same number of occupants.

The classification of functions enabled an analysis of the activities of occupants without setting a rigid use for each room. The description of dwellings' use with functions has been used in Portugal since the 1960s for studies of housing space standards (Portas, 1969) and occupants' behaviour (Pereira and Gago, 1974). The classification of functions was updated in later studies (Pedro, 1999). Table I presents the classification of functions used in this study.

The levels of quality reflect the degrees of fulfilment of occupants' needs and aspirations. As a fallback for unacceptable situations, two levels were set:

- (1) The basic level ensures that occupants cannot suffer serious physical or mental injury. This level is usually used to evaluate whether an existing building is unfit for human habitation.
- (2) The minimum level ensures that the common needs of users' daily life are fulfilled. This level is used to prevent the construction of new buildings detrimental to occupants or urban quality.

#### 3.2 List of furniture and equipment

The furniture and equipment necessary for each number of occupants, function and quality level was selected. The selection criteria were the furniture and equipment indispensable to undertaking specific functions, usually put into place by the occupants, and indicated in other research literature. The furniture and equipment frequently used by occupants was identified from housing advertisements, post-occupancy evaluations (Figure 1) (Coelho, 1995, 2000) and surveys (Pereira and Gago, 1974).

Function	Activities system
1. Sleeping	(a) Double (b) Twin (c) Single
2. Cooking	(a) Food storage (b) Food preparation
3. Eating	(a) Quick meals (b) Dining
4. Living	
5. Play/study/work	(a) Children play (b) Adolescent play/study (c) Adult play/work
6. Clothes care	(a) Laundry (b) Drying clothes (c) Ironing clothes (d) Sewing
7. Personal hygiene	(a) Bath/shower (b) Toilet (c) Health care
8. Circulation	(a) Entrance (b) Communication/separation
9. Domestic management	(a) Cleaning (b) General storage (c) Control of the environment
10. Being outside in private space	

**Table I.**  
Use functions of the dwelling

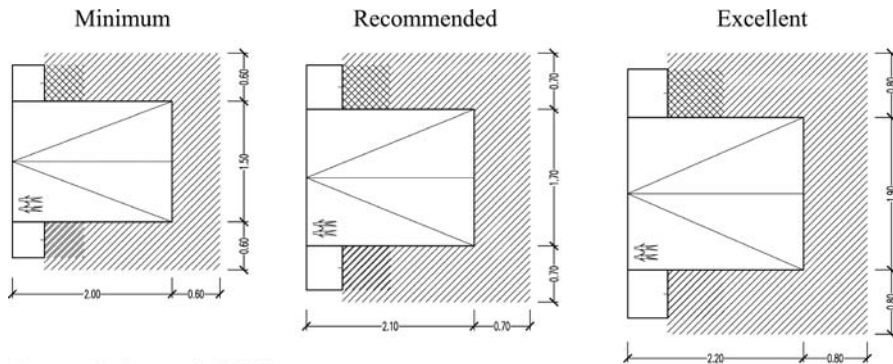


**Figure 1.**  
Photos of double-bed bedrooms in social housing in Portugal

**Source:** M. Menezes

### 3.3 Size of furniture and equipment

A market survey was carried out to determine the size of furniture and equipment. A sample of each item was built, using examples selected from furniture and equipment catalogues distributed in Portugal. Each sample item was organized by size, in increasing order. The sample was segmented in 50 percent, 75 percent and 87.5 percentiles, corresponding to the minimum, recommended and excellent levels of performance for each item of furniture and equipment (Figure 2). To correct possible deviations in the sample, these values were checked against the size of furniture and equipment described in the research literature. The size of access zones, the free space



Source: Pedro *et al.* (2006)

**Figure 2.**  
Size of a double bed with  
bed-sides and its access  
zones

necessary for the use of furniture and equipment (e.g. space in front of a chest of drawers to allow the drawers to open and close), were also set using the same research literature. These items of furniture and equipment and their access zones were drawn in parametric blocks in AutoCAD (Pedro *et al.*, 2006).

### 3.4 Typical arrangement of furniture and equipment

The furniture and equipment are usually arranged in certain configurations that result from certain factors: functional reasons (e.g. sequence of actions necessary to prepare, cook, and serve meals), rationality in the occupation of the space (e.g. kitchen with cabinets in an “L” leaving one corner for a table), and cultural values (e.g. Table in the centre of the room in line with the sideboard). The arrangements used most often were examined in the above-mentioned housing advertisements (Figure 3), post-occupancy evaluations of housing (Coelho, 1995, 2000) and surveys (Pereira and Gago, 1974).

### 3.5 Models of functional spaces

Models of functional spaces were drawn for each function. In the models, the furniture requirements set in 2.2 of Table I, with the size and access zones set in 2.3, were placed in the arrangements set in 2.4, allowing sufficient space for the occupants to be able to



**Figure 3.**  
Layout of double-bed  
bedrooms taken from  
housing advertisements

move around within the rooms and to undertake normal activities. In some models the location of the door and window was considered (Figure 4). When several arrangements are possible the ones that require less surface area were chosen.

### 3.6 Functional space and dwelling areas

The analysis of the models enabled the area for each functional space to be determined. These values were checked with the research literature on the subject. The habitable area of the dwelling was obtained by adding up the area of all functions that are usually located in habitable rooms (living room, bedrooms and kitchen). The net internal area of a dwelling was obtained by adding up the areas of all its functional spaces.

### 3.7 Comparison of the results

The results were compared with the mandatory area requirements presently established in Portugal and in ten other European countries.

## 4. Minimum area standards

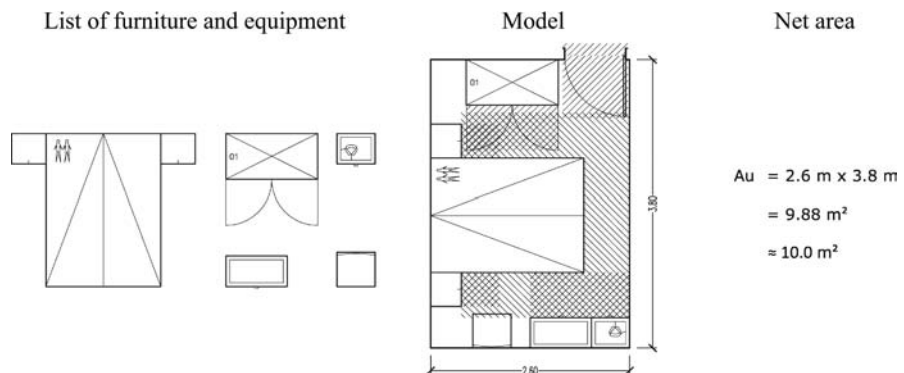
### 4.1 List of furniture and equipment

When determining the needs of furniture and equipment it was assumed that:

- A dwelling must enclose spaces to perform all the domestic functions, in order to allow autonomous use.
- A dwelling's spaces must have sizes and shapes that allow placement of the furniture and equipment necessary to satisfy the common daily needs of its occupants.
- Disabled persons must be able to access the dwelling. To assure this, at a minimum the entrance, living room, kitchen and a toilet must be accessible.

At the minimum level, furniture and equipment was attributed to all functions, with the following exceptions:

- children's play (5a), because it takes place during a short period in the family's life cycle. An alternative space for adolescent play/study was foreseen (5b);



**Figure 4.**  
Sleeping function (double bed)

- ironing (6c) and sewing (6d), because they can take place in a circulation zone or at a table;
- cleaning (9a) and control (9c), because no space is required; and
- being outside (10), because it can take place in common or public spaces.

Figures 5 and 6 present the furniture and equipment attributed to each function and number of occupants at the minimum level.

When determining the basic needs for furniture and equipment the programme adopted at the minimum level was used, except for the quick meals function (3a). For the remaining functions only the essential items of furniture and equipment were included. At this level, dwellings are not required to be accessible by disabled persons.

#### *4.2 Areas by function*

The area of each function (Tables II and III) varies gradually as the number of occupants involved in it increases. The only exception is the area for laundry (6a), which is constant, because the equipment planned is the same for all dwellings although the amount of clothing increases.

The area for circulation is 10 percent to 14 percent of the total area of the other spaces. These percentages were obtained by analysing the designs of seventy social housing units built in Portugal between 1990 and 1997. The increase in the circulation area is not entirely gradual, because of the need to balance additional spaces for personal hygiene in some typologies.

For the sleeping function three types of spaces were foreseen, with double, twin and single beds. In all dwellings with two or more occupants there is a double sleeping space. In dwellings with an odd number of occupants an additional single sleeping space is foreseen. The remaining sleeping spaces are twin. This distribution enables the possibility of dwellings being occupied by a couple and requires less area for the sleeping function. Different combinations can be created by dividing one twin bedroom into two single bedrooms.

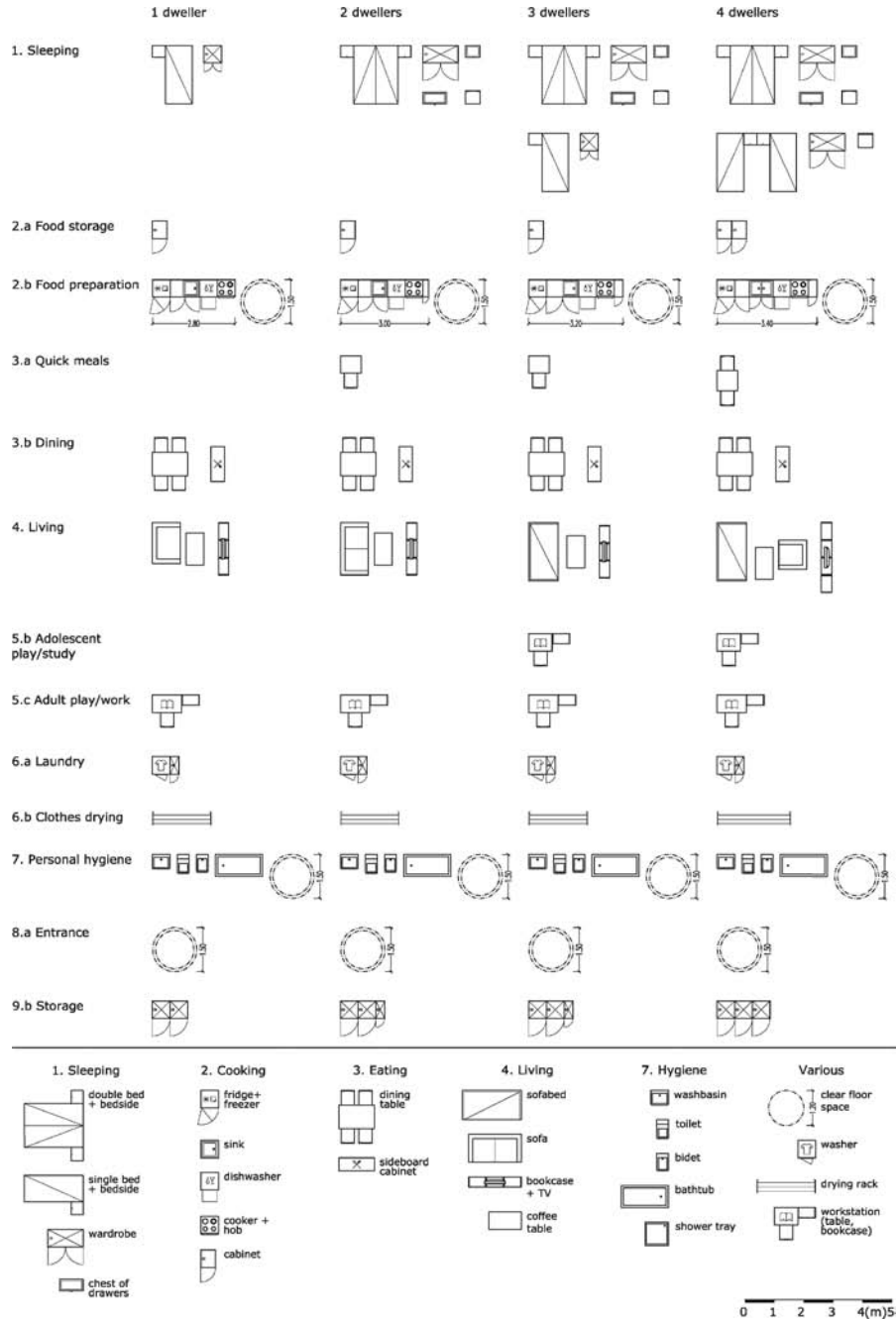
Figure 7 presents each functional space, with its respective area, for the minimum level models.

#### *4.3 Net internal dwelling area*

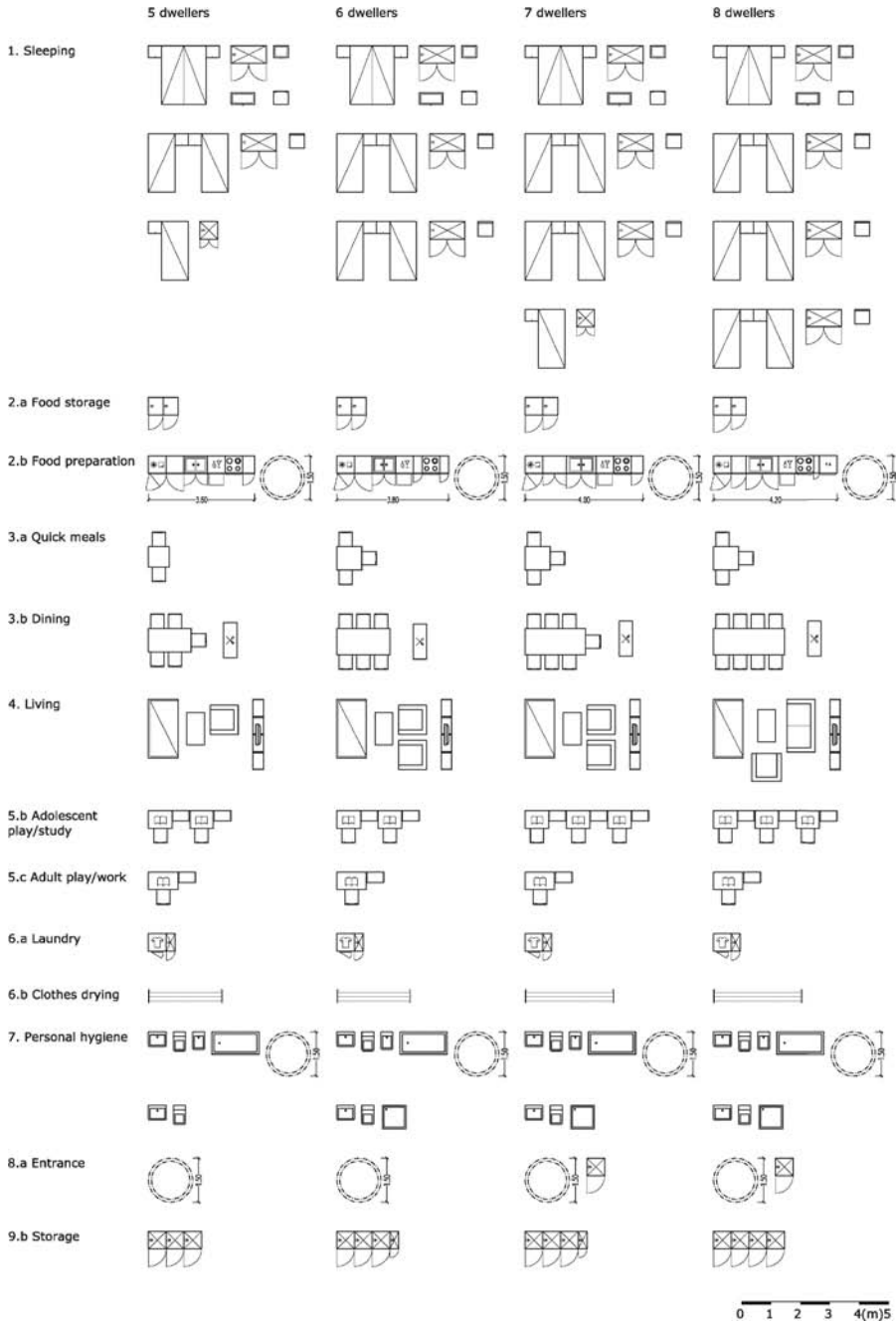
The minimum areas of the dwelling for each number of occupants are presented in Tables IV and V. There is a gradual variation in the net internal area: at the basic level it increases 7.0 m<sup>2</sup> per occupant, and at the minimum level 9.0 m<sup>2</sup> per occupant. The index of net internal area per occupant is within the following limits (Figure 8):

- At the basic level, it is not less than 8.5 m<sup>2</sup> per occupant, considering the maximum number of occupants, and is 14 m<sup>2</sup> for the probable number of occupants, the limit below which the satisfaction of the inhabitants tends to be negative;
- At the minimum level, it is not less than 12 m<sup>2</sup> per occupant, considering the maximum number of occupants, and is nearly 20 m<sup>2</sup> for the probable number of occupants, the limit above which the satisfaction of the inhabitants tends to be positive.





**Figure 5.**  
Minimum level – list of  
furniture and equipment  
(part 1)



**Figure 6.**  
Minimum level – list of  
furniture and equipment  
(part 2)

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Function	Number of occupants									
	1	2	3	4	5	6	7	8	9	
1 Sleeping	Double		8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
	Twin				7.0	7.0	7.0	7.0	7.0	7.0
	Twin						7.0	7.0	7.0	7.0
	Twin								7.0	7.0
2 Cooking	Single	4.0		4.0		4.0		4.0		4.0
	Food storage	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0
3 Eating	Food preparation	2.5	2.5	3.0	3.0	3.5	3.5	4.0	4.0	4.5
	Dining	2.5	3.0	3.5	4.5	5.5	6.5	7.5	8.5	9.5
4 Living		4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
5 Play/study/work	Adult play/work	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
6 Clothes care	Laundry	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Drying clothes	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
7 Personal hygiene	Main	2.5	2.5	2.5	3.0	3.0	3.0	3.0	3.0	3.0
	Second						1.5	1.5	1.5	1.5
8 Circulation	Entrance	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0
	Communication	1.0	2.0	3.0	3.5	4.0	4.0	4.0	5.5	6.0
9 Domestic manag.	General storage	0.5	1.0	1.0	1.5	1.5	1.5	1.5	2.0	2.0

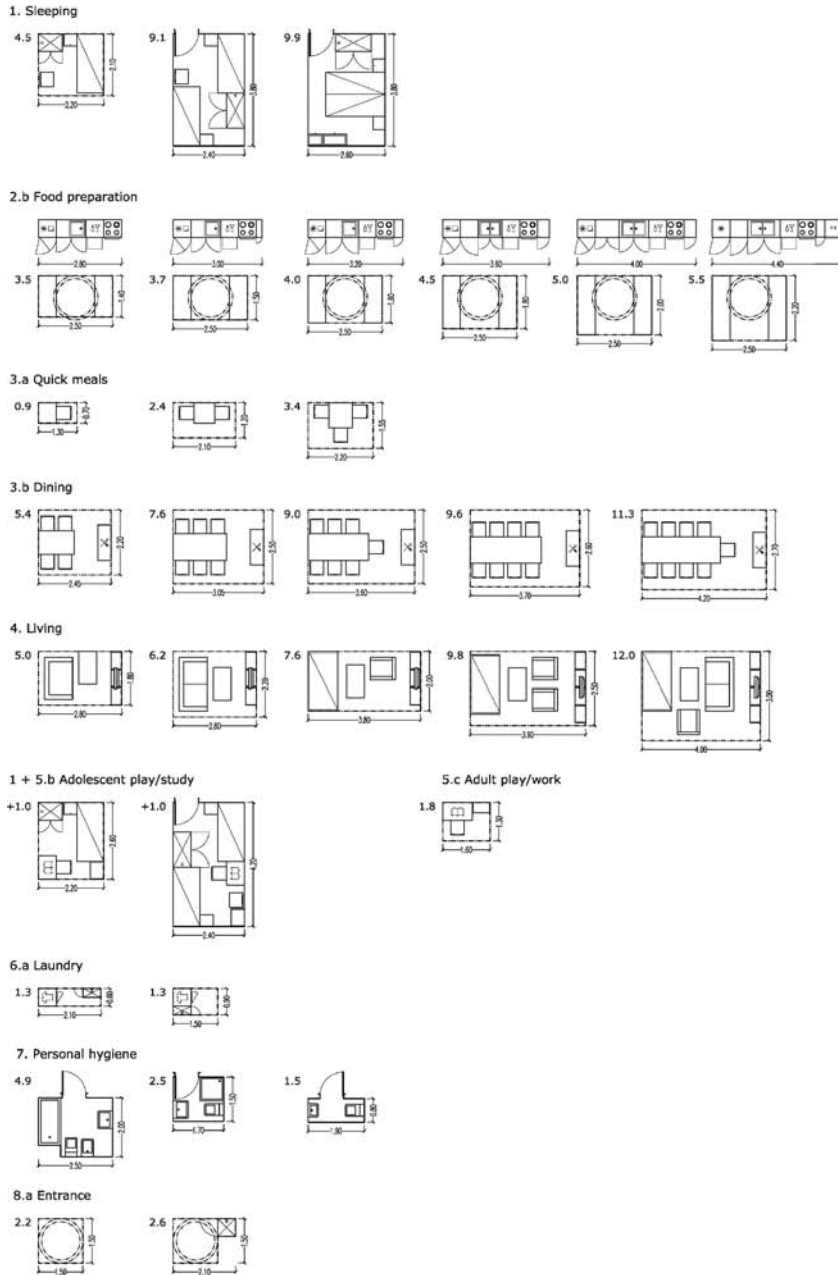
**Note:** Area for each function (m<sup>2</sup>)

**Table II.**  
Basic level

Function	Number of occupants									
	1	2	3	4	5	6	7	8	9	
1 Sleeping	Double		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	Twin				9.0	9.0	9.0	9.0	9.0	9.0
	Twin						9.0	9.0	9.0	9.0
	Twin								9.0	9.0
2 Cooking	Single	4.5		4.5		4.5		4.5		4.5
	Food storage	0.5	0.5	0.5	1.0	1.0	1.0	1.5	1.5	1.5
3 Eating	Food preparation	3.5	3.5	4.0	4.0	4.5	4.5	5.0	5.0	5.5
	Quick meals		1.5	2.0	2.5	2.5	3.0	3.0	3.5	3.5
4 Living	Dining	5.0	5.0	5.5	6.0	7.0	8.0	9.0	10.0	11.0
		6.5	6.5	7.0	8.0	9.0	10.0	11.0	12.0	13.0
5 Play/study/work	Adolescents			1.0	1.5	2.0	2.5	3.0	3.5	4.0
6 Clothes care	Adults	1.0	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Laundry	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
7 Personal hygiene	Drying clothes	0.5	0.5	0.5	1.0	1.0	1.0	1.5	1.5	1.5
	Main	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
8 Circulation	Second					1.5	2.5	2.5	2.5	2.5
	Third									1.5
9 Domestic manag.	Entrance	1.5	1.5	1.5	2.0	2.0	2.0	2.5	2.5	2.5
	Communication	1.5	3.0	4.5	5.0	5.0	5.5	5.5	6.5	6.5
	General storage	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.5	2.5

**Note:** Area for each function (m<sup>2</sup>)

**Table III.**  
Minimum level



0 1 2 3 4(m)5

**Figure 7.**  
Minimum level – models  
of functional spaces and  
their area (m<sup>2</sup>)

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	Number of occupants								
	1	2	3	4	5	6	7	8	9
Maximum	1	2	3	4	5	6	7	8	9
Probable	1	2	2/3	3	3/4	4	4/5	5	5/6
Habitable area	14.0	19.5	25.5	30.5	37.0	42.0	48.5	53.5	60.0
Net internal area	21	28	35	42	49	56	63	70	77
Net internal area per occupant (probable number of occupants)	21.0	14.0	11.7	10.5	9.8	9.3	9.0	8.8	8.6
Net internal area per occupant (maximum number of occupants)	21.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0

**Table IV.**  
Basic level

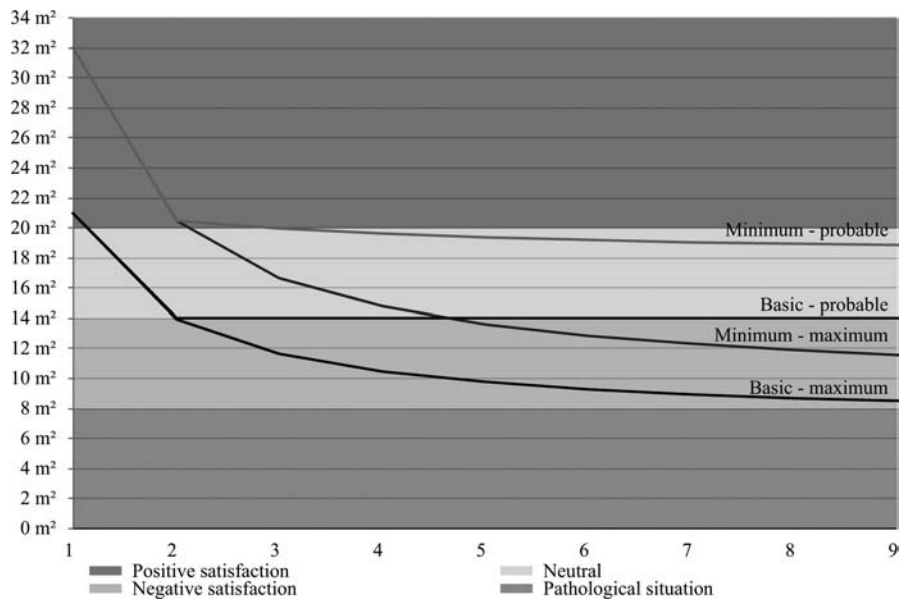
**Notes:** Area for each function (m<sup>2</sup>)

	Number of occupants								
	1	2	3	4	5	6	7	8	9
Maximum	1	2	3	4	5	6	7	8	9
Probable	1	2	2/3	3	3/4	4	4/5	5	5/6
Habitable area	20.5	28.0	35.0	42.0	49.5	57.0	64.5	72.0	79.5
Net internal area	32	41	50	59	68	77	86	95	104
Net internal area per occupant (probable number of occupants)	32.0	20.5	16.7	14.8	13.6	12.8	12.3	11.9	11.6
Net internal area per occupant (maximum number of occupants)	32.0	20.5	20.0	19.7	19.4	19.3	19.1	19.0	18.9

**Table V.**  
Minimum level

**Notes:** Area for each function (m<sup>2</sup>)

**Figure 8.**  
Net internal area per occupant



## 5. Comparison

### 5.1 Comparison with area standards established in Portuguese building regulations

The *General Building Regulations* (Portugal, 1951, 1975) establish the minimum area for habitable rooms (bedrooms, living room and kitchen), toilets and bathrooms. Additional area must be added to the kitchen, the living room or to create a separate room for clothes care. These area standards are set by the number of rooms, and no standards are indicated for dwellings with three, five or eight occupants.

In order to enable the comparison the basic and minimum areas determined for each function (Tables II and III) were added to the sets of rooms where they usually take place. The living room, kitchen and supplemental area cover the cooking, eating, living and laundry functions. The bedrooms cover the sleeping and play/study/work functions. The toilet and bathroom cover the personal hygiene function.

Table VI presents the results. The conclusions are that:

- The area set for the basic level is 15 percent to 20 percent lower than the area established by the *General Building Regulations* for new dwellings. This decrease is understandable since the basic level is intended to verify whether existing dwellings, many of which were built before the current space standards came into force, meet minimum habitability conditions.
- The area set for the minimum level is 5 percent to 15 percent higher than the area established by the *General Building Regulations*. This increase is due to two main changes: the toilet and bathroom include clear space for a disabled person to move, and there is additional area for the play/study/work function, which increases the area of the bedrooms.

### 5.2 Comparison with Portuguese statistics on housing construction

The evolution of the area of new dwellings in Portugal from 1996 to 2007 was analyzed. There is statistical data available on building permits granted for dwellings, including the total number of dwellings by number of rooms and total habitable area. The

Number of occupants	1	2	3	4	5	6	7	8	9
Number of rooms	0	1		2		3	4		5
<i>Living room, kitchen and supplemental area</i>									
General building regulations	22.0	20.0	–	24.0	–	26.0	30.0	–	30.0
Proposal: basic level	15.5	12.0	14.0	16.0	18.5	21.0	23.5	25.5	28.0
Proposal: minimum level	22.0	18.0	20.0	22.5	25.0	27.5	30.5	33.0	35.5
<i>Bedrooms</i>									
General building regulations	–	10.5	–	19.5	–	28.5	35.0	–	44.0
Proposal: basic level	–	9.0	13.0	16.0	20.0	23.0	27.0	30.0	34.0
Proposal: minimum level	–	11.5	16.5	21.5	26.5	31.5	36.5	41.5	46.5
<i>Toilet and bathroom</i>									
General building regulations	3.5	3.5	–	3.5	–	5.0	5.0	–	6.0
Proposal: basic level	2.5	2.5	2.5	3.0	3.0	4.5	4.5	4.5	4.5
Proposal: minimum level	5.0	5.0	5.0	5.0	6.5	7.5	7.5	7.5	9.0
<i>Total</i>									
General building regulations	25.5	33	–	45.5	–	57	67	–	77
Proposal: basic level	18	23.5	20.5	35	42	48.5	54.5	60	66
Proposal: minimum level	27	34.5	41.5	49	58	66.5	74.5	82	91

**Table VI.**  
Area for sets of rooms  
(m<sup>2</sup>)

habitable area in this case includes only the bedrooms, sitting rooms and living rooms. The kitchen is not included (INE, Statistics Portugal, 2008).

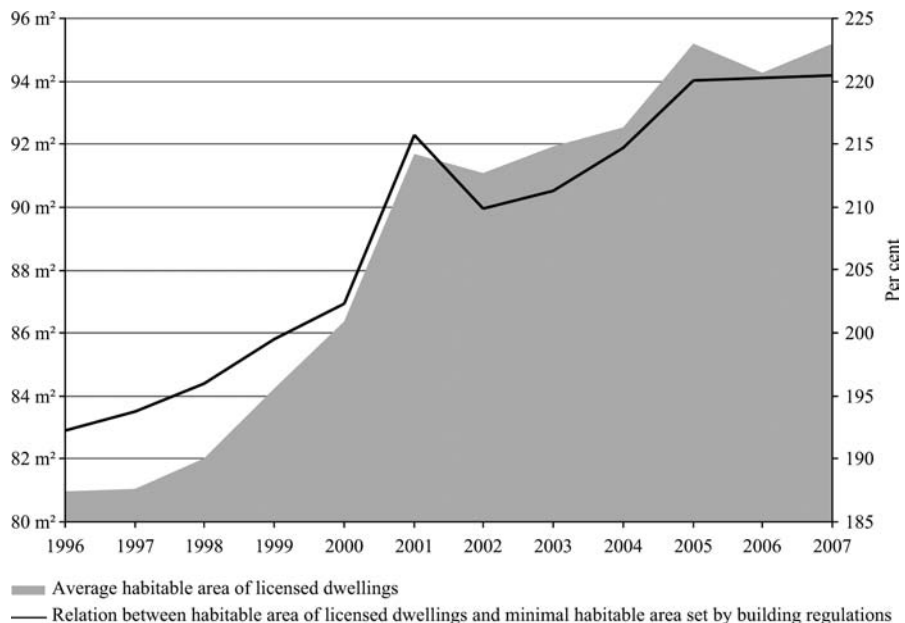
It was verified that the average habitable area increased gradually throughout the analyzed period, from 81.0 m<sup>2</sup> in 1996 to 95.2 m<sup>2</sup> in 2007. This difference constituted an increase of about 17 percent in 11 years. When comparing the total habitable area of the licensed dwellings with the total habitable area of the same dwellings according to the minimum values set by the building regulations, it was verified that in 1996 the first were on average 192 percent of the second, and that this percentage increased to 221 percent in 2007 (Figure 9). On average, dwellings are twice as big as the minimum standard (INE, Statistics Portugal, 2008).

The conclusion is that if the minimum level was adopted as a mandatory standard for the construction of new dwellings the impact would be small. The statistical data available do not enable us to determine how many dwellings granted a building permit would be below this standard.

### 5.3 Comparison with area standards in other European countries

An analysis of the space standards included in the mandatory technical regulations of several European countries shows that:

- In Belgium, using the Brussels Capital-Region as an example, the minimum areas for the habitable rooms in new housing are as follows: 20 m<sup>2</sup> for the living room, 8 m<sup>2</sup> for the kitchen, 14 m<sup>2</sup> for the first bedroom and 9 m<sup>2</sup> for the remaining bedrooms. The minimum habitable area of a dwelling with just one habitable room, including a living room and a kitchen, is 22 m<sup>2</sup> (Belgium Regional Building Regulations, 2006).



**Figure 9.**  
Comparing habitable areas of dwellings

**Source:** Data from INE (2008)

- In Spain, using the Catalonia region as an example, the minimum net area of a dwelling, new or existing, must be 10m<sup>2</sup> per occupant for the first four occupants and 8m<sup>2</sup> for each additional occupant. The minimum net area for a new dwelling has been set at 30m<sup>2</sup> and 20m<sup>2</sup> for an existing dwelling (Spain, Catalonia Decree 259/203, 2003).
- In Finland the minimum net area for a new dwelling is 20m<sup>2</sup> (Finland, Ministry of the Environment, 2004).
- In France, the minimum net area for a new dwelling is 14m<sup>2</sup> per occupant for the first four occupants and 10m<sup>2</sup> for each additional occupant (France Construction and Housing Code, 2008).
- In the Netherlands the minimum habitable area is 24m<sup>2</sup> for new dwellings and 14m<sup>2</sup> for existing dwellings. At least 55 percent of the net area of the dwelling must be habitable space. Therefore, the minimum net area of a new dwelling is 43.6m<sup>2</sup> for new dwellings and 25.4m<sup>2</sup> for existing dwellings. Part of the area can be in common habitable spaces (Netherlands, 2001).
- In Ireland, Building Regulations (1997), England and Wales, Building Regulations (2000), Norway, Technical Regulations under the Planning and Building Act, 1997 (2005), Sweden, Building Regulations (2002) and Denmark, Danish Building Regulations (2008) there are no quantitative area standards for dwellings in mandatory technical regulations.

In some countries, there are area standards that apply to only some types of development. For example, in England the English Partnerships' (2007) quality standards and in Ireland the Department of the Environment, Heritage and Local Government (2007) provide guidance on the minimum acceptable gross internal areas required in relation to occupancy and dwelling type. The guidelines from the English Partnerships are identical to the results of a study for the London Authority which also includes the minimum acceptable net internal area for 1 person and 7 persons (HATC, 2006). To be comparable with the net area, the internal gross floor area set for England and Ireland was divided by 1.15.

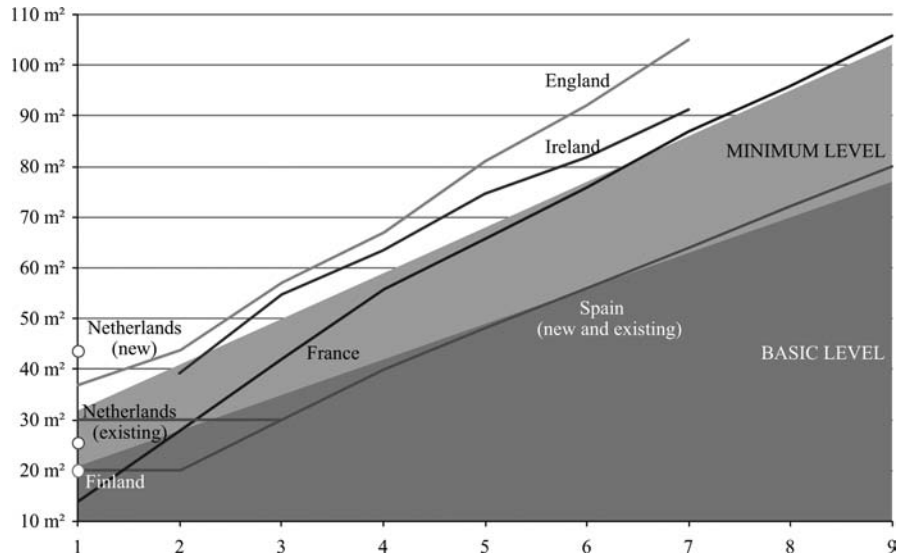
Table VII and Figure 10 present the internal net area of dwellings for several European countries.

Number of occupants	1	2	3	4	5	6	7	8	9
Number of bedrooms	0	1	2	3	4	5	6	7	8
Proposal: basic level (existing housing)	21	27	35	42	49	56	63	70	77
Proposal: minimum level (new housing)	32	41	50	59	68	77	86	95	104
Spain (new and existing housing)		20	30	40	48	56	64	72	80
Finland (new housing)	20								
France (new housing)	14	28	42	56	66	76	86	96	106
The Netherlands (existing housing)	24								
The Netherlands (new housing)	43.6								
England (new housing) <sup>a</sup>	37	44	57	67	81	92	105		
Ireland (new housing) <sup>a</sup>		39	54	63	74	81	91		

Note: <sup>a</sup> Adapted values

**Table VII.**  
Net internal area set in  
several European  
countries (m<sup>2</sup>)





**Figure 10.**  
Net internal area of dwellings by number of occupants

In most of the countries studied there are floor area standards for dwellings. These standards may be mandatory requirements, a condition for financial support or guidelines set by developers. Some countries have only a mandatory minimum size requirement for any dwelling, which ensures one person a dwelling of adequate size (e.g. The Netherlands and Finland). The justification is that space standards in dwellings designed for two or more people can be increased by under-occupancy (Wren, n.d.).

The conclusions are that there is a strong similarity of the basic level with the requirement in Spain, both applying to existing dwellings; in France similarity between the minimum level and the requirement is also strong, but only in dwellings for more than three occupants; the floor area guidelines in England and Ireland are greater than the requirements of other countries, which is reasonable since they are not mandatory for all developments.

## 6. Discussion and conclusion

### 6.1 Conclusions

The minimal net area for existing and new dwellings is presented in Tables IV and V. There should be an increase of 5 percent to 15 percent of the net internal area presently established in the Portuguese building regulations for new dwellings. The building regulations should also set a minimum net internal area for construction of existing dwellings, which can be 15 percent to 20 percent lower than what is presently established. If these proposals were adopted, the impact in the construction industry would be small. The proposals are similar to the mandatory net area requirements set in France and Spain.

The methodology adopted relates the needs of occupants with area requirements. Area requirements are not dependent on building types (flats, houses), tenures (owned, rented), locations (city, country), cost (affordable, cheap or expensive) or developers

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(social, private). The method for obtaining the net area of each function and dwelling is explained. If necessary, the list of furniture and equipment can be modified to determine different area requirements.

The functions used to describe occupants' use of the dwelling are not associated with rooms. The distribution of the functions and the associated areas is a design decision, which should aim to adjust each layout to the foreseen occupants. Conceiving rooms capable of accommodating different functions can be a design option. Usually, these flexible rooms require more floor area, yet they also enable the dwelling to be a platform that the inhabitants adjust to their way of life, instead of being conditioned by the characteristics of the spaces.

### *6.2 Limitations*

This paper focuses on the overall internal floor space of the dwelling. This parameter enables us to study and compare the total size of a dwelling. However, other space standard parameters are also important to ensure a functional dwelling.

Area standards were established in order to meet the needs of occupants in contemporary Portugal. These needs are determined in part by social, cultural and economic factors. Therefore, the area standards should not be applied to different contexts without adaptation.

The area standards are a "safety net" intended to prevent the development of dwellings with inadequate space, which raise significant concerns about long-term sustainability and suitability for the designed level of occupancy. The area standards are not "good practice" guidelines.

The increasing amount of diversity in the composition of households and acceleration in the changing ways of life justify the need for dwelling flexibility. Flexibility discourages dwelling mobility and renovation work, and contributes to extending the useful life of buildings. Neither the change in needs of occupants nor an increase in area to allow greater flexibility was anticipated.

Area standards were set to enable adequate living conditions even in periods of maximum occupancy. However, this does not guarantee that during some periods the dwelling could be used by more persons than anticipated (overcrowding) and so does not permit adequate living conditions.

Space standards can be set by functional requirements (e.g. list of furniture and equipment to fit in a dwelling) rather than by minimum floor areas and dimensions. Functional requirements are a more effective and flexible way to ensure that sufficient space is provided, since they reflect issues such as room shape and the position of windows and doors. However, functional requirements have the disadvantage of being more complex to use and verify.

The life of the occupants takes place in a continuous space, which includes dwellings, a building's common spaces, a neighbourhood's public spaces, nearby collective equipment, etc. There can be some compensations of area between the dwellings and its environment (e.g. a dwelling with no area for children to play can be compensated for by a generous common garden).

All the necessary spaces for the autonomous use of each dwelling were foreseen. Some functions or activities can be relocated to common spaces (e.g. clothing care can take place in common laundry facilities). These changes should only be made with the agreement of the future occupants.

The area standards drew upon a function-based and user-oriented approach. User satisfaction with existing dwellings and stakeholder views were not investigated. Should the proposed standards be used to replace the mandatory *General Building Regulations* requirements, they should be critically assessed in terms of these two sources of information.

### 6.3 Future developments

The study focuses on the net internal area of dwellings. Its continuation will enable a review of the remaining space standards for dwellings.

The net internal area was determined on the basis of existing knowledge on dwelling use. No empirical studies were carried out to update this knowledge. It is necessary to study how dwellings are presently being used in Portugal and foresee the future evolution of their use. This will enable a review of the area requirements for each function and of the dwelling.

Area requirements were determined for occupants without special needs. The study of area requirements for dwellings used mainly by old persons or by disabled persons will support planning special dwellings (e.g. with accessible, adaptable, or universal design features).

Area requirements are defined in legal documents in the majority of European countries, to assure adequate conditions for use. Different parameters are used to set these requirements. The comparison of legal documents from different countries would enable an analysis of which parameters permit the designer as much freedom as possible in how area is distributed among different rooms, and are easy to verify with the building authorities.

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