B I G C I T Y ✖ T I N Y L I V I N G

MICRO-HOUSING IN INNER LONDON

STUDENT NAME Anntje Wong
STUDENT NUMBER 1215191
COURSE CODE AR3EX320

TUTORS Sake Zijlstra
Olv Klijn
Ype Cuperus

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the Built Environment

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Preface

This report has been written as part of the Explore Lab graduation programme, which will conclude my master studies at the Faculty of Architecture and the Built Environment at TU Delft.

Micro-living has garnered a lot of attention in the last few years. There are different understandings and appearances. *Living micro* may refer to smart design that makes a house mobile, flexible and independent, and which allows the dweller to live a paripatetic and adventurous lifestyle living on the road. Another interpretation of *living micro* focuses on minimizing one's physical belongings down to only essentials, in order to reduce the personal carbon footprint. The type of micro-living as studied for this research are the space-constrainted dwelling that have emerged in many metropolitan cities, as a result of housing need and increasing living densities.

Compact living has become a necessity now that increasingly more people start to live in cities. This question asks from architects to interpret the modern urban qualities and to design smaller but still enjoyable dwellings. The housing situation in London and its interest for micro-housing provided me with a case study for the research and design project. With this project, I aim to explore the creative possibilities of high-density European housing.

Anntje Wong
April 2017

Introduction

Problem

Because of an immense population growth, London has gone into a major housing crisis. It is becoming increasingly expensive to live in the urban centre, because of the surge in rents and housing prices. According to calculations, the UK capital needs to build 49,000 more homes per year for the coming decades.[1] As a reaction to the housing need, smaller living units such as micro-housing are being developed in the inner city. This development has been met with both positive as negative critique.

Amongst the negative appreciation are concerns about the increase in living density and its effects on health and wellbeing. Others comment that building micro-housing is self-defeating, because in the end, prices will still be determined by the market. The resort to smaller homes is not readily seen as a solution that could solve the bigger problem which has originated from the political and real estate-related housing system.[2] On the positive side, for the high percentage of one-person households in this city, it is proving to be - at least - a short-term solution. Combined with communal spaces they find a high degree of acceptance. Small but cheaper apartments are seen as a welcome compromise by different groups such as young starting professionals, 'stayover' commuters (people who work in the city on weekdays, but spend the weekends in the countryside), the self-employed and students, who are all property-searchers that add pressure on the existing housing stock. For these groups, it does not make sense to build houses designed for nuclear families, as they have different domestic requirements and make use of the city as their public living room.[3]

The locations for daily activities are shifting between the public and the domestic spaces. This gives us an incentive to rethink the functional requirements of housing, especially when we are designing housing for smaller footprints. One can imagine that in the case of London and other world cities, micro-housing will be deployed on a larger scale in the future. This creates an opportunity to study the benefits as well as the challenges.

Scope

This research builds on the hypothesis that there are opportunities to be found in the micro-unit housing type, as a solution to living in the inner-city to many households. Micro-housing can offer sustainable housing, as long as it is paired with well designed, well managed spaces, targeted at the right users, and with a consideration of how the living space may extend to involve public facilities.

Therefore, the main research question of this research is *"How does the micro-dwelling become a sustainable urban housing typology"* ? The answer is given through theoretical studies, and studies on floor plans and domestic activities. The scope of this study focuses on the division of domestic space per function and domain, and an activity-based study to the use of space.

Structure of research

The first chapter aims to answer the question: "*How do compact living and the city relate to eachother, in the historical and current state?"* The answer is given in a twofold way. The first part describes the target group for whom compact living applies and the types of compact housing that have been realised during the last century of urban housing. The second part analyses how the domestic functions have been spread over different domains.

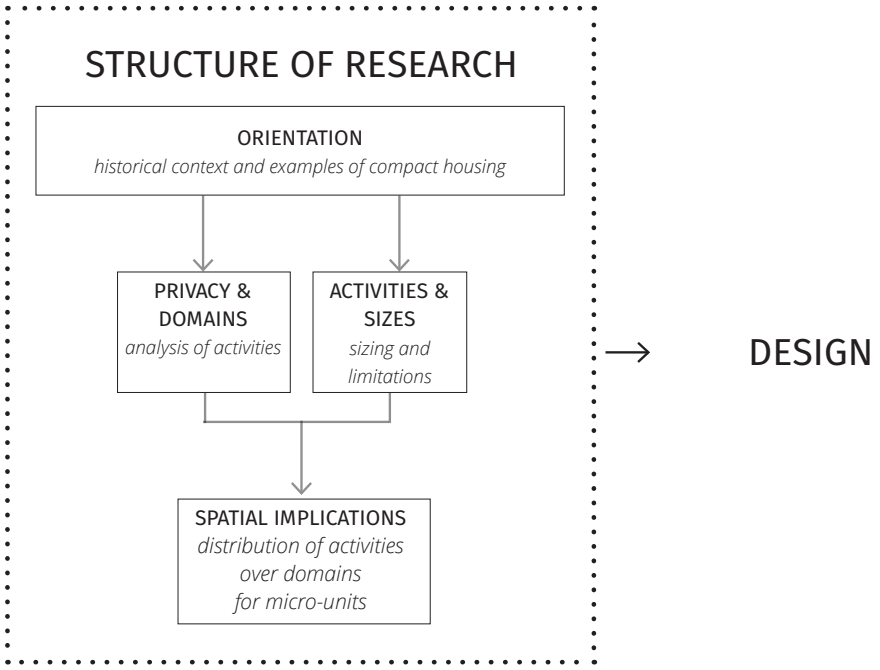
The second chapter aims to answer the question: *"Which meanings and values are attached to micro living, and how do they influence one's willingness to live in a micro-home?"* A study on the target group and lifestyle analyzes the social dimensions of micro dwelling. The meanings clarify which priorities are held and which compromises the target group is willing to make. This study aims to find core qualities of micro-living.

The third chapter aims to understand *"Can micro-unit sizes still provide enough space for crucial activities?"* Firstly,

1. Greater London Authority, *Housing in London 2014*, Greater London Authority, London, 2014, p.86.
2. Chandler, Joan, Malcolm Williams, Moira Maconachie, Tracey Collett, and Brian Dodgeon. "Living Alone: Its Place in Household Formation and Change." Sociological Research Online 9, no. 3 (2004).
3. ibid

London's micro-units are specified by their dimensions. The concept of space is understood by a meaning and by a size. Basic activities and specific activities are examined. Based on the meanings attached to micro-units, a selection of activities are made for analysis. Study of how the activities take place in a limited physical setting provides understanding of the implications of designing micro-units in regards to the dweller's experience and enjoyment of the home. The results of the study provide a background to understanding the consequences of design decisions made in the the design phase of the graduation project.

In the Conclusions, the results from all the chapters are combined to answer the main research question "*How does the micro-dwelling become a sustainable urban housing typology?*"



1 Historical analysis of micro-housing

London is familiar with many examples of compact dwellings built over the course of the twentieth century. Constructed in reaction to various events with some intended for temporary and other for permanent use, micro-housing was at times presented as a solution and at other times condemned as a problem. This chapter shows how compact housing in London evolved from the late nineteenth century towards the micro-housing of the present day. A selection of examplary floor plans illustrate the transition in room and function sizes and the changes of the private, communal and public domains.

1.1 Period 1: 1860 - 1913

During the Second Industrial Revolution, London rapidly developed into a haven for migrant newcomers. The rapid urbanization lead to undesired living conditions. The technological industrialization provided work in factories which attracted people from all over Europe and beyond. It caused London's population to more than double from three to over seven million in the second half of the 19th century. Large settlements of working classes formed in the urban region. They lived in housing surrounding the places of employment which in many cases hade been constructed illegally. Houses were built back to back on small alleys, a configuration that spurred unhygienic and overcrowded living conditions.[1] Co-habitation of multiple families and the sharing of sanitary amenities was unusual. Families lived together in a single room, while people who had come to the city by themselves often had no fixed address and slept in lodging houses, which were cheap overnight-accomodations providing a bed in a dormitory and a simple meal.

By the turn of the 19th century the public and political awareness rose on the extreme poverty and the discrepit conditions in the slums. To improve the living conditions the government intervened by executing demolitions and slum clearances. In their place new housing for the workers were built, not by the government but by philantropic figures. The new housing put in place were the so-called 'model dwellings', financed with private money and built by privately employed builders.[2] However, the amount of realised housing turned out to be insufficient to relocate all evicted people. In addition, higher than envisioned construction costs led to high rents that only the higher working classes could afford. The slum clearances therefore led to the displacement of many workers out of the areas close to their location of employment.

The working classes lived as families in the model dwellings in private living spaces, sharing amenities both per storey and per housing block. The design was centered around communality. All daily activities could be done close to their private domains. They lived close to work and amenities, and all other frequent movements were within the vicinity of the housing estate.

One of the model dwellings realized during this time is Peabody Square, in Southwark London. The estate existed of two square housing blocks erected around linked squares accessed by an arched main entrance. The blocks housed 384 flats in total, divided over nineteen smaller blocks. The tenants shared communal spaces and facilities in the spacious courtyards, staircases, lobbies, laundry rooms, baths, sculleries and water closets. Baths were situated on the ground floors and laundry was done in separate buildings. The floorplans of the housing blocks were vertical repetitions which made construction simple and straightforward. The separate placement of a water closet and scullery in a shared room of 6 m^2 enabled social control and supervision of sanitary facilities. Each unit consisted of one living room and a bedroom to house a family. Each room had one window to allow daylight entry and to induce ventilation. The living room was the only heated room, and the fireplace was connected to a stove. A shared landing of 14.5 m^2 for four to five families gave access to the scullery, water closet, and the central staircase. This translates to a shared internal circulation space of 2.9 to 3.6 m^2 per family, and a total private area of 23 to 24 m^2. Bedrooms measured 10 - 11 m^2 and living rooms were 13 m^2. The use and division of space was centered around communality.

1. University of the West of England 2008, The History of Council Housing, accessed 6 June 2016, <http://fet.uwe.ac.uk/conweb/house_ages/council_housing/print.htm>
2. ibid

Peabody Square

Southwark, London

1871

Figure 1.1 (clockwise from top) Peabody Square estate, overview, entrance and central courtyard

Communal amenities

Circulation space

Private rooms

BR	bedroom
LR	living room
Sc	scullery
WC	water closet
Cupb	cupboard

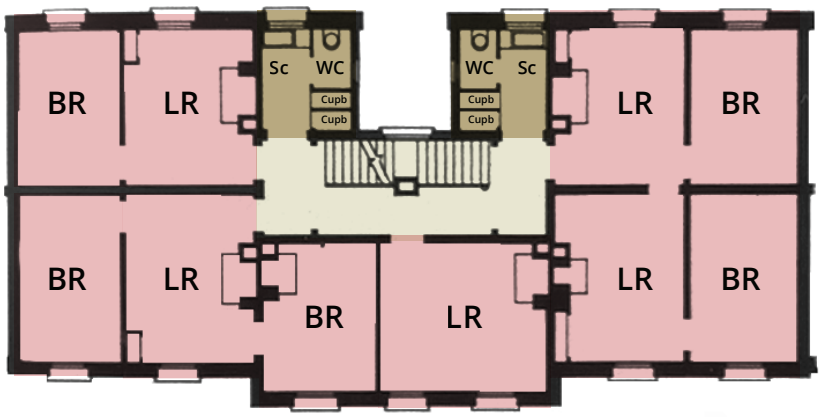


Figure 1.2 Part of the Peabody Square second-floor plan (1871) scale 1:200

1.2 Period 2: 1919 - 1940

During the First World War virtually no new housing was constructed and part of the stock was lost in the bombardements. The government took on an active role in housing and presented itself as the socially responsible provider of sufficient and proper housing for the returning soldiers and the people from lower classes. Over the interwar period the government introduced several housing acts with varying success. Under the period of each act the quality of the newly constructed homes varied as a result of the financial and engineering-related circumstances.

The Housing Act of 1919 introduced a high building standard to ensure comfortable homes. A standard new three-bedroom house during the time measured an internal area of 93 m^2. In 1921 a lack of finance and labour halted further constructions. Contrastingly, the private building societies showed successful building homes in the suburbia with popular domestic elements such as parlours and bay windows. The Housing Act of 1924 required new homes to be equipped with a separate bathroom, but reduced size and quality standards and promoted cost-conscious building methods to push the productivity. The standard size for a three-bedroom house reduced to 58 m^2. Estates were built at higher densities with smaller units to produce more affordable housing. The Housing Act of 1930 initiated large-scale slum clearances and rehousing. The new housing built in place of the original slums became unaffordable for poor families, and the vast majority of new housing was built the in urban peripheries.[3] In some cases the tenants in these housing estates became isolated, when speculated settlements of new industries in adjacent areas failed to develop. To them, relocation brought on additional costs and time for the work commute. After 1932, The Great Depression led to reduced costs for building and funding and the center expanded widely into suburbias of privately owned homes. However, dense slums in the inner city continued to exist into the Second World War.

An example of housing for the lower classes built under the Housing Act of 1924 is Birchfield House in Poplar in east London. The estate rehoused people from inner city clearance areas. The floorplan was designed by the London County Council as a so-called 'simplified' five-storey blocks of flats[4]. The corner-shaped building is accessed from a square with two main entrances. Homes were grouped per two or three units and accessed via balconies which doubled as communal spaces. Water supply facilities were grouped adjacent to eachother to ensure simple construction and sanitary control, reminiscent of the model dwellings. Each bathroom was shared by every two or three units. Each family had access to a private scullery and water closet, though these needed to be accessed from across the shared landing. A gas stove next to the fireplace in the living room served for the preparation of food. A gas fire in the corner of each bedroom provided additional heat. Initially there was been no electricity installed, only gas for cooking and heating. Bedrooms measured 11 m^2 and living rooms 14 to 17 m^2. The total private area of an apartment was 29 to 32 m^2. The shared bathroom measured 4.5 m^2. The shared landing was 13.0 m^2 in three-apartment clusters, and 8.7 m^2 in two-apartment clusters, which averages to 4.4 m^2 of available semi-private internal circulation space per family.

Compared to the previous example of Peabody Square in Birchfield House these private living quarters were slightly larger in size and the average internal living area per occupant also increased. All basic facilities, with the exception of the shared bathroom, were now private and accessible from shared circulation space. Even with the facilities still shared by multiple families, living spaces could be seen shifting from the communal to the private domain.

With the great number of new housing built in the interwar period, urban housing still remained out of reach for the lowest classes. Poor families lived in remaining slums, while middle-income classes were housed in both urban and suburban areas. The suburban area around London which was constructed during this period, frames the inner London area of today.

3. Greater London Authority, *Population and employment projections to support the London Infrastructure Plan 2050*, Greater London Authority, London, 2013, p.3.
4. The designs were simplified in regards to building and space standards to build houses faster and cheaper. Similar to many other estates it was cost-consciously constructed in five storeys, which was the building height for which no elevator needed to be installed.

Birchfield House

Poplar, London
1926-1927

Figure 1.3 (clockwise from top) Birchfield house floor plan, view from the street, overview

Communal amenities
Circulation space
Private rooms

BR	bedroom
LR	living room
Sc	scullery
Bth/W	bathroom + wash room
WC	water closet

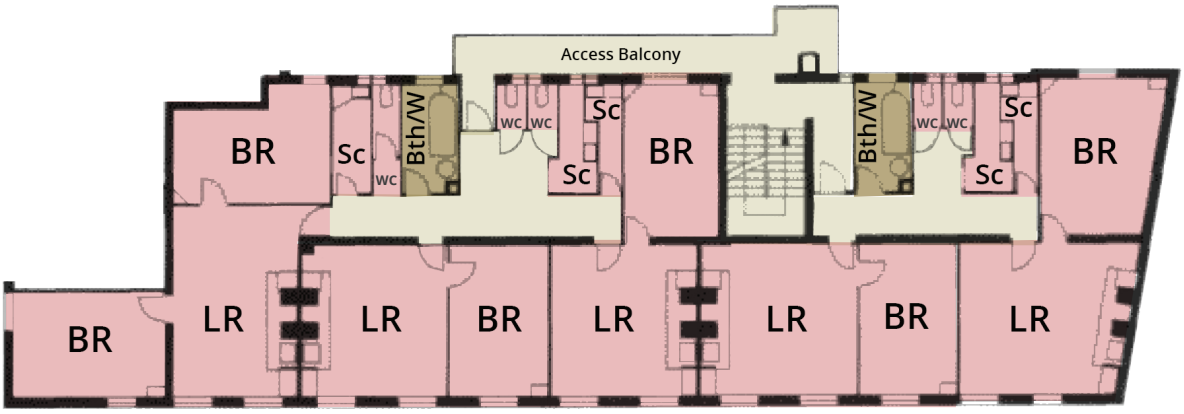


Figure 1.4 Part of the first-floor plan of Birchfield House (1926-27) scale 1:200

1.3 Period 3: 1945 - 1980

After the Second World War the housing shortage was enormous and new slums had emerged. The government responded by setting up a major building programme for a region-wide decentralization process and promoted settlements out of the centre. By the 1980s, decentralization was clearly visible and the Inner London population size had declined by two million. The intent of government housing was no more restricted to providing for the working classes, for in practice the different groups in thjbe population became very difficult to discern.

In the first years after the war the focus was on making repairs to the existing properties, acquiring existing housing and dividing them into multiple dwellings to house more families, and rapidly constructing new homes using prefabricated elements.[5] Standardization of building materials helped to construct quickly and cheaply. Prefab-houses were an emergency solution and homes were constructed in peripheral urban areas on any site suitable for situating two or more units. The first factory-built single storey 'box bungalows' intended as temporary emergency housing were completed only two weeks after the war ended. The structures had two bedrooms, complete plumbing and heating, fully fitted kitchens and bathrooms on an internal area of just 43.2 m^2. Eventually, the structures were deemed too small and were demolished after only several years. Another type of quick-to-assemble pre-fabricated housing was the pre-cast reinforced concrete house (PRC) which had a metal-inforced structure. The PRCs had an intended lifespan of 60 years to continue functioning not only as emergency housing, but also as durable housing after the war. However, due to corrosion of the metal inforcements a great number of PRCs were demolished in the 1980s. Most were suited as housing for temporary use, and densified areas horizontally but not vertically.
In the 1950s, the government attempted to boost building activities by abandoning the standards for minimum size and quality. High-rise constructions were advised and thus projects for tower blocks higher than six storeys received higher amounts of subsidies. Areas marked as slums were demolished and redeveloped according to modern high-rise town planning concepts. Many of the first small but fully private apartments, the first micro-homes appeared in these vertically dense high-rise towers. In 1964 the government responded to the growing importance of private car use, by requiring a parking space for every home. Improvements for housing sanitation and climatization prompted the increase of minimum space standards to allow for rooms to be flexible in it function.

Next to family dwellings, a need for the housing of elderly single-person households emerged. After the war, the life expectancy rose and the number of people of post-retirement age has since been growing. One of the examples of elderly housing is The Lansbury Lodge Old People's Home. The two-storey building housed up to 49 elderly people who were accomodated by a permanent in-house staff of five. The communal sitting rooms and dining hall served as daytime living spaces for residents and guests, with entertaining events such as concerts or plays. Single bedrooms had an internal area of 5.4 m^2, double bedrooms were 9.7 m^2. Bedrooms are placed in a wing with shared amenities (30 m^2) and accessed by central circulation space (120 m^2) which connects to the communal activity spaces (100 m^2). The in-house staff makes up a significant part of the complex and uses its space (220 m^2) for services and private residences. The design counterbalanced small private spaces with large communal spaces that accomodated daily care and recreation. Remarkable about these dwellings are the presence of facilities and staff that serve the activities of the residents, all under the same roof. In comparison, the focus on communal activities and service contrasted with the family dwelling which came to exist of fully private living spaces and sanitary facilities.

5. London County Council, op.cit., p.41

Lansbury Lodge

Poplar, London

1949-1951

Staff and service functions

Communal activity spaces

Communal amenities

Circulation space

Private rooms

1. Gardener
2. Kitchen
3. Staff dining room
4. Dining hall
5. Staff sitting room
6. Canteen
7. Sitting Room
8. Matron's office
9. Visitors
10. Ash store
11. Wheel chair store
12. Doctor
13. Sick bay
14. Linen store
15. Ironing room
16. Bath room
17. Sluice room
18. Single bedroom
19. Double bedroom

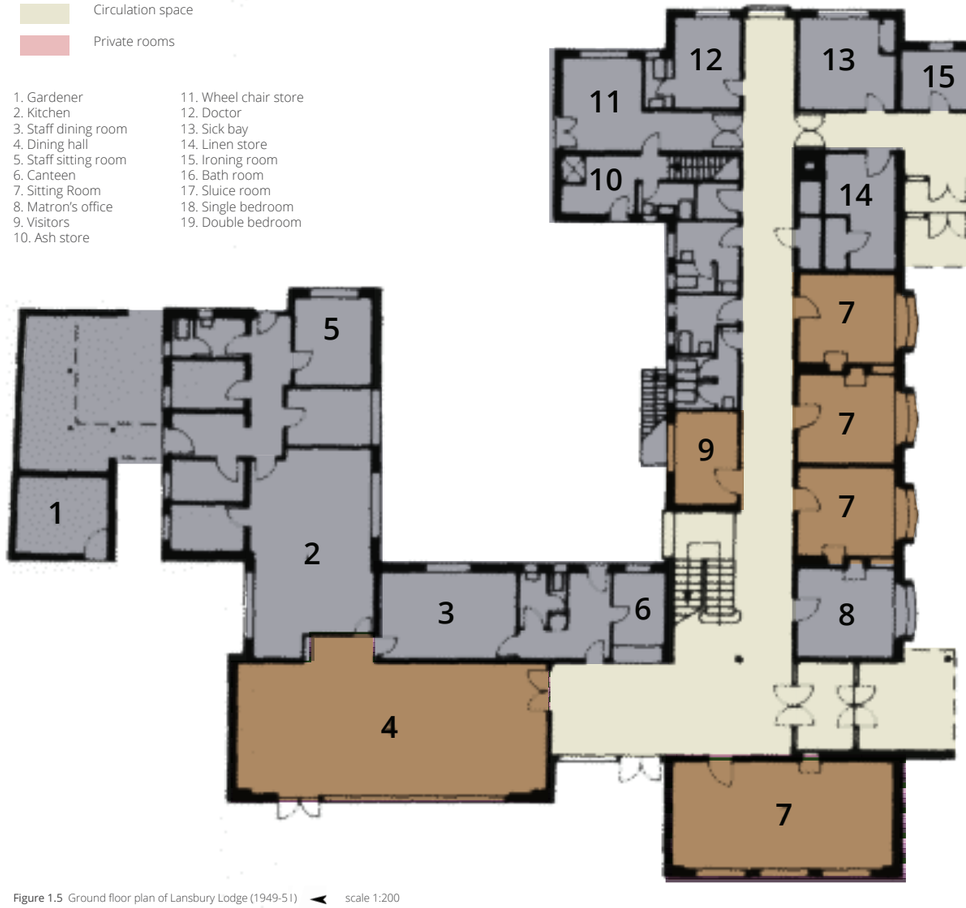


Figure 1.5 Ground floor plan of Lansbury Lodge (1949-51) ◄ scale 1:200

Figure 1.6 Lansbury Lodge main entrance, internal main staircases

1.4 Period 4: 1980 - now

Alike other large cities in prosperous industrialized nations, London entered into deindustrialization during the development of an information-based economy. The presence of industries in manufacturing, construction and transport-and-communications sectors in the inner city declined, and service-oriented businesses such as banking, insurance and the financial sectors became prominent. The change in the economic makeup catalyzed social changes. The new workforces consisted of academically educated young and middle-aged adults. The government and private business formed partnerships to realize housing to specifically attract these new workers. Most of the newly settled inhabitants chose to live alone in Inner London in the vicinity of work, urban attractions and entertainment. Their lifestyles influenced regeneration schemes of large areas, with most notably the example of the London Docklands. The area to the east of the City borough formerly consisted of derelict and brownfield areas. Its housing scheme was examplary for developers. The large area was redeveloped with housing and plenty local amenities and services. The new inhabitants created an economic impulse to the area, because of their high levels of consumption[6]. The project was the precursor to London's inclination towards large building schemes on large sites. The urban neighbourhood with the proximity of commercial amenities became an interstitial space where daily life transpired.
These developments brought an end to the decentralization. The repopulation has shown to be selective by age and socioeconomic status, because by the 1990s Inner London households were notably of middle and higher incomes. Although one-person households had already existed from the 1950s when the population of elderly started increasing, from the 1970s on the household composition was observed developing under the people of working age. London has been at the forefront of this cultural demographic shift across western Europe. Over the two decades from 1971 to 1991 the average household size fell from 2.1 to 2.7. Between 1981 and 1991 the people in solo households were responsible for 80% of all new household formations. Certain neighbourhoods were shown to be traditionally attractive but over time all boroughs in Inner London have measured a decline in family households and a rise in smaller households. These early developments were fundamental for wider cultural changes across all population groups of adult ages.

Over the period of 2002 to 2013 the number of inhabitants and employments grew 13.5% and 12.5% respectively, but the housing stock expanded with merely 9.2%[7]. The housing need drives people to look for alternatives. There is a distinction between the trends in Inner London and Outer London. Inner London absorbed the population growth mainly through an increase in the number of households, while Outer London households have increased in size[8]. This can be explained by the inclination for singles (and couples without children) to live more centrally, while families are more attracted to the outer boroughs. However, the inaffordability of inner city housing may be withholding people from making new household formations. Especially young adults are now often unable to afford for themselves and stay at home with their parents for longer. The expensive housing market affects all income classes. People looking to own but unable to do so on their own, may now turn to arrangements of co-ownership. The need for studio and one-bedroom apartments drive one third of the total need, and 69% have indicated to look for accomodation in the social sector. This shows that a large segment of the stock in the private rented sector is unaffordable to these households[9]. These drivers contributed to the need for smaller dwellings.

An example of micro-housing is developed by the company Pocket Living. The dwelling size is 37 m^2. Underfloor heating replaces radiators, floor-to-ceiling windows give a spatious impression. The homes do not have access to private parking spaces. The kitchen and living room combine into one living area of 18 m^2. A 3 m^2 shower room replaces a bathroom and 4 m^2 circulation space connects all the spaces and gives access to a separate 11 m^2 bedroom. From the front door, all spaces and facilities are private. There is little attention for communal facilities. The homes are intended for young starters and sold at 80% of the market rate of similar homes.

6.Ray Hall and Philip E. Ogden, "The rise of living alone in Inner London: trends among the population of working age," Environment and Planning A 35, no. 5 (2003)
7. Greater London Authority, *Housing in London 2014*, Greater London Authority, London, 2014, p.39.
8. ibid, p.17.
9. The number of people that fall between eligibility for council housing and the affordability-level of the private rented sector is increasing. Modern social housing in the United Kingdom is constructed as a safety net only for the very poor and the homeless. Because of this, many tenants find no other option than to look for housing in the private rental market when they would rather be socially renting.

Pocket Living

Camden, London

2010

Figure 1.7 Pocket micro apartment impressions and interior view

Private rooms

BR	bedroom
LR	living room with kitchen
BR	bathroom with WC
St	storage

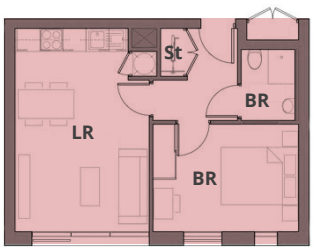


Figure 1.8 Floor plan of a Pocket flat scale 1:200

1.5 Conclusions

The first chapter aimed to answer the question "What is the relation between compact living and the city?"
The subject has been studied in a twofold way. Firstly, the history of compact living and its target dwellers have been studied. Secondly, the domestic functions as spread over different domains has been analysed.

Compact housing relies on the urban environment

History shows that there is over a century history of compact housing. Improvements and changes have resulted from new technologies, political influences, and non-governmental powers. However, it is clear that the need for small housing has become an enduring need within central London. People for whom the housing were built have usually been the working classes who desired to live close to work. The proximity between work and residence has always been an important condition. In the cases that housing was deemed unfit, demolition has often made way for new dwellings. However, demolition has also shown to lead to unsatisfactionary results when dwellers were displaced to remote locations. It is of importance to understand that dwellings not only consist of the housing itself, but also of the residential area and the social fabric that connect the lives of the dwellers. Demolition and relocation may rupture this fabric, and not serve solve the ongoing housing problem adequately.

Homes have become more private

The first examples of compact housing show that inclusion of communal spaces was quite common. The idea behind designing for communality, was to replace functions that could not be procured inside the private unit. Common spaces were situated centrally between units, or on and alongside internal and external routing. Over the years the provision of communal functions has diminished.

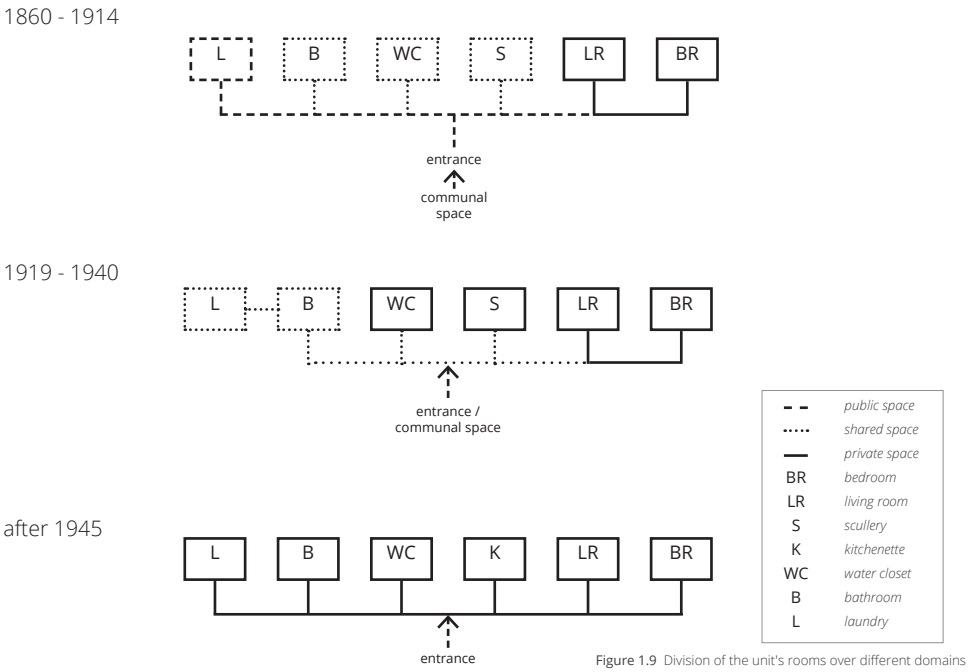


Figure 1.9 Division of the unit's rooms over different domains

Comparing the sizes over the different periods, it becomes visible that even though household sizes have been declining, the sizes of the different functions have not become much smaller.[10]

10. Greater London Authority, *Housing in London 2014*, Greater London Authority, London, 2014, p.7.

period	**1860 - 1914**	**1919 - 1940**	**after 1945**
average household size	4.7 persons	4.3 ~ 3.4 persons	3.3 ~2.1 persons
circulation space	2.9 - 3.6	4.4	4
living room	13	14 - 17	15
bedroom	10 - 11	11	11
scullery/kitchenette	3	5 - 6	4
wc	2	2	1.5
bath	-	1.5	1.5

Figure 1.10 Division of the unit's function sizes in m^2

In the matter of discussing micro-apartments, it is important to note that although size obviously is a main focus, the most significant change is the division of the functions over different domains, which in practice affects the design requirements. Most notable is the shift from several functions from the public and the communal space into the private domain.

To further investigate how small households live in the city, the next chapter studies how the micro-dwelling is interpreted by its residents.

2 Users

After the recentralisation since the 1980s, the number of inhabitants in Inner London grew explosively. The immense housing need stunted housing prices, making inner city housing close to unaffordable for many households of low and middle incomes. One third of the total housing need is for one-bedroom apartments. This demand exists for two thirds of social housing, and roughly equally divided demand over intermediate and private markets for the remaining one third. It shows that the group of one-person and two-person households looking for housing is large and heterogeneous. This chapter aims to connect the general and shared values attachted to living alone, which can be translated into design guidelines for the home and its residential environment.

2.1 Lifestyle and micro-housing relations

A US study found that 25% of conventional renters are willing to choose micro-housing over conventionally sized apartments.[1] This shows that micro-housing is not a solution for everyone. Based on the assumption that people shape the requirements for their homes according to their lifestyle and affordabilities, it is important to study why some people are willing to live in the city even when it means to compromise severly on living space.

There are demographically established values that convince increasingly more people to live alone.[2] The three main reasons have been set apart next to other studies, under which a research from Meesters (2009)[3] on people-and-environment relations. By comparing both the sociological background and the desires for home and residential environment, we can find how lifestyle requirements can affect the design of micro-housing in private, shared and public domains.

2.1.1 Cyclical living

Sociological background

People are living longer lives. Spending a quarter or a third of a life alone is no more out of the ordinary. Changing between living situations has become common. People change from living with families, to living with friends or a partner, and at times find themselves living alone. Periodic moving, owning multiple addresses or living in temporary locations are all a consequence of how living has become paripatetic to a certain degree. In central London the rise in life expectancy has been related to a decline in fertility rate.[4] This corresponds with the large share of one-person households. A 1987 study calculated that one's time living alone had an average duration of 4.76 years. This average is likely to increase.[5]

Cyclicality and micro-housing

Micro-housing is often mentioned as a short-term and temporary solution. For young adults aged 18 to 39, the group most likely to accept compromises on space, a self-contained unit symbolizes the first steps of the housing ladder.[6] For newcomers to London who are willing to rent a micro-unit the dwelling is seen as a central base while they get acquainted with the city, job or study, and while meeting new people. It is a compromise for a short duration of time in which one can navigate the city from an advantageous position. However, studies suggest that living alone is very likely to become a long-term living situation in the future[7]. More people forgo marriage and cycle more often through partnerships. Partners who end up living alone after the passing of a partner or are found in a too large house after the children have left home. Modern life is characterized by cyclical household transitions. Therefore, a growing target group needs to be kept in mind.

1. Urban Land Institute, The macro view on micro units, Urban Land Institute, Washington 2014, p. 18.
2. Klinenberg, E., Going solo: the extraordinary rise and surprising appeal of living alone (London: Duckworth, 2014), p. 21-34
3. Meesters, J., The meaning of activities in the dwelling and residential environment: a structural approach in people-environment relations, PhD diss., Proefschrift Technische Universiteit Delft, 2009.
4. Hall, R, Ogden PE, loc.cit.
5. Hall, R, Ogden PE, loc.cit.
6. Boumeester, HJFM, Lamain, CJM, Mariën, AAA, Rietdijk, N, Nuss, FAH, *Huizenkopers in profiel; Onderzoek naar wensen van potentiële huizenkopers*, NVB, Voorburg, 2006.
7.Chandler, Joan, Malcolm Williams, Moira Maconachie, Tracey Collett, and Brian Dodgeon. "Living Alone: Its Place in Household Formation and Change." Sociological Research Online 9, no. 3 (2004).

2.1.2 Self-directed living

Sociological background

Living alone offers time and space for restorative solitude. It serves to balance the energy invested into professional life and social contacts. In the most positive sense, the environment enables one to participate intensively in the different domains, while the homebase provides solitude needed for control and balance of time and energy. There are ways in which living alone contributes to self-realization. Living in the city provides a central base between work and recreation. The need for such a private homebase certainly applies to the highly fluid labour-market of London which attracts young independent professionals with a migratory lifestyle. Regardless of gender, career and studies are common reasons to withhold family planning or to abstain from intensive romantic relationships. Marriage has traditionally been the system in which females attained financial security, but this changed when medical and cultural changes gave women more autonomy. Inner London shows an overrepresention of younger women in solo households. The rising status of women has enabled an increase of females in professional and intermediate occupations, and has brought women's incomes more in line with those of men. For women and men who are in a relationship, living alone may as well be a way to fulfil one's own desires. Living separately can be a non-standard solution to finding a balance between the different life domains. Couples living together but owning a pièd-a-terre in the city may do so for one partner to have shorter commutes to work, while the other lives in their primary dwelling.[8]

Self-direction and micro-housing

According to Meesters, there are general values everyone expects from their residential environments. People prefer to live in an environment that supports them to fulfil their daily duties in an efficient way. The dwelling needs to fulfil the desire to break from work, to find pleasure, to experience convenience while doing their daily tasks, to relax, and to have space for maintaining and forming social contacts. People living in city centres focus on saving time and the close-knit urban network offers exactly the highly functional and efficient space they desire to live and work in. The most valued additional value of urban environments is the access to a stimulating environment, which helps to forget about daily obligations and to get away from work. Micro-housing is a strategic choice for people valuing self-direction. They change the requirements for their dwelling according to their current lifestyle and affordabilities.

2.1.3 Individualised housing

Sociological background

Relations of intimacy and care between people is no more easily defined within the borders of a family home. Somewhat paradoxically, living alone in a densely populated area can be a strategy to shield oneself from the hypercommunication of modern society[9]. Research suggests that people who live alone compensate for the solitary dwelling by becoming more socially active.[10] Within the home are many means for communication and leisure provided by television, telephone, radio and internet. Large cities are hubs for social meetings for socializing with other people. It comes as no surprise that cities are places where subcultures thrive, because they are places were social synergies can emerge. Moreover, metropolitan and urban areas are often set up with an abundance of commercial facilities such as coffee shops, gyms, clubs, food delivery services and supermarkets which support a solo and social lifestyle.

Individualisation and micro-housing

People are increasingly dividing their time over multiple addresses. This however does not imply that the meaning of dwelling has fully changed. It shows hat the public sphere is offering more and more places where private social activities can take place, which in turn is changing our understanding of privacy. This can be illustrated by the following excerpt from Fennell (2009):

> *"Demand for micro-units (...) may reflect changing norms regarding the relation between the home and rights of privacy and association. Rather than providing a private sphere within which residents associate with others, [this new housing type allows] residents to live in closer proximity with others. This enables individuals to associate with (...) like-minded individuals."* [11]

8. Mulder, CH, Van der Klis, M, 'Beyond the trailing spouse: The commuter partnership as an alternative to family migration', *Journal of Housing and the Built Environment,* 2008, pp. 1 - 19.
9. Klinenberg, op.cit., p.10
10. Meesters J, *The meaning of activities in the dwelling and residential environment: a structural approach in people-environment relations*, Delft University Press, Delft, p.154.
11. Garnett, N.S., 'Unbundling Homeownership: Regional Reforms from the iside out', Yale University Press, l.j. 119, 2010, p.25.

The space required for dwelling is dependent on the activities actually taking place inside of the house, and can minimize beacuse of the presence of the social and functional services of the city:

> *"How much space a given household finds necessary for its well-being depends on the cultural context and on which activities are contained within the household, as opposed to being socialized within a larger community or procured privately outside the home."* [12]

Rather than seeing the city as replacing the home, the city should be regarded as a space that brings a multiplicity of settings for activities. This expansion of locations for both public and private activities underpin how compromises can be made on space in the private dwelling. The home is just one of the places where daily activities take place.

2.2 Conclusions

The future is likely to require more housing for people who live alone. The transition into solo living often accompanies a great change in one's personal life, during which one has to adjust to a new life phase. A balance has to be recovered between work and personal life, between being with others and being alone. Living alone does not mean that social activities within the dwelling have become unnecessary. The home and its environment need to ensure the fostering of social connections, and within this connection a micro-home should still offer the possibility to lift social contacts to intimate levels. Furthermore, modern cyclical lifestyles requires that transitioning from one living situation into the other needs to be supported and not be impeded by a lack of private space.
The home is a place for withdrawal, in contrast to the city environment which provides a high-paced, functional and engaging social space. Considering the great interdependence of the home and the city, the micro-home and the neighbourhood need to align together to create a living environment in which daily activities can be balanced. Offering a multiplicity of private places in the public space is an important term on which micro-housing can form a satisfying compromise.
By taking into account the social dimension next to the development of space-conscious design, architects can make enjoyable and socially sustainable micro-dwellings.

Some domestic activities will inevitably still become impractical to exercise or even impossible. Activities will shift their settings within the home and even to outside of the home. The following chapter discusses how certain activities may be caused to shift.

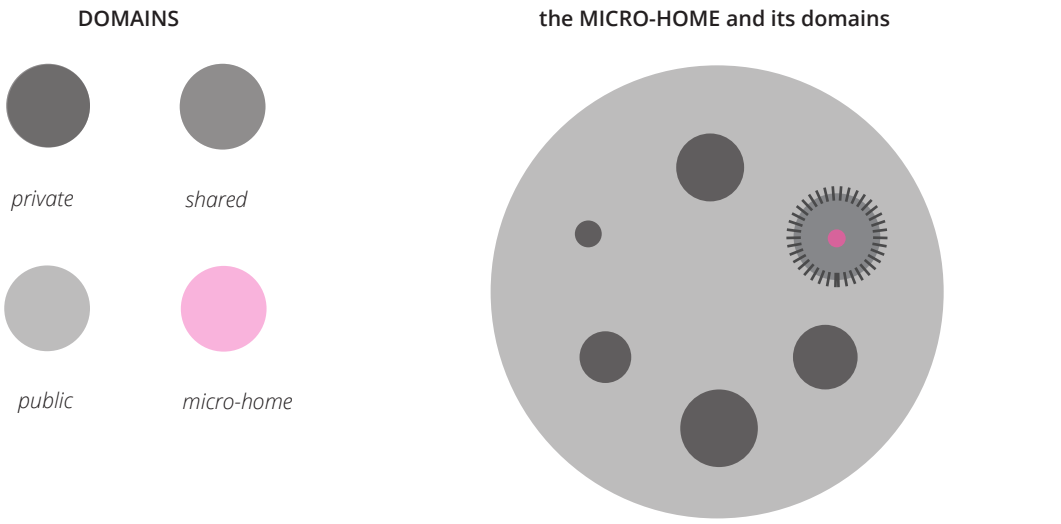


Figure 2.1 The micro-home consisting of a private core and shared functions, and the public sphere offers settings for private activities

12. Fennell LA, 'Property in housing', *Academia Sinica*, l.j. 31, 2009, p.56.

3 Sizes and activities

Lifestyle values that are associated with micro-living have been discussed in the last chapter. The values can be linked to exemplary domestic activities. How these activities can be exercised in the dwelling also determines the quality of the dwelling. Activities take place in certain places within the dwelling, which are so-called *settings*. The focus is on determining these settings to find out whether there is sufficient space for a certain activity.

3.1 Method

The assessment of a dwelling layout can be done in many different ways. For this study the focus is on the size of the unit and within it, which settings for the activities are possible. The study is constrained to a 2D-analysis of floor plans and does not take into account the possibilities with differing ceiling heights.

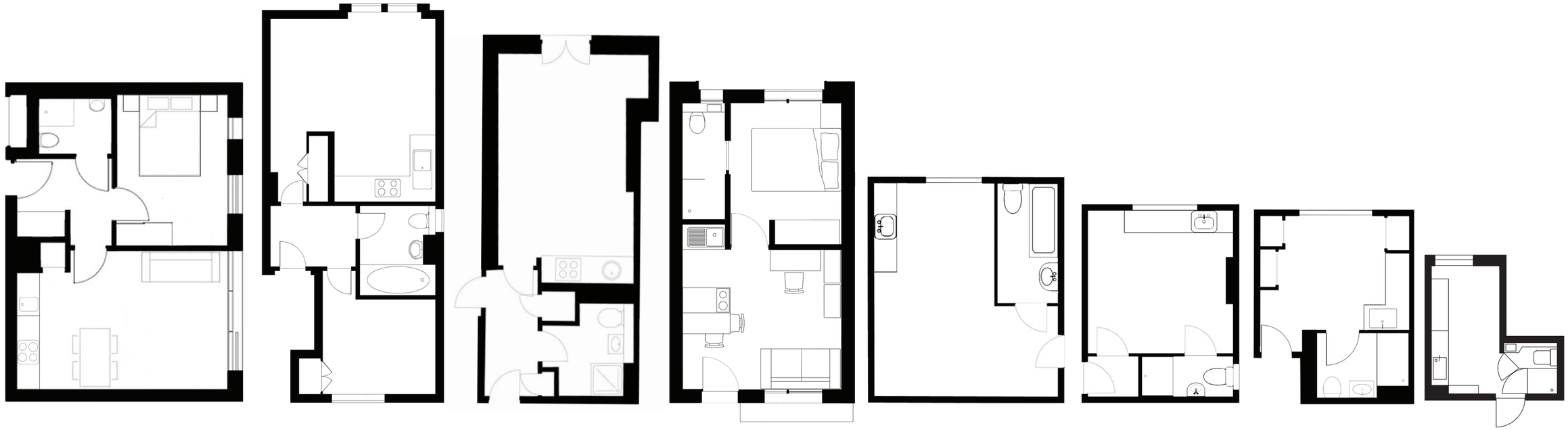
Specification of micro-sizes
Firstly the micro-sizes of London are specified. Sizes vary per region and country, and within the definition is no set size indication. A micro-unit is a self-contained dwelling with a toilet, shower or bath, kitchen or kitchenette, which is of considerably smaller dimensions than regular apartments that can be found in the same area. More than often, micro-sizes tend to be smaller than allowed by housing regulations. The exploration of micro-sizes and its effects on the activities, sheds light on how much quality can still be accomplished within a certain dwelling size.

Basic activities
Secondly the settings for basic activities are compared over various micro-sizes. Most of the basic activities in a dwelling are related to hygiene, sleeping and food. These activities often take place in a demarcated space, such as a bathroom, living room or bedroom. These demarcations can be made when there is enough space to make room divions, which are hard barriers in a dwelling. The walls break the visual connections, insulate sound, and set a certain atmosphere and level of privacy. On top of that, the activities determine and limit the associations that are congruent with each separate room. The number of possible room divisions is relative to the size of the unit.
When the possibilities for divisions diminish, the settings of the different activities will have to take place in the same space. Settings can be seen as soft barriers between activities, because there may not be a visual or sound limitation, or a framing of a certain atmosphere or privacy zone.

Specific activities
Thirdly, twelve basic activities that are specifically related to micro-units have been selected. Each activity is described in order to determine the settings, sizes and its associations with the space in which it is exercised.

Conclusion
The study of sizes and layouts of the activities gives an indication of the feasibility to design a qualitative features into the varying micro-unit sizes.

3.2 Specification of micro-sizes



	Pocket	*Westbourne Park*	*Harrington Road*	*Y-Cube*	*Pembridge Villas*	*Pembridge Villas*	*Arrundel Gardens*	*Brompton Road*
Total area	**37 m²**	**32 m²**	**28 m²**	**26 m²**	**23 m²**	**16 m²**	**14 m²**	**7 m²**
Living room	17 m²	18 m²	19 m²	13 m²	19 m²	12 m²	9 m²	4 m²
Bathroom	2 m²	4 m²	3 m²	3 m²	4 m²	2 m²	4 m²	3 m²
Bedroom	10 m²	7 m²		9 m²				

Figure 3.1 Overview of micro-unit sizes (scale 1:100)

London prescribes no minimum space standards set by regulation, only advisory standards as issued by the Royal Institute of British Architects (RIBA).[1] The current minimum space standard for a one-bedroom, two-person dwelling on a single storey is set at 50 m².[2] A one-bedroom, one-person dwelling with a bathroom is allowed to be 39 m². If the bathroom is replaced by a shower room, the minimum space for a 1-bedroom 1-person dwelling becomes 37 m², but a separate bedroom of minimally 8 m² is required. Most new large-scale projects adhere to these standards. However, many apartments under the advised limit exist and are widely offered. For semi-permanent housing such as student accommodations, it is argued that the adviced minimum does not need to be followed. Also, conversion projects of existing houses often do not follow advice. London knows many examples of apartments that are smaller and without separate bedrooms. Therefore, in this study the unit sizes under 37 m² have been regarded as *micro*.

For the study of activities, eight properties under 37 m² are analysed. Six of eight selected properties have been selected from online rental offers.[3] These examples are micro-units created out of conversions of existing houses. Two properties have been realised from recent projects. Y-Cube is a project realised by the YMCA and consists of prefabricated stackable dwellings. Pocket is a developer for inner city micro-houses meant to be sold on the private market.

1. Royal Institute of British Architects, op.cit., p.2.
2. Standards are set in gross internal area
3. All properties sourced from http://www.zoopla.co.uk/, date accessed 18 July 2016

3.3.1 Basic activities: hard barriers created by divisions

Figure 3.2 Overview of micro-unit divisions (scale 1:100)

When units are large enough for separations to be made into different rooms, the settings of alike activities can be separated as well. Rooms will typically be named after a main function. These hard barriers allow for the allotment of a clear set of typical meanings to each room. Types of activities are clustered.

The partitioning of space offers various additional possibilities. Rooms can be designed according to the different meanings attached to its corresponding activities. A bedroom clearly is a more intimate, private and solitary space than a living room. It also provides a level of practical comfort, by making it unnecessary for the dweller to change the setup of a room before changing into another activity.

In all eight selected floor plans, the kitchen is not located in a separate space, which points to an obvious connection between the activities in the kitchen and in the living room.

When there is no separate bedroom, the multifunctionality of the living room needs to expand and to provide space and settings for both social and intimate activities.

A unit size of 37 m² down to roughly 30 m² can still be divided into four different rooms. Under roughly 20 m² the number of separate rooms diminishes down to two rooms. The number of room divisions has to be at least two. In all cases, the bathroom will need to stay separate.

3.3.2 Basic activities: soft barriers created by settings

Figure 3.3 Overview of micro-unit settings (scale 1:100)

The three most basic activities of *hygiene, sleeping, cooking & dining* have been indicated in the floor plans.

When the living room and bedroom merge, the activities assigned to the room change. This merging causes the social space to be merged with the most private and intimate space of the house. When the internal space minimizes further, not only merging of functions will occur, but also overlapping of settings.

The smaller the living unit, the higher the multifunctionality of the living room. Micro-dwellers will need to become flexible in their interpretation of the dwelling space, and prepared to perform all activities in the very same space. Overlapping of settings becomes inevitable for units under the size of 20 m2. When this happens, activities will share settings. At this point, the limitation of size and its effects on the quality becomes severe.

3.4 Specific activities

The core quality of a micro-dwelling is that it offers the independency and privacy to do whatever one desires in one's own home. This ultra-private space acts as a counterweight to the daily social life in the high-paced city. It provides a break from the outside world. Meesters[1] found the three meanings of *socializing, refuge* and *leisure* to be the three most mentioned meanings of a homes in any residential environment. Solitary activities in the micro-dwelling solitary activities have a high importance, but, a micro-home also needs to offer possibilities for leisure, and social activities.

The research of Meesters shows that certain home-activities are performed more often in an urban environment. Twelve of those activities have been selected and analyzed. From each activity its meaning, its necessary sizes and the implications have been described.

Solitary activities	#1	Watching tv
	#2	Reading
	#3	Doing nothing
	#4	Eating
	#5	Working at home
	#6	Being at the computer
	#7	Playing music
	#8	Listening to music
	#9	Doing handicrafts
Social activities	#10	Entertaining guests
	#11	Eating with guests
	#12	Cooking

1. Meesters, op.cit.,

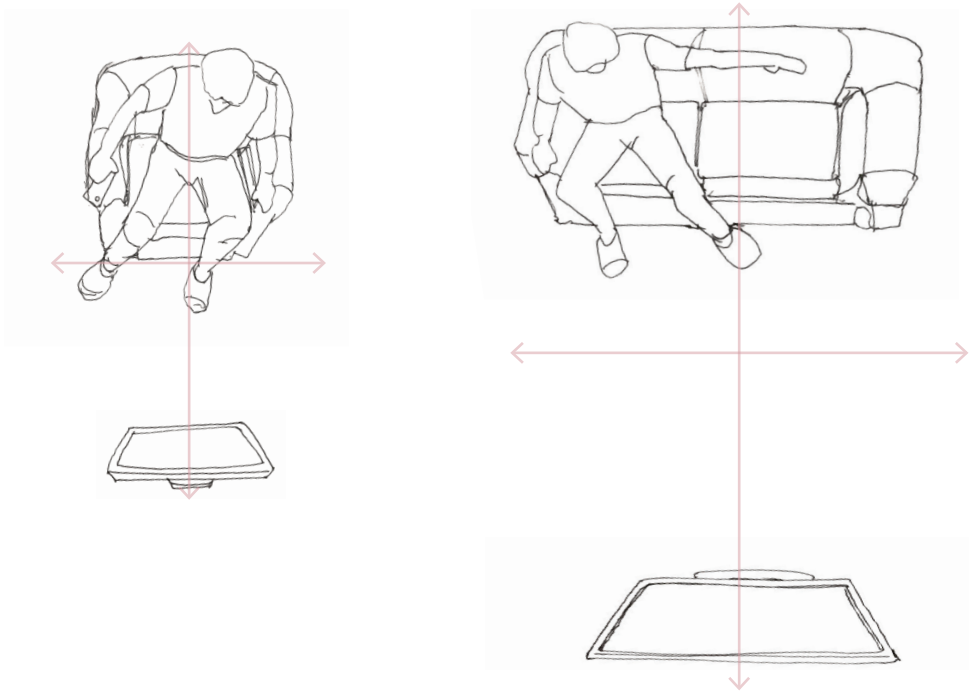
3.4.1 Watching tv

One of the main functions of dwelling is for the purpose of relaxation. *Watching tv* allows people to relax and come to rest, It makes them forget about their daily work and may serve as a source to learn new things and to stay up to date with the news. The television is a one-sided medium which offers different types of information. The information is procured in a passive way in a “tune in, or opt out”-mode. It provides leisure at a low level of engagement.

The higher the resolution of the television screen, the shorter the distance from which the screen can be optimally viewed. With technological advancements and higher resolution screens being developed, the distance to a screen can be as close as 0.5 meters. However, for watching television a relaxed sitting pose or reclined position is often desired. Therefore, watching tv is accompanied by an armchair, sofa, or another soft surface one can lay down on such as a bed, mattress, or a carpet.
For modest spaces, screen sizes go up from 20” (50 cm) and are not likely to exceed a size of 35” to 40” (90 ~ 100 cm diagonally). This implies a viewing distance between 0.5 m ~ 3 m.
A screen-mount to the wall enables a clear space underneath and cancels the need for a footstand.
Without the availability of a television, a laptop computer could also fulfil the need.

The setting in which one usually watches tv is the living room.

Figure 3.4 Watching tv size variations (scale 1:33)



2000 m x 1200 mm

3000 mm x 2000 mm

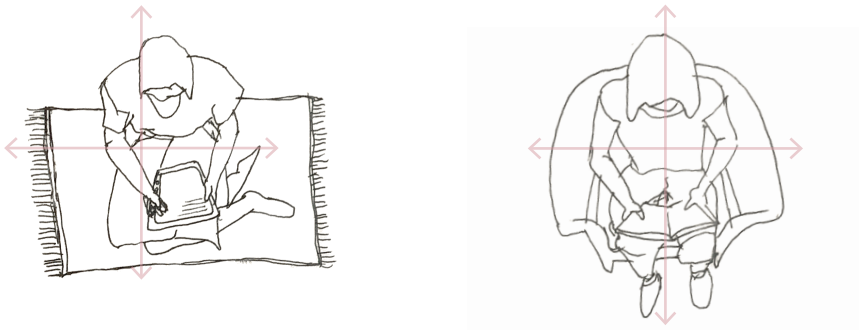
3.4.2 Reading

Just as *watching tv, reading* helps to relax and to forget about daily obligations but requires a more active choice for engagement. Making a choice for the type of literature, collecting the book or e-reader, and commencing to read while staying focused, is an exercise of self-direction. Reading can serve a broad range of interests. It contributes to the function of the dwelling as a leisureful activity that provides a feeling of refuge from daily tasks. It also helps to learn new skills and to acquire information. The information can be used to help balance daily life.

Reading requires a more or less stationary physical posture, and a predictable, comfortable environment where one can be at ease. In the case of physical books, storage space is required. Books are usually stored within easy grasping distance, in a coffee table or on a shelf. They can form part of the decoration. However, in small spaces storing things out of sight can contribute to a more comfortable and tidy living space. Storage spaces can be incorporated into the design of walls, staircases or floors as smart space solutions.

Reading can be done in various rooms, in the living room, the kitchen, bedroom or even in the bathroom. It has no fixed setting.

Figure 3.5 Reading size variations (scale 1:33)



1200 mm x 1200 mm

1400 m x 1200 mm

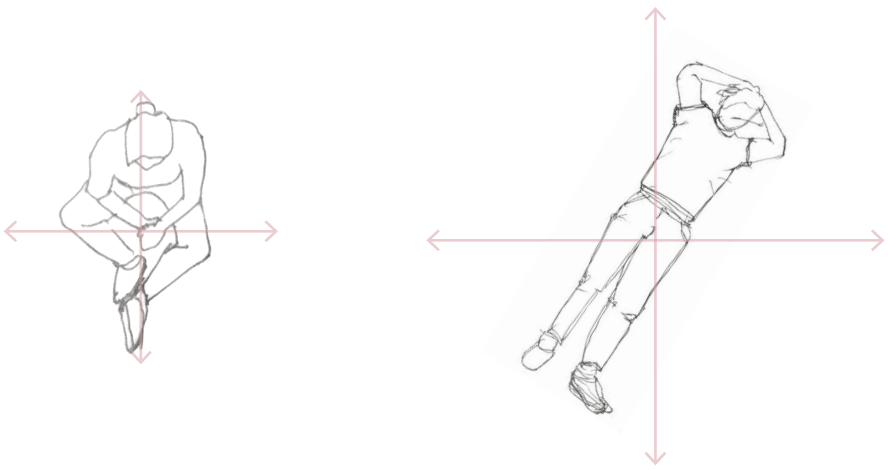
3.4.3 Doing nothing

Doing nothing seems very arbritary, or a non-action, but the activity fulfils the desire to get away from things and to forget about daily needs. The high-paced working environment of London requires much mental and physical energy. Doing nothing is a way to relax and to get away from obligations. Doing nothing means not to be working to achieve goals, to be executing a task, or actively seeking external stimuli. It creates mental space for new inspirations, new ideas, reflection and preparing oneself to new experiences.

Doing nothing is done by remaining physically static for a period of time. This can take form as reclining in a chair or chaise, or on a bed. The mere availability and control of a private space where one can rest quietly is sufficient. What can be an added quality is if there is a view through out of a window. This gives the possibility to gaze outwards during rest and contemplation. The predictability of your own house should provide enough comfort to actually proceed to do nothing.

Doing nothing can be done in various rooms, in the living room, the kitchen, bedroom or even in the bathroom. It has no fixed setting. If one feels comfortable enough to linger outside the private home, it can even be done out of the house.

Figure 3.6 Doing nothing size variations (scale 1:33)



1200 mm x 1200 mm

2000 mm x 2000 mm

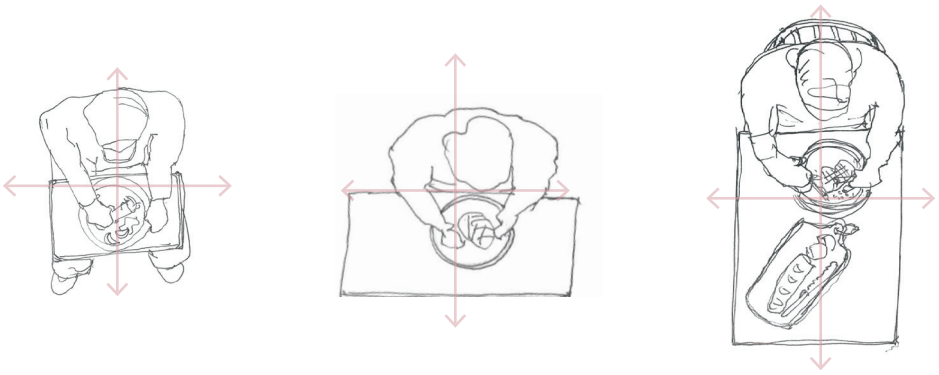
3.4.4 Eating

For this activity it is relevant to discern between *eating* alone and *eating with others*. Eating alone can occur either at home or out of home. People living in city centres connect eating to being a basic need. This means that they see eating as something one cannot do without. However, the study of Meesters shows that eating alone is separated from the activity cooking. The efficient and amenity-packed city environment provides many places out of home to find food, which makes it very common for eating to occur without the activity of cooking. Restaurants and cafes are serving meals, shops sell take-away and snacks, supermarkets provide easy to prepare meals. It is possible to go days without cooking. Eating alone in an establishment or in a public space is not uncommon.
This activity allows one to come to rest, to refuel and to experience a feeling of peace and quiet. Having your own controllable space in which this activity can be done contributes to the quality.

Because of the space limitations it is often not possible to create a separate room for eating in a micro-unit. The activity therefore transitions into the living room. This does not pose any conflicts, as the meanings behind eating and the functions of a living room do not clash. It already is common for people living in the city centre to eat in the living room more often.

The most basic space requirement for eating alone allows one having a place to sit and a surface to put the plate on. Surfaces can be foldable, retractable or otherwise temporary.

Figure 3.7 Eating size variations (scale 1:33)



1000 mm x 1000 mm

1200 mm x 1000 mm

1600 mm x 1000 mm

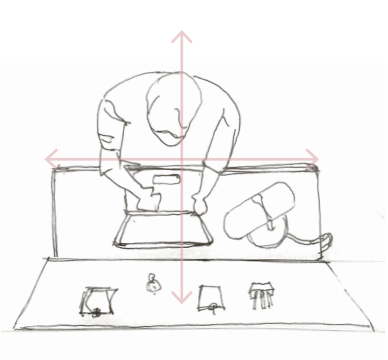
3.4.5 Working at home

Working at home and *Being at the computer* are described as two separate activities. The activities are seemingly similar, but serve two different dimensions.

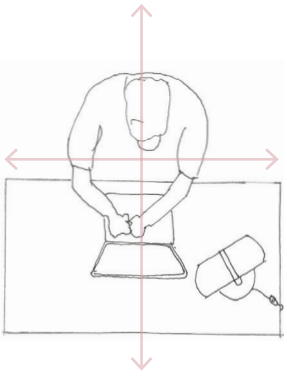
Working at home provides people with the possibility to work and to access information from a remote location. This activity is valued because it promotes ways one can self-direct their time and energy. This activity often consists of working with the computer because of the predominantly knowledge and service-based work in the metropolitan environment. It saves time, enables to do what you desire, improves focus and concentration, and therefore is a very important activity in city homes. For people running their own company, it significantly opens up possibilities regarding working location and daily schedules. Working at home is seen as welcome proxies to working at the physical offices, institutions or higher educations, which still are nearby.
Aside from its benefits, working at home also poses a conflict with the meanings of the home. It interferes with the place where one can break away and forget about work. Especially in the city, people need the possibility to work at home. A micro-house is likely to not have enough space for a separate study. In most cases, the place to work at home transitions into the living room.

To work at home, a surface is needed to hold a computer and working documents. Because of the conflicting meanings between working and relaxing, it would improve the experience of the micro-unit if these functions can be performed in separated spaces. A solution is to have a retractable or foldable working desk, which can be stored away when it is not needed.
Working at home is done because of the solitary properties. However, it can become lonely to work alone for longer periods of time. In the possibility of clusterized micro-units, the provision of a communal working space can offer some minimal socialization and a desired separation of the working place from one's most private living space.

Figure 3.8 Working at home size variations (scale 1:33)



1200 mm x 1200 mm



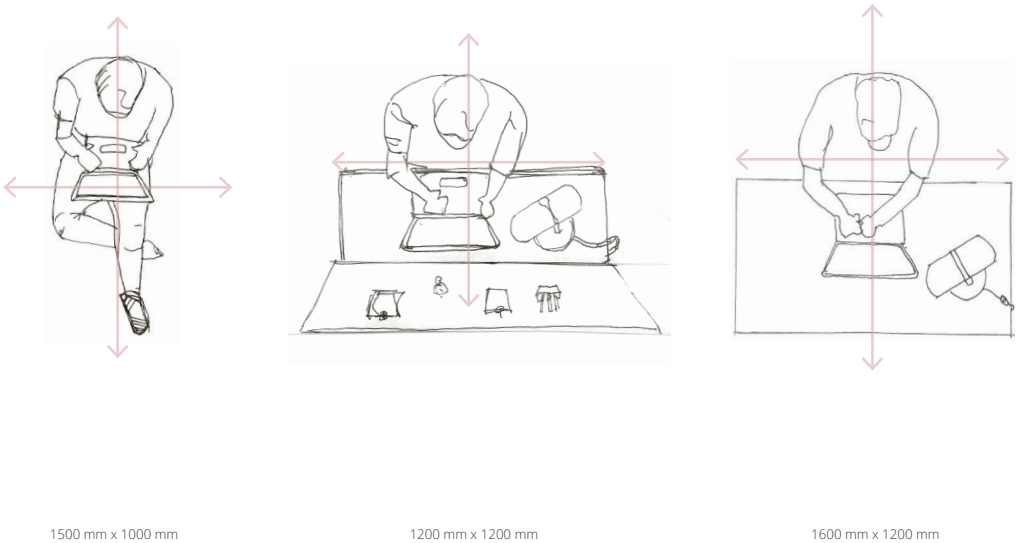
1600 mm x 1200 mm

3.4.6 Being at the computer

Being at the computer opens up many ways for leisure and socialization. The internet can be used to stay in touch with family and friends, to stay up to date with news and developments, or to access media entertainment. One can direct their communication with others, while physically remaining in the private space of the house. Access to modern communications mitigates the feelings of isolation concerned with living removed from faraway family and friends. By the information obtained through the computer, one can direct and plan its own movements, and learn about events in the surroundings, and plan itineraries. Time spent at the computer helps to break from the obligations from work or study.

The activity is very flexible. The computer can be used on the lap, on the sofa, in an armchair or in many other places and positions. It is not as static as using the computer for work purposes, and does not conflict with the main meaning of house which is to provide relaxation. Therefore, this activity can be done in the living room.

Figure 3.9 Being at the computer size variations (scale 1:33)



1500 mm x 1000 mm

1200 mm x 1200 mm

1600 mm x 1200 mm

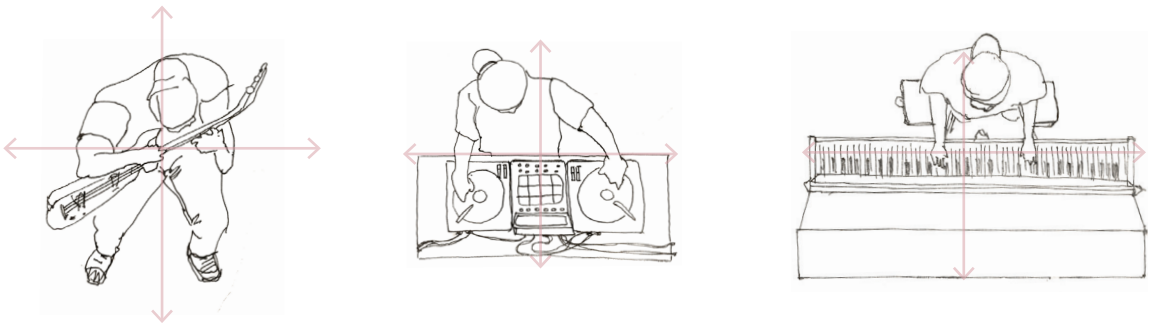
3.4.7 Playing music

Playing an instrument and making music have many benefits. It is an active form of leisure and provides the possibility to acquire and to improve personal skills. A reason to play music in one's own personal living space is to ensure that there is privacy during the exercise, while at the same time having an enclosed space helps not to disturb neighbours. Playing music also aids in training concentration spans, relieving stress, fostering creativity, and personal expression. These are congruent with the lifestyle in which self-direction is an important value.

When one lives with other people, house rules or the feeling of surveillance may impede one to play music at home. Having your own space helps. Not all instruments may be possible to be played at home because of the size or the sound. Access to studio spaces in the proximity of the house, can make up for space limitations. Other options are the availability or the possibility to play music in public spaces. When micro-units are grouped together, access to communal studios can be a solution.

The activity of playing music occurs in the living room.

Figure 3.10 Playing music size variations (scale 1:33)



1400 mm x 1400 mm

10000 mm x 1200 mm

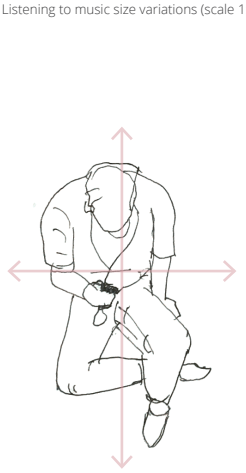
1000 mm x 1500 mm

3.4.8 Listening to music

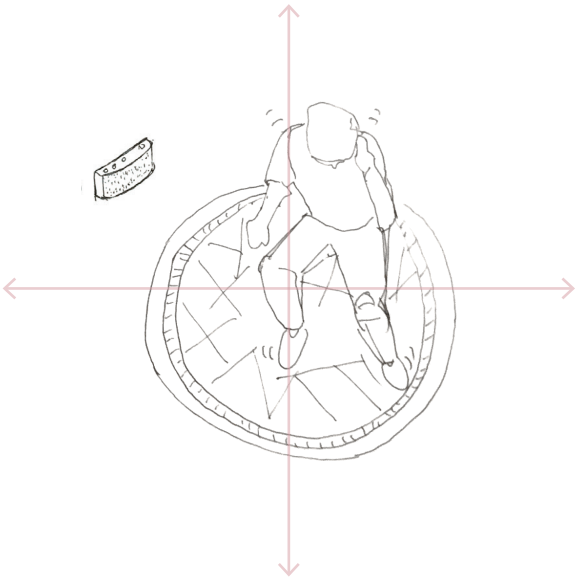
Listening to music is an easy way to experience leisure. It elevates the mood, reduces stress, and helps to forget about work. It can be combined with other activities such as doing nothing, cooking or cleaning. It can also be done during social activities when other people are around.
Listening to music can also include listening to the sounds in the environment which may help to relieve feelings of isolation. Hearing other people in the vicinity, for example a neighbour coming home, city traffic sounds or people walking by, may provide a welcome sound. At other times, it may be desired to have these uncontrolled noises blocked from the domestic space entirely, in order for one to fully control which sounds can and cannot be heard. Especially in the case of small living spaces, the pouring in of external sounds may feel like a sonic invasion of the private space.

Listening to music can be done in all spaces.

Figure 3.11 Listening to music size variations (scale 1:33)



1500 mm x 1000 mm



2500 mm x 2500 mm

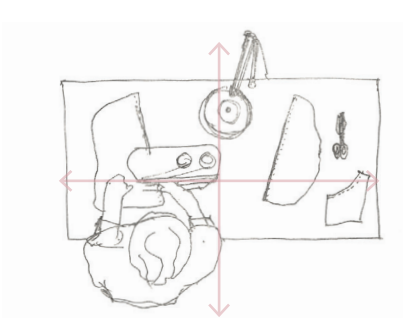
3.4.9 Doing handicrafts

Doing handicrafts is related to the activity relaxing. There are different ways one does handicrafts. It can be small handicrafts and need a surface for working and ample storage space. It can also require more space, a free space horizontally and vertically, or the possibility to install tools and equipment to loadbearing structures. During this activity, the space can become dirty. It can be desired to have a space that can be left as is, so that on continuation the work can be picked up where it has been left off. In the city centre, gardening is not seen as a need but as a handicraft. The study of Meesters shows that people in the city with access to a garden have usually consciously chosen to have access to this feature.

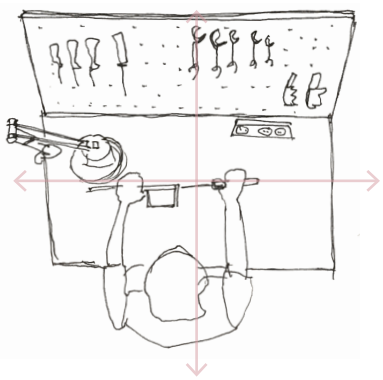
More than often, doing handicrafts will not be comfortable when living space is already scarce. The presence of tools and materials or mess from working counteracts a clean and tidy living space. A flexible division within the living space, and storage options can make a workplace possible within a micro-unit. This can provide the space but does still require to change and clean the space, when another activity commences.

When micro-housing is developed with communal spaces, atelier spaces can provide added value.

Figure 3.12 Doing handicrafts size variations (scale 1:33)



1200 mm x 1400 mm



1600 mm x 1600 mm

3.4.10 Entertaining guests

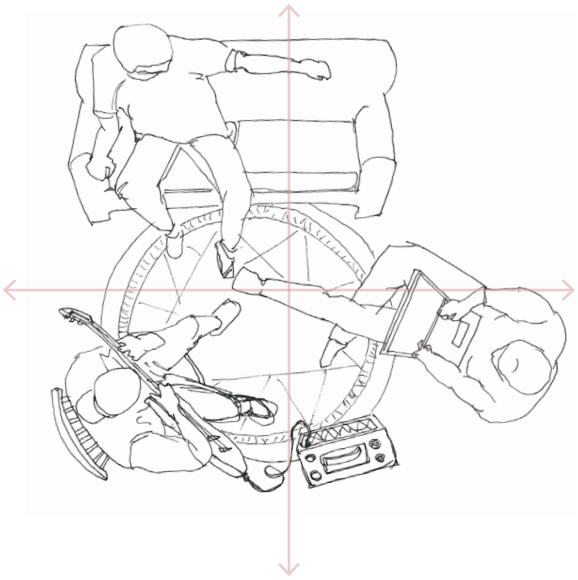
Spending time with friends and family in one's own space is beneficial for social interaction and a good atmosphere. The activity combines meanings of leisure, socializing and refuge. Meesters' study shows that the dwelling traditionally is understood as a place for relationships with friends and family, also in the city centre setting. However, this activity shows one of the crucial issues with micro-units. The lack of space makes it less probable to provide a comfortable space for inviting guests over.

What is unique to the city centre, is that dwellers when dwellers have access to private outdoor space it is foremost used as a social space. When weather conditions allow, the living room and private outdoor space are exchanged or form extensions to its activities. Spending time in private outdoor space rewards city dwellers with a feeling of freedom and space, which is unique and cannot be found in the living room-setting.

For people who see the micro-unit primarily as a temporary living solution, much of the socialization may occur outside at social meeting points such as a bar or cafe. However, it is important to be aware of the limits when a small living space is impeding the development of social contacts.

The setting to entertain guests is the living room.

Figure 3.13 Entertaining guests (scale 1:33)



2500 mm x 2500 mm

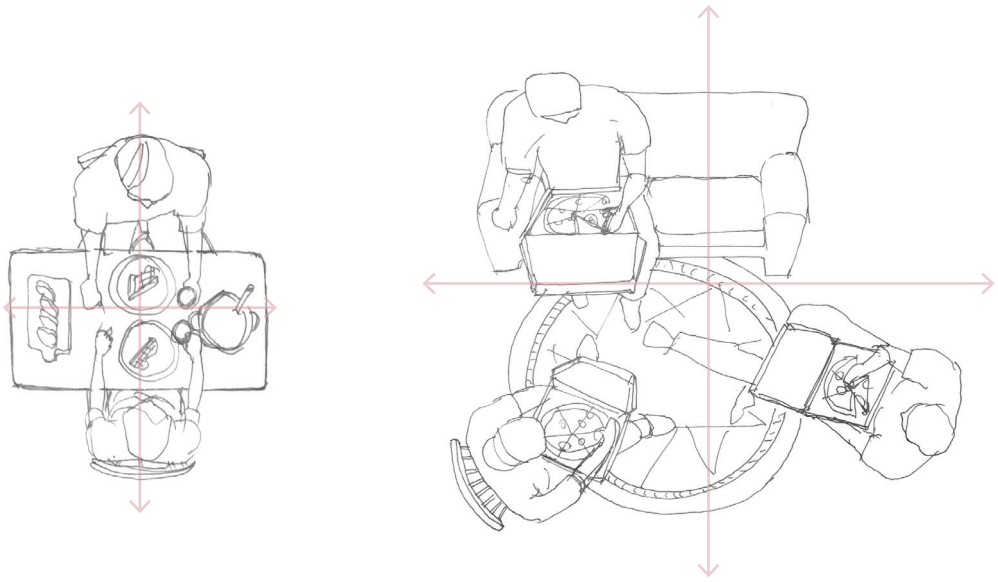
3.4.11 Eating with guests

Eating and cooking are connected when multiple people are involved in the activities. Cooking and eating together fosters goodwill and kindness, and is an activity that is part of broader socialization processes. This specific activity connects the kitchen and the living room together. In the case of micro-units, the space limitations leads to both settings becoming to some extent interchangeable.

Eating with guests, when weather allows, can also move from the living room space into the private outdoor space. Personal outdoor space serves mostly as a 'nice weather'-living room. Because of the strong dependence on weather suitability, a private outdoor space may be discarded as inefficient and unsuitable during design decisions, in spite of the added quality.

Dining surfaces that can be extended and retracted, or stored away when unneeded, may provide the possibilities for inviting guests over, when the possibility arises. Interior design and furniture need to provide the flexibility of the living room to be transformed into a space where one can invites guests over for dinner.

Figure 3.14 Eating with guests size variations (scale 1:33)



1800 mm x 1000 mm

2500 mm x 2500 mm

3.4.12 Cooking

As mentioned in the last activity, cooking in the city centre has a strong social character and is linked to eating with guests. It affords social interaction with family and friends, which helps to break from work and to show kindness to others, an act that helps to foster relationships.

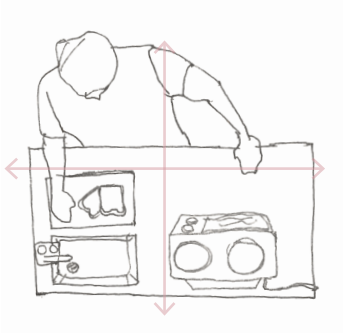
Cooking asks for a functional space and cooking appliances. Because it is directly connected to eating, it implies that the space required is for the combined activity of cooking and eating. Home appliances and tools will most commonly not be part of one's belongings that are moved along and therefore are expected to be present upon moving in.

Leisure activities such as doing handicrafts, playing music and other hobbies can alternatively be procured out of the home. But, the space limitations affecting the functional spaces needed for cooking and inviting guests over for dinner in one's private space, make this a troubled activity for the micro-house. The difference between micro-units and conventional housing can be strongly felt. This activity illustrates how the micro-unit can form a potential barrier for socializing with others.

A full kitchen needs not to be present. Appliances such as a microwave or oven are handy to be used to heat or reheat easy meals, when one is not planning to cook large meals at home. Standard kitchen appliances can be of smaller size to accustom to the micro-unit. A conventional stove may be replaced by storeable electric cooking plates. However, a full-sized kitchen can be regarded as an added quality to the dwelling.

When micro-units have access to collective spaces, a full-sized kitchen which can be rented for occasions may form a solution. Cooking and eating with others combine the living room and the kitchen into one space. It can often be seen in micro-housing, that there is no separate kitchen.

Figure 3.15 Cooking size variations (scale 1:33)



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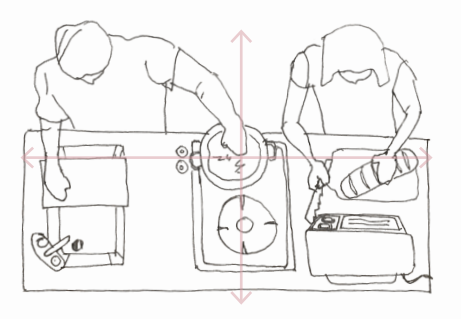

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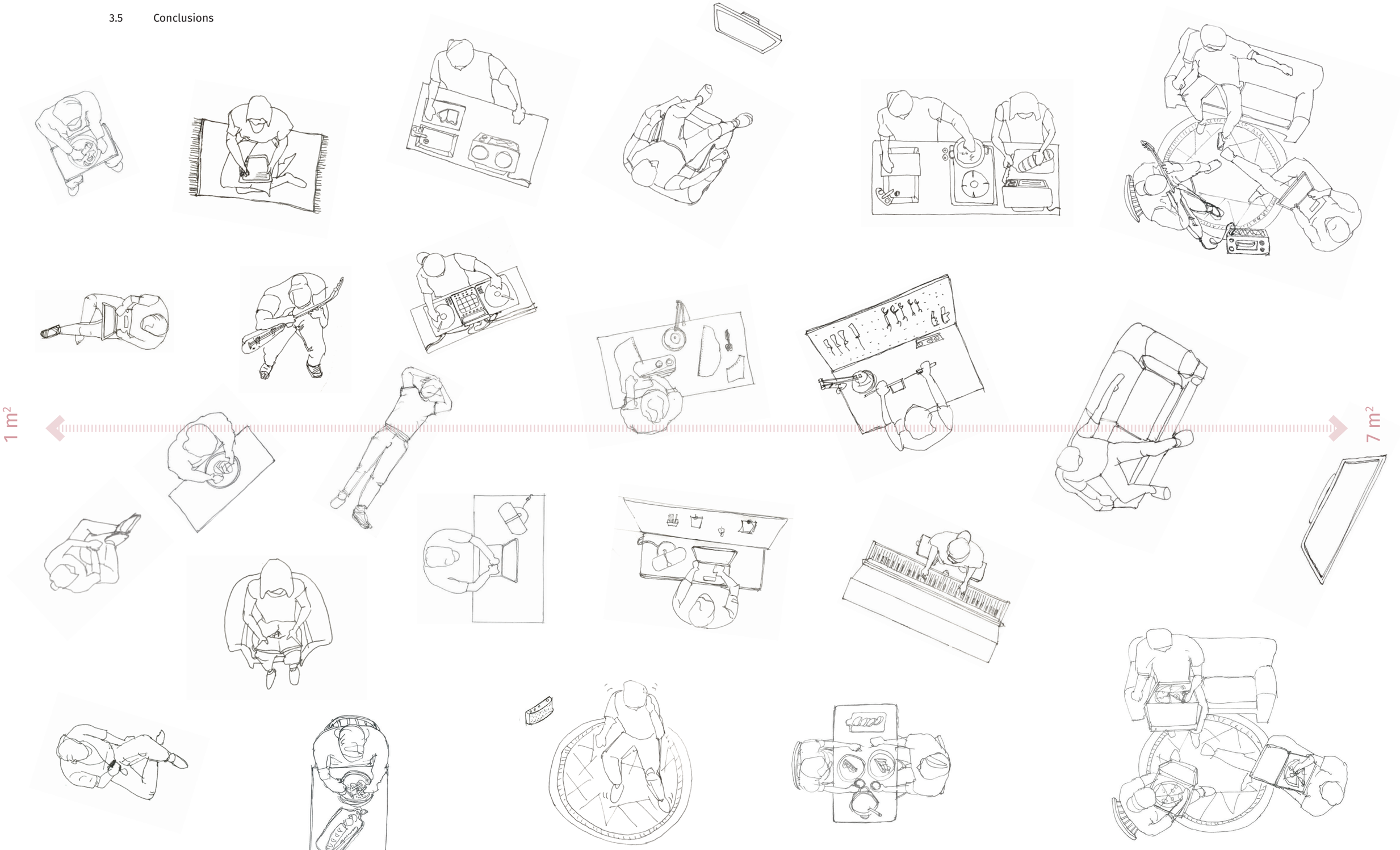

Figure 3.16 Activities arranged by size (scale 1:33)

This chapter aimed to understand whether micro-units could still provide enough space for crucial activities. The analysis provided an understanding of the implications of designing micro-units in regards to the dweller's experience and enjoyment of the home.

London's micro-units have been specified as self-contained units with a total internal size under 37 m^2. Activities taking place in spatially limited dwellings encounter several problems. Firstly, the possibility to link a set atmosphere and meaning to a room becomes limited when the number of rooms diminishes. Secondly, as the internal space decreases, activity settings will start to overlap. Living in a micro-unit then demands an 'active' and flexible interpretation of dwelling, because one has to change the setup before one can change from one activity to another. Living alone makes this possible, however if fluid transitions between the different settings is impossible, the level of comfort could be impeded.

The study of the specific activities has shown that several activities become complicated:

Working at home
Having a workspace at home is specifically valuable to city dwellers. Ideally, the workspace is set as a separate space, otherwise it clashes with the meaning of the living room, which is to provide rest and a break from the outside world. A certain predictability and control of the space is of importance.

Doing handicrafts, playing music
These spaces require an amount of space ranging from moderate to high, and often a provision of instruments and tools, possibly technical requirements for sound insulation, and an atmosphere of a workspace. A workspace should be allowed to become dirty during the process of working. A studio space for playing music should be insulated well enough. However, these activities range from the solitary to social. A social dimension to the activity makes it possible to procure space outside of the private unit.

Entertaining guests, eating with guests, cooking
These three activities are strongly mutually related and have a strong social aspect. Meeting with others in one's home is a form of goodwill and serves the human need to socialize with others. These activities become troubled when a space is too small to comfortably host guests. Procuring the setting outside of the private unit is possible, if the activity can be exercised privately.

Most activities are moving into the living room, which then transforms into a multifunctional room and the heart of the micro-dwelling. There are conflicts arising due to this transformation. Social activities with other people are most compromised. It must be kept in mind that the most important meaning a dwelling serves, is to provide a break from one's daily obligations and a place to rest. Making a room multifunctional is not enough, the design also needs to enable the dweller to switch between different interpretations or atmospheres of the spaces, which will benefit the quality of the dwelling experience. There are possibilities to explore with providing additional spaces in shared or public spaces, on condition that these can be used privately.

4 Conclusions

The first chapter aimed to answer the question: "*How do compact living and the city relate to eachother, in the historical and current state?*"
The most compact dwellings in the city have always been lived in mostly by the working classes. The proximity between work and residence has always been an important condition. It is of importance to understand that dwellings not only consist of the housing itself, but also of the residential area and the social fabric that connect the lives of the dwellers. Nowadays small and one-person households make up a third of all inner London's households. The city has become a functional and experiential social centre, providing leisure and relaxation. History shows that communality has gradually become a lesser priority in the design of compact housing. The dwelling has increasingly become more independent as a living unit through the addition of the private kitchen, bathroom and private circulation space. Although household sizes have been declining, the sizes of the different functions have not become much smaller. Size obviously is a main focus, but the most significant change is the division of the functions over different domains. Most notable is the shift from several functions from the public and the communal space into the private domain.

The second chapter aimed to answer the question: *"Which meanings and values are attached to micro living, and how do they influence one's willingness to live in a micro-home?*"
The future is likely to require more housing for people who live alone. The transition into solo living often accompanies a great change in one's personal life, during which one has to adjust to a new life phase. A balance has to be recovered between work and personal life, between being with others and being alone. Living alone does not mean that social activities within the dwelling have become unnecessary. The home and its environment need to ensure the fostering of social connections, and within this connection a micro-home should still offer the possibility to lift social contacts to intimate levels. Furthermore, modern cyclical lifestyles requires that transitioning from one living situation into the other needs to be supported and not be impeded by a lack of private space. The home is a place for withdrawal, in contrast to the city environment which provides a high-paced, functional and engaging social space. Considering the great interdependence of the home and the city, the micro-home and the neighbourhood need to align together to create a living environment in which daily activities can be balanced. Offering a multiplicity of private places in the public space is an important term on which micro-housing can form a satisfying compromise. By taking into account the social dimension next to the development of space-conscious design, architects can make enjoyable and socially sustainable micro-dwellings.

The third chapter aimed to understand *"Can micro-unit sizes still provide enough space for crucial activities?"*
Most activities are moving into the living room, which then transforms into a multifunctional room and the heart of the micro-dwelling. There are conflicts arising due to this transformation. Social activities and solitary activities that require a high level of control over the environment are jeopardized the most. It must be kept in mind that the most important meaning a dwelling serves, is to provide a break from one's daily obligations and a place to rest. Making a room multifunctional is not enough, the design also needs to enable the dweller to switch between different interpretations or atmospheres of the spaces, which will benefit the quality of the dwelling experience. There are possibilities to explore with providing additional spaces in shared or public spaces, on condition that these can be used privately.

As an overall conclusion and answer to the main question *"How does the micro-dwelling become a sustainable urban housing typology?"*:
Micro-living provides a way to live in an individual way in a private home in urban and metropolitan areas where the affordability of housing is challenged. Social activities within these private quarters are of importance, however become most at issue due to space constraints. For micro-dwelling to become a sustainable housing style, space for pressurized activities should still be procured close to home and available for residents to be used in their personal privacy.

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