The sociability of the street interface - revisiting West Village, Manhattan

Garyfalia Palaiologou, Laura Vaughan
The Bartlett School of Graduate Studies, University College London, 132 Hampstead Road, London, NW1 2BX. E-mail: g.palaiologou@ucl.ac.uk, l.vaughan@ucl.ac.uk

Abstract. *This paper examines the micromorphology of street interfaces, considering how street life is shaped by the emergent pattern of built form and spatial layout. In an effort to reassess Jane Jacobs's conception of liveability, the study uses urban form and space syntax methods to record the changing micro socio-spatial texture of West Village, Manhattan. The paper discusses the way in which pedestrian experience varies and changes as the characteristics of street facades change: from the postmodern solid block front to an alignment of short row house facades or from a wholly domestic setting, to a street lined with shops and businesses. In order to understand the urban streetscape as a place of social activity, the study examines the built volume in terms of building-street connections aggregated within a block frontage. The resulting pattern is analysed to consider how morphological properties might give rise to street interaction. The study also maps the mixture of buildings by age and relates this pattern to the spatial distribution of non-domestic land uses, the street network configuration and associated urban interfaces. Conclusions suggest morphological features of the built form which are more likely to generate and support a vibrant street-life over time.*

Key Words: Micromorphology, urban interfaces, Jacobs, West Village, row house.

Introduction

The field of urban morphology has fundamentally contributed in a morphological reading of the built environment identifying the basic components of urban form: the building, the plot and the street (Conzen, 1960; Caniggia and Maffei, 1979; Korpf, 1996; Çalişkan and Marshall, 2011). One of the main inquiries of morphological studies refers to the organisational rules of the way building units are aggregated to consist urban space. Space syntax studies on the other hand, aim to shed light on the social output of spatial patterns, to interpret 'the social logic of space' (Hillier and Hanson, 1984). Combining principles and methodologies from both fields, this paper aims to examine the way the urban components work together (the building, the plot and the street) to configure varying spatial and in turn social situations in the street domain. The study focuses on the role of building-street connections in creating sociable places.

In one of the earliest publications of the subject, *The Social Logic of Space*, building-street interfaces are seen to shape social encounter. (p.143). Subsequent work by Julienne Hanson's (2000, 2009) identifies the potential role of building morphology, as an extension of urban interfaces[12], in creating sociable places. This street scale focus, lies within the wider context of the way in which cities are theorised in the field of space syntax, where the spatial and physical properties of urban space are seen as generators of movement patterns, which in turn shape patterns of potential co-presence and encounter, creating the 'virtual community' (Hillier 1989, p.13). The author suggests that space distributes the physical presence of users and thus organises the potential patterns of co-presence and encounter. Co-presence and encounters are thus two basic preconditions for social events to be generated within space. The aim of this

[12] In Hanson's words regarding non-lively streets: '… the whole story is one of a ruptured interface between dwelling and street' (2000, p.113). This relates to Jacobs's observations regarding the importance of 'eyes on the streets', namely of a building-street interface that allows for interaction between the users of the building and the street occupiers or moving pedestrians.

study is to build on this work by looking at the way varying types of interface bring about varying potentials for interaction. The analysis here focuses on a detailed analysis of how buildings aggregate along block faces, testing the hypothesis that building-street interface corresponds to the street's wider connections within the city's street network.

The discussion in this paper is based on mapped and quantitative data collected for the area of West Village in Manhattan, New York. Acknowledging academic critiques that seek for an evidence-based investigation regarding the validity of some of the mostly cited, yet empirical, urban design theories (extensively discussed in Marshall, 2012), this study revisits West Village to take a step towards reassessing Jane Jacobs's conception of *liveability* using quantitative data and a morphologically informed approach.

Furthermore, leaving aside theoretical motives, West Village is an interesting case in its own right due to its particular built form properties. Restrained by the physical limits of a fixed geographical area, urbanisation processes in the Manhattan Island have been continuously challenging the building volume, building densities and the potentials for a vertical expansion of the city. However, West Village stands out as a special case within the Manhattan metropolis. Since 1969, Historic District Designations have protected the historic building stock of West Village. The surviving row houses in the Village are not just reminiscent of the neighbourhood's picturesque qualities; instead they are living carriers of the past and the present. Being used, altered and re-used over time to house shifting densities, uses and lifestyles, the historic built form works as an incubator for street liveability. At the same time, the non-historic parts of the area, lying at the urban blocks of the west waterfront, have faced far more extensive transformations which included block-scale demolitions and redevelopments as well as gentrification projects. As a result, the present state of the Village streetscape brings together varying morphological urban settings; from row houses and tenements, to post-modern blocks and former industrial buildings. In this respect, West Village consists a rather interesting case study where we can explore and compare the levels of social activity that varying morphological settings appear to support and develop over time.

In what follows, the discussion introduces briefly the role of citywide urban forces in shaping the spatial and physical context in West Village historically. Then, the properties of the historic built form in terms of the building-street interface are described. Following this, the current Village streetscape is analysed in terms of the social encounters organised by the built form. In particular, the study looks at the properties of the street interface in historic and non-historic parts of the case study area. Finally, the paper discusses the role of the street network in configuring varying street profiles.

West Village

With its street gridiron dating back to 1790 (almost 20 years earlier than the Commissioners' Plan of 1807-11), West Village is considered one of the oldest parts of Manhattan. Located in proximity to the financial district and downtown city centre, the Village was challenged by the pressures of urbanisation as early as 1830s (Ware, 1965, p.9). In its early development the area was building up a profile as a desirable neighbourhood for the wealthier parts of the population, which soon attracted an extensive spread of row housing. At the same time the piers and transport depots were forming the industrial west waterfront. This strong functional split – and correspondingly, morphological split in terms of the built form – has since played a definitive role in the history and development of these two contrasting districts: the Village heart, later to become part of the Historic District Designation, and the west waterfront which has faced large scale demolitions and redevelopments.

From the earliest period onwards, the varying socio-economic forces of the spreading urbanity started to shape the diverse architectural profiles of the neighbourhood (Dolkart, 2009:115-116). Figure 1 summarises the contrasting urban forces which were challenging West Village at the turn of twentieth century. Most of the row houses were gradually converting into

multiple-occupancy, if managing to escape demolition by giving way to tenements, apartment buildings and small industrial units[13]. Building development varied in order to accommodate the needs of shifting populations, functions and economic standards. The row houses (both new and existing) were converted into work-live units[14] or apartments for single living. Tenement building spread around the area to house manual labourers, creating challenging densities, high lot coverage and consequently leading to poor living conditions. High-rise apartment buildings with commercial ground floors filled up the north-south citywide street alignments, such as Sixth and Seventh Avenues. And finally, warehouses and small manufacturing units to support industrial uses were constructed on the western Village blocks close to the piers. The profile of the neighbourhood changed even further with the extension of Seventh Avenue in 1914 and Sixth in 1918. These street extensions increased the area's centrality within the Manhattan grid and turned the Village into more of a passage, rather than just a self-contained area. Figure 2 shows space syntax analysis of the Manhattan street network before and after the street extensions (darkest colours represent higher values in accessibility and permeability[15]), illustrating the sudden increase in the area's significance within the city network. During the second half of the twentieth century, the physical unity of the neighbourhood underwent dramatic transformations, some of which had a significant impact on the social image of the streets. An example of such redevelopment was the demolition of all buildings in the block bounded by Barrow, Morton and Washington Streets to be replaced with post-modern housing (construction started in 1969 and completed in 1974).

Notwithstanding all these pressures, a significant number of row houses survived in the area[16]. Protected by the Historic District Designation in 1969, the row houses in the heart of the village are today intermingled with younger buildings, creating vibrant street qualities of functional and morphological mixture. Mapping the features of the West Village streetscape in the present times (c.2011-2013) and comparing the historic and non-historic parts, the following analytical parts of the paper aims to address properties of the built form that have a potential impact on street liveability. The role of the street network in shaping a street's social profile is also discussed.

The historic building-street interface

Before looking at the urban streetscape in the Village as a whole, it is important to look solely at the historic building typologies that this study takes into account and to discuss some of their morphological properties. More particularly, the study considers the row house and tenement building types (Figure 3). Descendants of the row house typology (Davis, 2006:151-153), tenement buildings can be divided into two further typological groups: the 'old-law' tenements (including the 'railroad' and 'dumb-bell' types) and the 'new-law tenements' (Plunz, 1990:13, 49). Old-law tenements are five- to six-stories high and cover up to 90 percent of a typical 25-by-100-foot Manhattan lot (coverage reduced to 80 percent after the Tenement House Act of 1879). Living conditions in these buildings were characterised by severe lack of light and ventilation. Slightly improved - to match standard plans approved by the Tenement House Act of 1901 - the new-law tenements are taller buildings with a façade length almost twice the size

[13] For instance, the construction of Union Terminal Freight Station and of U.S. Appraises Stores (c.1950-52) at the south-west blocks of the Village led altogether to around 140 building demolitions.
[14] Work-live units refer to artists' houses and studios as well as to commercial-residential buildings.
[15] Space syntax analysis calculated in Depthmap software (Turner, 2001). The measure of combined integration and choice at different scales of analysis represents the potential for a given street section to be used for movement through and around the area within that given distance.
[16] For a discussion regarding the spatial and social factors that enabled the continuity of the historic row houses in West Village see the discussion in a previous ISUF conference paper: Palaiologou and Vaughan, 2012.

of row houses and old-law tenements. New-law tenements usually cover around 70 percent of a 40- or 50-by-100-foot lot (*ibid*., p.47-49).

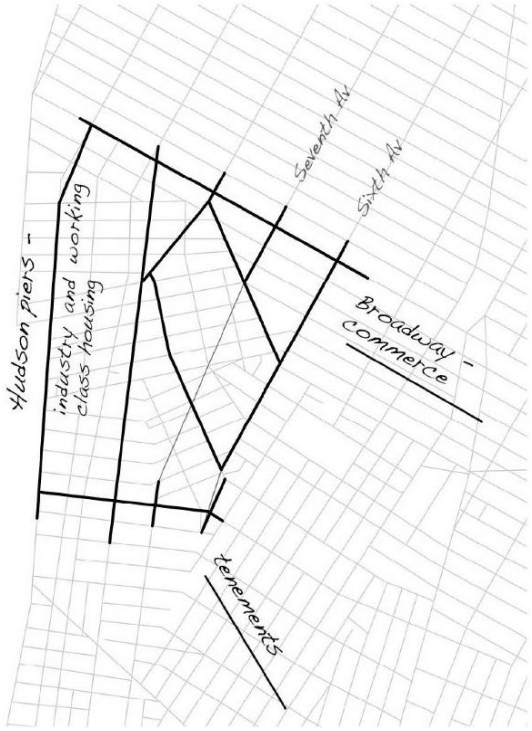

Figure 1. West Village - urban challenges at the turn of twentieth century.

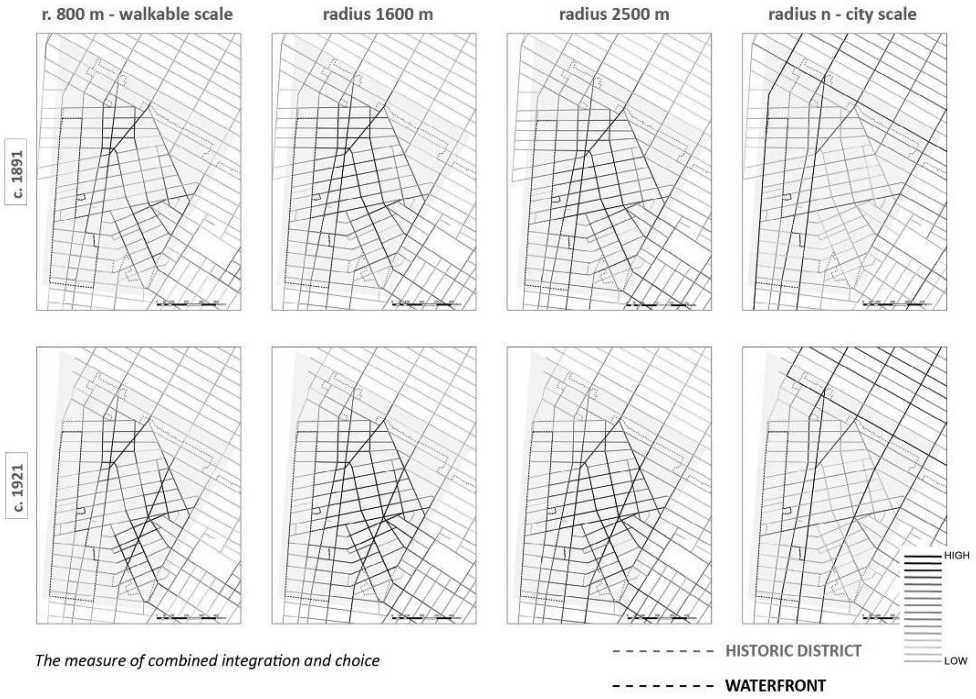

Figure 2. West Village - analysis of the street network properties before (c.1891) and after (c.1921) the extension of Sixth and Seventh Avenues.

Besides row houses and tenements, there are other historic buildings as well with long presence in West Village. Such buildings are small industrial units, factories, schools etc. However, the primary focus of this study is the façade organisation of row houses, and consequently, their building-street interface. For this purpose, the analysis here distinguishes between the row house and tenement typologies for two main reasons: on the one hand, these building types present regularities and typological consistencies in terms of the façade treatment. And on the other hand, row houses – and tenements as their descendants – represent the most common residential building type of the Commissioners' historic Manhattan.

Figure 4 illustrates a survey of the historic built form presence in West Village. The map shows the row houses and tenement buildings still existing in c.2013. The buildings' colour range (dark-oldest, light-youngest) represents four main typological groups: the shell of a single-family row house (black); the railroad and dumb-bell[17] types of old-law tenements (dark grey); the new-law tenements (grey); and finally, the remaining buildings which do not belong to a particular building type and are mostly later developments. It is clear from the map that the Historic District Designations capture the majority of the historic rows and tenements within the study area.

More particularly regarding the façade organisation (Figure 3), in the early row houses the building frontage is characterised by a trilateral vertical alignment of casements. The domestic door entrance lies at either side and is usually accessed via the *stoop* (stepped entrances or porches). In the cases of an additional function occupying the ground floor – usually commercial – the non-domestic entrance is once again aligned under either the central vertical zone of windows or to one side. Accordingly, alignment with windows is also retained in the case of an additional separate domestic entrance when the single-family row house is turned into multi-dwellings. There are also examples where the second domestic entrance is placed underneath the elevated stoop of the main old entrance (like in the more grandiose Italianate style row houses). Due to the small scale of these buildings, façades present in most cases a maximum of two thresholds. The railroad and dumb-bell façades (old-law tenements) which are slightly bigger in scale (both for façade length and height) are organised in four columns of windows, with the main building entrance located in the middle of the façade length. Often, this building type presents additional commercial uses in the ground floor which are placed at the sides of the central domestic entrance. Finally, the new-law tenement typology, covering larger plots, introduces a more solid ground floor, with fewer openings to the street. In other words, the older narrower building types are found to present a denser pattern of building-street connections squeezing as many thresholds as possible into the façade.

Figure 3. West Village - row house, old- and new-law tenements.

[17] Variations of the old-law tenement building type; for details see Plunz, 1990:13, 49.

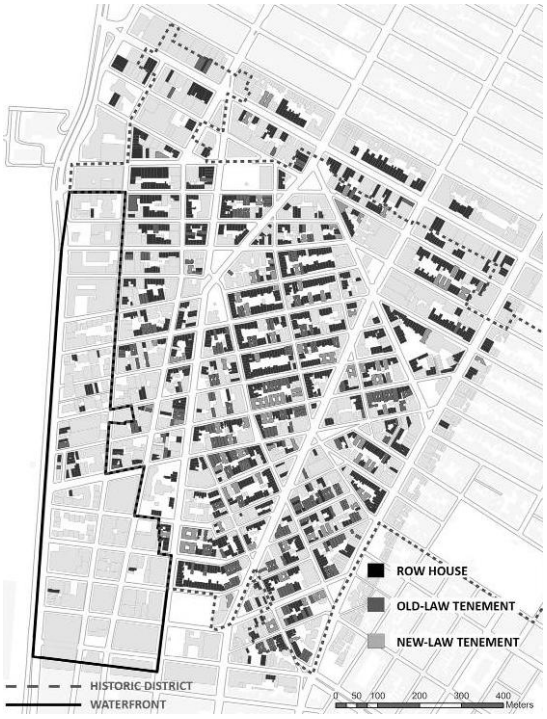

Figure 4. West Village - row houses, old- and new-law tenements (c.2013).

The record of building thresholds collected from a survey of West Village conducted by the first author in 2011 confirms this last observation regarding façade length and density of thresholds (see Table 1). In order to form a general overview of the *density of thresholds* in the area of West Village for each one of these three historic building types as well as for the non-historic buildings, we can look at the ratio of the *total façade length* for each type to the *total number of building entrances* in each case. Based on the features of row houses in West Village (1325 row house units, 1469 sides facing streets), results show that in a streetscape completely built up with row houses a pedestrian would anticipate passing a building threshold approximately every 3.8 meters. A similar spacing between thresholds is expected in a hypothetical route constructed alongside old-law tenements (245 units were recorded and 272 façades), where a door would be expected every 4.1 meters. This slight deviation between the two building types is explained by the slight increase in plot size for the latter. A new-law tenement streetscape would be looser in terms of building-street connections, with doors lining up every 4.5 meters. In general, these historic building types commonly form a rather dense building-street interface. Summarising the previous results, the estimated frequency of thresholds for the historic built form is a doorway every 4 meters on average. In contrast, the analysis shows that the remaining buildings in West Village are likely to present an entrance every 10 meters on average. Considering results comparatively, we understand that the building-street interface of row houses and tenements supports more than twice the potential for building-street interaction than the rest of the buildings in the area.

The key observation from this analysis does not refer to the building types *per se*, rather to their morphological properties. More particularly, what is important to understand here is that the narrower the façade (and in effect the plot width), the higher the potential for a denser building-street interface is observed. The mean façade length for row houses and tenements in West Village is calculated at 8.4 meters. On the other hand, the remaining building façades are twice as longer with their mean length reaching as high as 22.4 meters.

Table 1. Row houses, old- and new-law tenements; door encounter rate (c.2013).

	Buildings	Doors	Tot. Façade Length (m)	Door encounter rate (m)
Row house	1324	2477	9523	3.8
Old-law tenement	244	523	2139	4.1
New-law tenement	101	326	1463	4.5
Historic	1669	3326	13125	3.9
Non-historic	982	2156	21982	10.2

The image of the streets

The aforementioned analysis is based on a theoretically evenly constituted urban streetscape; namely, it assumes an equal number of door entrances across all urban block-fronts in the case study area. Although this analysis provides an idea regarding the impact of morphological properties on the street interface, it does not capture the fine-grained complexity and morphological diversity of real urban settings. In order to configure a better representation of reality, the following section studies the built form properties at the scale of street segments. This time, analysis considers each segment side separately in order to study in greater detail the properties of the constituted *street interface*. Lying behind this is the proposition that whilst the configuration street network itself shapes – all things being equal – the varying distribution of people around an area, the building-street connections organise potential interactions between inside/outside (private/public) spaces. The study looks firstly at the *frequency*, and secondly, at the *mixture* in terms of morphology of building thresholds and the function each building contains. The study then also considers these results alongside straightforward space syntax measures of potential flows (as will be shown in section 5, below).

The survey record of building thresholds is illustrated in Figure 5. The map shows building entrances in the area of West Village coloured according to building use type. Considering the Village's historic split in terms of functional and morphological character – into the west waterfront on the one hand and the Historic District on the other (where the majority of rows and tenements lie within) –, results are summarised for each one of these areas to then be discussed comparatively.

To begin with, in order to form on overview of the building-street interface density for each district within the Village, we can summarise the number of building entrances and relate this to the total length of façades (Table 2). In terms of the building properties, the mean façade length of buildings within the Historic District is almost half the length of frontages in the non-historic Village parts. This in turn impacts on the street interface: within the Historic District, where pedestrians are likely to encounter a building entrance every 6 meters on average, in contrast to the significantly more sparse street interface of the west waterfront where building entrance spacing increases to 13 meters on average.

Following, in order to measure more precisely the *threshold frequency*, we can look at the number of building entrances per street segment side in relation to the block frontage length[18]. Figure 6 illustrates the calculated threshold frequency for street sides in West Village. Lighter colours reflect lower frequency and thus a looser street interface. As indicated by the threshold frequency map, the streetscape within the Historic District is constituted by a denser building-street interface (dark greyscale). The strong presence of rows and tenements which take over the

[18] The block frontage length equals the sum of the length of building façades calculated separately for each segment side.

majority of historic blocks supports higher threshold frequencies, and thus higher potential for inside/outside encounters. In contrast, building thresholds become sparser towards the waterfront (light grey block sides). Building footprints in the waterfront blocks appear larger, and this implies longer building façades. This morphological feature, in combination with the sparse building-street connections, creates a less porous ground floor emphasising further the historical split of the Village streets.

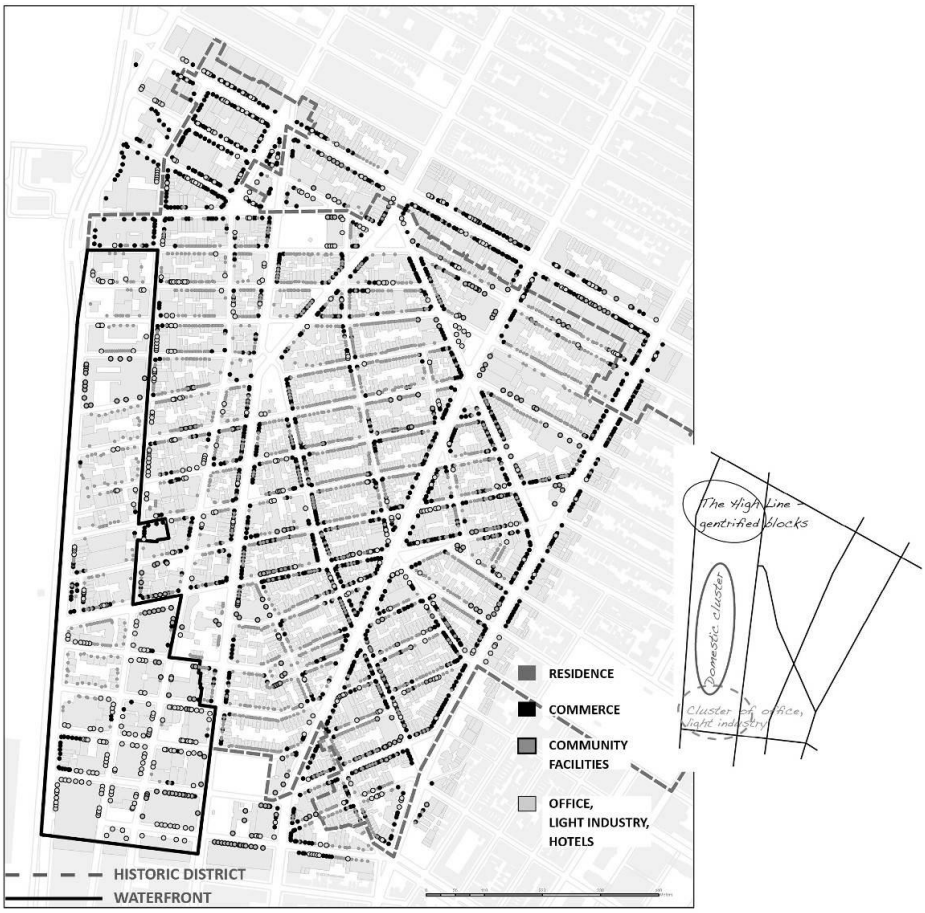

Figure 5. West Village - threshold map and land use distribution (c.2011).

Table 2. West Village - threshold record for Village parts (c.2011).

	Façades	Doors	Tot. Façade Length (m)	Mean Façade Length (m)	Door encounter rate (m)
Historic District	2354	4449	26742	11.4	6.0
Non-historic	494	1064	10871	22.0	10.2
Waterfront	249	518	6554	26.3	12.6

Figure 6. West Village - threshold frequency (c.2011).

The next step is to understand the street interface as an aggregate of varying uses overlooking at the street domain. Building use has an impact both on the morphology of the building-street interface, as well as on the social profile of streets. There are building uses which aim to engage the pedestrian and hence open up the building interior to the street domain visually or accessibly (like retail and commercial uses in general). There are also uses with a more private character which aim to protect the interior function from the pedestrian traffic. Depending on the uses aggregated within a block front, pavements become more or less private or public in their morphology; also, depending on the mixture in uses aggregated within a block front, pavements become mono-functional or mixed-use. These properties (morphology and function, respectively) have an impact on the potential social profile of the street segment.

Studying the threshold map of West Village, we can explore the social profile of streets within the Historic District and outside, firstly in terms of uses *per se*, and secondly in terms of the mixture of uses (Figure 5, Table 3). The most predominant uses within the Historic District are the domestic (57.2%) and commercial (32.5%) types. Retaining the historically more industrial profile, non-domestic uses in the west waterfront refer mostly to offices and light industry (60.9% of the non-domestic uses). In general, for parts lying outside the Historic District non-domestic thresholds cover the majority of pavements (64%).

Table 3. West Village - threshold use record for Village parts (c.2011).

	Façades	Doors	Domestic uses	Commercial uses	Community services	Other uses	Vacant	Stoops	Primary thresholds
Historic District	2354	4449	2547 57.2%	1430 32.1%	134 3.0%	308 6.9%	30 0.8%	908 20.4%	3447 77.8%
Non-historic	494	1064	353 33.2%	319 30.0%	109 10.2%	253 23.8%	30 2.8%	98 9.2%	927 87.1%
Waterfront	249	518	205 39.6%	63 12.2%	54 10.4%	182 35.1%	14 2.7%	58 11.2%	442 85.3%

However, the most important observation arising from this map refers to the mixture of uses. Looking at the distribution of thresholds, it is interesting to point out that within the Historic District, in many street segments a mixture of varying uses is observed across the length of a block frontage. In the waterfront district on the other hand, thresholds of the same uses seem to cluster at the block scale: see for instance, the offices and light industry at the south, the residential blocks moving northwards, and finally, the gentrified district of The High Line (see Figure 5). Here, it is of relevance to recall references that highlight the importance of 'heterogeneity' as a significant characteristic of urban life (Hanson and Hillier, 1987). Urban space becomes livelier and more sociable when it brings together in close proximity varying uses that support one another in everyday rituals (Jacobs, 1961, p.153). Functional mixture at a finer scale (like the building and the segment) is one of the features lost in the redevelopments of the waterfront area in West Village.

Functional mixture leads to morphological mixture of varying building-street relations. The private-public transition can be configured in terms of access in many ways depending on the level of privacy required by the building function[19]. A basic distinction of thresholds is considered here between *primary* and *secondary* ones (based on the work of Hanson, 2000; Hanson and Zako, 2007). Primary boundaries are direct entrances (the building line coincides with the plot line). Secondary boundaries refer to indirect building-street relations, where in order to access the building entrance a user needs to pass firstly from an additional space (like a staircase or a yard) bounded by a secondary threshold (like low or high fences). Table 4 shows the relation between building function and the type of building-street transition (direct or indirect). Commercial uses in the area of West Village have almost exclusively a direct relation with the street domain (94.5% primary thresholds). Offices, hotels and buildings with light industrial uses (land use category named 'other') also have in their majority direct building entrances (92.5%). Community service buildings (like schools and churches) have in some cases (22.6%) a protected and more private interface. Finally, as expected, domestic uses are the most prominent in having an indirect relationship with the street, with one out of three residences in the Village distinguishing the private interior from the public domain. Overall, the degree of privacy of the building-street interface depends on building use and purpose which in turn influence the morphological treatment of the private/public transition.

Morphological mixture is also an outcome of architectural variations. In this respect, morphological diversities are more likely to occur when a block frontage is the assemblage of many building façades. Consequently, building units with narrow façades (meaning more building units per block) and of different architectural styles contribute to creating a complex micromorphology on the street pavements. For example, row houses themselves present many morphological variations regarding the building-street interface. Ascending and descending stoops, grandiose or modest porticos, direct entrances, areaways etc., all consist variations of the row house interface based on architectural style. These morphological variations can create in turn different social situations. For instance, when accessibility to the stoop is free from barriers (like low railings), then stoops can work as informal places of social encounters (people meeting, seating, talking etc.). Likewise, a commercial use might extend outwards and take up parts of the pavement area. Looking at row houses and tenements in West Village, we can form an idea of the complex spatial relations that these building types can generate over time. Figure 7 shows varying threshold types for the row houses and old-law tenements (which have the narrowest façades). Data in Table 3 confirm as well the more significant presence of stoops within the Historic District, while the west waterfront is mostly constituted by direct entrances.

[19] Consider here the varying levels from publicity to privacy as discussed by Newman 1972, 1975: from a social utility perspective a space can be characterised as 'public', 'semi-public', 'semi-private', 'private'.

Table 4. West Village - threshold type according to land use (c.2011).

	Domestic uses	Commercial uses	Community services	Other uses
Primary thresholds	1953 67.3%	1652 94.5%	188 77.4%	521 92.9%
Secondary thresholds	947 32.7%	97 5.5%	55 22.6%	40 7.1%
Total Doors	2900 53.2%	1749 32.1%	243 4.4%	561 10.3%

Figure 7. West Village - type of entrance for row houses and old-law tenements (c.2013).

In a sense, analysis in this section has treated the block frontage as a morphological unit. It has been argued that the properties of the building-street connections within a block frontage regarding relate to the potential social encounters organised by the built form: blockfronts with denser and more diverse (functionally and morphologically) building thresholds are more likely to generate street liveability. Comparative analysis for the current historic and non-historic streetscape in West Village has suggested that the narrowest façades of historic building typologies support higher densities and mixture of building thresholds in relation to the solid, larger in footprint and often monofunctional non-historic buildings.

The role of the street network

Following these observations, it becomes of interest to explore the reasons why some street sections develop a vibrant and sociable interface over time and others fail to do so. This section discusses the role of street network in distributing functional mixture (and consequently morphological built form). The relation of land use allocation and street configuration has long been established by space syntax studies (Hillier, 1996, Chapter four; Hillier and Vaughan, 2007). According to space syntax theory, streets with higher potential for *accessibility* and

permeability are more likely to attract uses requiring higher footfall, like retail, and to generate 'multiplier effects' over time.[20]

A straightforward way to address the potential relation of a street segment's interface with its role within the street network is to group street segments based on their space syntax ('syntactic') values (high, medium, low) and then explore the features of thresholds for each group. Accordingly, Tables 5 and 6 show results from this analysis performed for the area of West Village. Analysis is calculated for the measure of 'combined integration and choice', both for the local and the city-wide context of street network performance: firstly, analysis addresses the walkable radius of 800 meters in order to estimate the performance of the street network at a neighbourhood scale; and secondly, the wider city surroundings are considered with analysis calculated for the whole of Manhattan (radius n). Results for both studied scales indicate that segments with higher syntactic values contain higher numbers of commercial thresholds (almost twice higher on average) in comparison to segments with low values. It is also interesting to observe that the percentage of secondary thresholds (namely entrances with a more private character) is significantly lower in segments with high values. In effect, it is indicated that in the case of West Village segments with higher potential for pedestrian traffic have developed a more public street profile.

In order to interpret accessibility and permeability (namely the configurational properties of the street network) in terms of morphology, the study looks in addition at the physical characteristics of street segments which might influence the chances for a street part to develop high potential in attracting pedestrian movement (and thus attract more urban-like uses). Jane Jacobs's observations and interpretations provide a morphological hint regarding the characteristics of permeability: the author argues that short blocks enhance pedestrian flows, become livelier and consequently, support greater socio-economic mixture. Here, we interpret this morphological property of the built form (namely, the short block front) as a configurational property of the street network (short segment length). Indeed, looking at the syntactic map of the Manhattan street network illustrating the values for the measure of 'combined integration and choice' (for radius 800 – namely the walkable scale) we can observe that shorter block sides have measurably higher potential for pedestrian flows (Figure 8, Table 7). To examine this further we summarise the properties of building thresholds based on segment length (Table 8). Results confirm a potential impact of street segment length (and respectively of block size) in the land use allocation. In the Village, shorter segments (with length below 100 meters) have a prevailing non-domestic character, with the majority of commercial uses allocated there. Longer segments on the other hand are more domestic in their social profile and are constituted by more private building-street interfaces with secondary boundaries.

Pedestrian flows themselves confirm the role of street network in terms of the generated street liveability. As mentioned in section 1 above, spatial patterns are considered to give rise to the 'virtual community'. The theory of 'natural movement' discusses how the configurational (namely, the relational) properties of the street network generate a primary distribution of movement patterns (Hillier et al., 1993). Movement patterns relate in turn with phenomena of co-presence. Physical co-presence is a fundamental precondition for social life to be generated in the street domain. Additionally, from a morphological perspective it is important to note here that not only the building function has an impact on the morphology of the building-street interface; the street function as a pedestrian route and its levels of utility also play a role in determining the type of the configured micromorphology of the sidewalk. For instance, depending on the levels of pedestrian traffic, building thresholds can occupy the pavement width (like in the case of stoops and areaways) or stand back at the building line (direct entrances) giving way to passing through users.

[20] In Hillier's words (1996:127): "The urban grid through its influence on the movement economy is the fundamental source of the multifunctionality that gives life to cities".

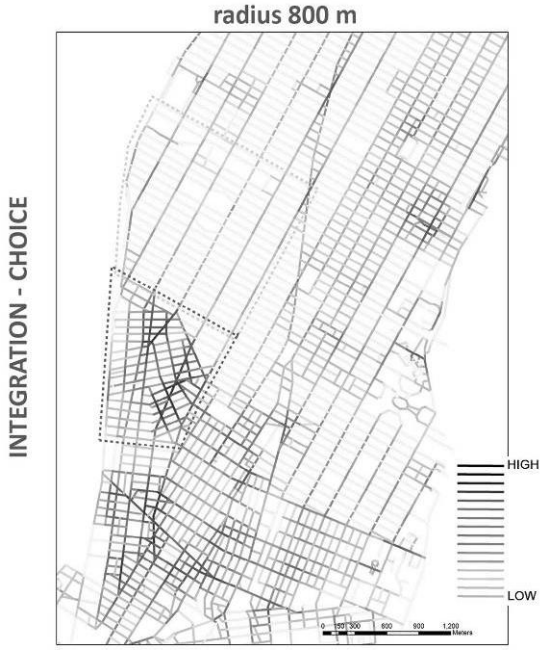

Figure 8. Manhattan - short/long segments and permeability. Segment angular analysis for *combined measure of integration and choice* for radius 800 meters.

Table 7. Manhattan - mean values for the measure of *combined integration and choice* for radius 800 meters according to segment length (c.2011).

	0 < 50 m	**50 – 100 m**	**100 – 150 m**	**150 – 200 m**	**200 m and over**
Segment Count	1138 14.6%	3851 49.5%	1151 14.8%	726 9.3%	919 11.8%
Combined integration and choice radius 800 m	31.408	28.715	18.548	10.666	3.487

The morphology of a sociable street interface

This paper was an effort to address properties of the built form that relate to street liveability. Stemming from the work of Julienne Hanson in 'Urban Transformations' (2000), where the author interprets spatial and morphological properties of the built environment as social properties of urban space, this study aimed to explore further the morphological features of a lively street interface. Considering building-street connections as potential points of social encounter between the 'static' (interior) and the 'moving' (pedestrian realm), between the private and the public, the study suggests that building thresholds reflect the potential vibrancy and sociability of the building-street relation, and accumulatively of the street interface.

Examining the case of West Village, the effort was to decode the role of urban components in bringing together the spatial and physical affordances for co-presence and social interaction in the area. To summarise the key observations, throughout the analysis of West Village it was discussed that the following built form properties are to be considered when aiming for a vibrant sidewalk micromorphology: i) the plot size; narrow plots mean narrow building façades which in turn increases the potential for a high threshold frequency across the block frontage; ii) functional mixture; the mixture of building uses within the block frontage length; iii)

morphological mixture; buildings with varying architectural styles and consequently varying treatment of the private/public transition.

Table 8. West Village - threshold use record according to segment length (c.2011).

	0 < 50 m	50 – 100 m	100 – 150 m	150 – 200 m	200 m and over
Segment Count	47 15.1%	172 55.3%	74 23.8%	10 3.2%	8 2.6%
Total length	1.723 km 6.2%	12.922 km 46.5%	9.480 km 34.1%	1.618 km 5.8%	2.058 km 7.4%
Total façades	124	1220	1065	184	254
Total doors	219	2322	2070	397	501
Domestic	86 39.3%	1012 43.6%	1317 63.6%	219 55.2%	266 53.1%
Non domestic	133 60.7%	1306 56.2%	731 35.3%	178 44.8%	234 46.7%
Commercial	105 47.9%	994 42.8%	418 20.2%	119 30.0%	146 29.1%
Community	4 1.8%	75 3.2%	93 4.5%	22 5.5%	48 9.6%
Other	24 11.0%	237 10.2%	220 10.6%	37 9.3%	40 8.0%
Blank	12 5.2%	209 9.0%	222 10.7%	70 17.6%	45 9.0%
Secondary	30 13.7%	346 14.9%	511 24.7%	93 23.4%	155 30.9%

In addition to these properties, it was highlighted that short segments (and thus short block sides) enhance pedestrian flows and consequently increase co-presence. Finally, the effect of the street network in a street's profile has been discussed: movement patterns influence land use allocation and levels of pedestrian traffic having and impact on the morphology of the building-street connection. In other words, the street interface is the morphological unit where all urban components (building, plot, street) overlap, work together and potentially interact.

Overall, the study emphasised the role of density as well as of functional and morphological mixture in building thresholds within a block frontage as key properties for creating a sociable street interface. Considering the post-modern redevelopments in the west waterfront in West Village it can be understood that these urban blocks present the opposite morphological features: with building footprints covering large plots (which can be sometimes equal to the entire whole block area), lower threshold frequency and a more opaque ground floor, concluding that these redevelopments present far less potential for functional and morphological heterogeneity, for the oft desired 'urban diversity'.

Acknowledgements

This research is funded by an EPSRC scholarship.
The Manhattan background map was provided by the Department of Information Technology and Telecommunications, NYC © database right 2011.

References

Caniggia, G. and Maffei, G. L. (1979 [2001]) *Architectural composition and building typology: Interpreting basic building* (Alinea, Firenze).

Çalışkan, O. and Marshall, S. (2011) 'Urban morphology and design: Introduction', *Built Environment* 37, 381-92.

Conzen, M. R. G. (1960) *Alnwick, Northumberland: A study in Town Plan Analysis*, Publication no. 27 (Institute of British Geographers, London).

Davis, H. (2006) *The culture of building* (Oxford University Press, New York).

Dolkart, A. (2009) *The Row House reborn* (The John Hopkins University Press Baltimore).

Hanson, J. (2000) 'Urban transformations: a history of design ideas' *Urban design international* 5, 97-122.

Hanson, J. and Hillier, B. (1987) 'The architecture of community', *Architecture and Behaviour* 3, 249-273.

Hanson, J. and Zako, R. (2007) 'Communities of co- presence and surveillance: How public open space shapes awareness and behaviour in residential developments', in Kubat, A.S. et al. (eds.) *Proceedings of the Sixth International Space Syntax Symposium* (I.T.U. Faculty of Architecture, Istanbul) pp.021.1-021.22.

Hillier, B. (1989) 'The architecture of the urban object', *Ekistics* 56, 5-21.

Hillier, B. (1996) *Space is the machine: A configurational theory of Architecture* (Cambridge University Press, Cambridge).

Hillier, B. and Hanson, J. (1984) *The social logic of space* (Cambridge: Cambridge University Press).

Hillier, B and Vaughan, L. (2007) 'The city as one thing', *Progress in Planning* 67, 205-230.

Hillier, B., Penn, A., Hanson, J., Grajewski, T. and Xu, J. (1993) 'Natural movement: Or, configuration and attraction in urban pedestrian movement', *Environment and Planning B: Planning and Design* 20, 29-66.

Jacobs, J. (1961) *The Death and Life of Great American Cities* (Penguin, Harmondsworth - Middlesex).

Kropf, K. (2011) 'Morphological investigations: Cutting into the substance of urban form', *Built Environment* 37, 393-408.

Marshall, S. (2012) 'Science, pseudo-science and urban design', *Urban design international* 17, 257–271.

Palaiologou, G. and Vaughan, L. (2012b) 'The Manhattan row house as an exemplar of urban adaptability: 1874-2011', the *New Urban Configurations* EAAE / ISUF International Conference, TU Delft, The Netherlands, 16–19 October.

Plunz, R. (1990) *A History of Housing in New York City* (Columbia University Press, New York).

Turner, A. (2001) 'Depthmap: a program to perform visibility graph analysis, in Peponis, J., Wineman, J. and Bafna, S. (eds.) *Proceedings of the Third International Space Syntax Symposium* (Georgia Institute of Technology, Atlanta, U.S.A), pp.31.1–31.9.

Ware, C. F. (1963) *Greenwich Village, 1920-1930: A comment on American Civilization in the Post-War years* (University of California Press: Berkley, Los Angeles, London).