Paved with gold
The real value of good
street design

Design better streets
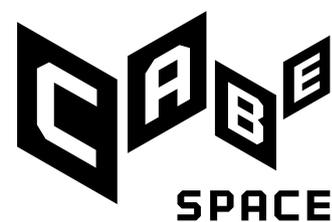
CABE SPACE

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planners apply national design policy and offer
expert advice to developers and architects. We
show public sector clients how to commission
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welcoming places.

CABE Space is a specialist unit within CABE
that aims to bring excellence to the design,
management and maintenance of parks and
public space in our towns and cities.

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Executive summary

About the research

Paved with gold, researched by Colin Buchanan, is the latest project in a long-term CABE research programme to investigate the value of design. Well-designed buildings, spaces and places contribute to a wide diversity of values and benefits. These range from direct, tangible, financial benefits to indirect, intangible, long-term values such as improved public health or reduced levels of crime. Benefits like these are very important to society but it's not easy to put a value on something as difficult to define as better public health. So how can we make sure that new developments are designed to deliver key public objectives?

Paved with gold shows how we can calculate the extra financial value that good street design contributes, over average or poor design. It shows how clear financial benefits can be calculated from investing in better quality street design. It also shows how, by using stated preference surveys, public values can be measured alongside private values, so that they can be properly included in the decision-making process.

Case studies

Ten London high streets were selected as case studies, as shown below.

London was chosen so that the researchers could build on work they had already completed for Transport for London.

1	High Road, North Finchley
2	High Street, Hampstead
3	Finchley Road, Swiss Cottage
4	High Road, Kilburn
5	The Broadway, West Ealing
6	High Road, Chiswick
7	Walworth Road, Southwark
8	High Road, Streatham
9	High Street, Tooting
10	High Street, Clapham
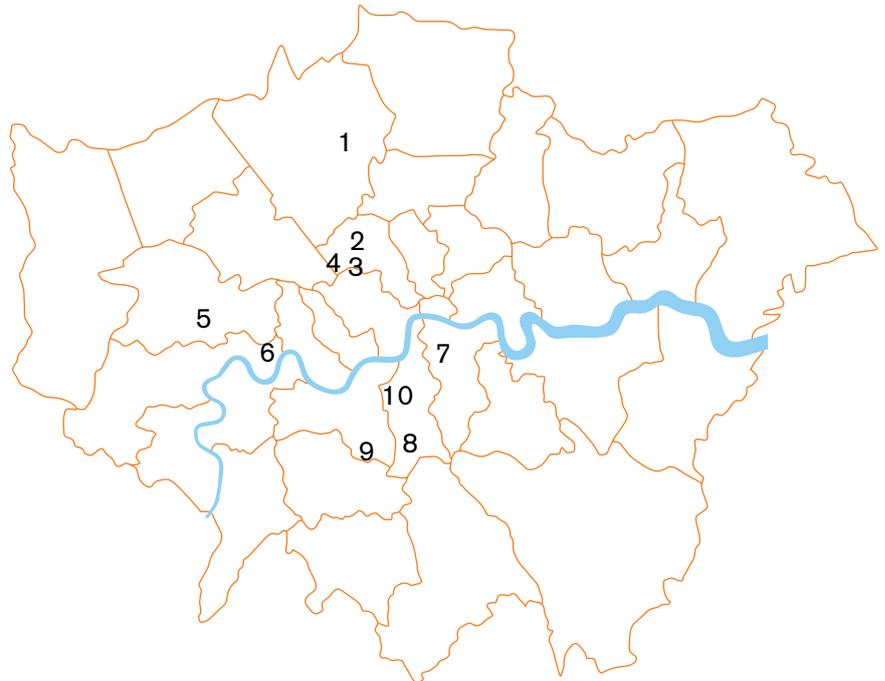
Fig 1: 10 London high streets list and map

Assessing design quality

The first phase of the research involved assessing the design quality of each of the case study high streets. This assessment used the pedestrian environment review system (PERS), a tool for measuring the quality of the pedestrian environment. PERS scores the way a street works as a link, facilitating movement from A to B, and as a place in its own right. Figure 2 shows the headline categories included in PERS and how these categories are weighed against each other.

The PERS tool was used to assess the quality of each high street. The final scores, calculated on a seven-point scale from -3 to +3, are shown below. These show relatively wide variations in quality, from Chiswick High Road at the top of the scale with +0.98, to the Walworth Road at the bottom with -1.70.

100%	
90%	Quality of environment 24%
80%	
70%	Personal security 13%
60%	Permeability 12%
50%	
40%	User conflict 11%
30%	Surface quality 10%
20%	Maintenance 9%
	Lighting 7%
10%	Legibility 5%
	Dropped kerbs/gradient 4%
	Obstructions 3%
0%	Effective width 2%
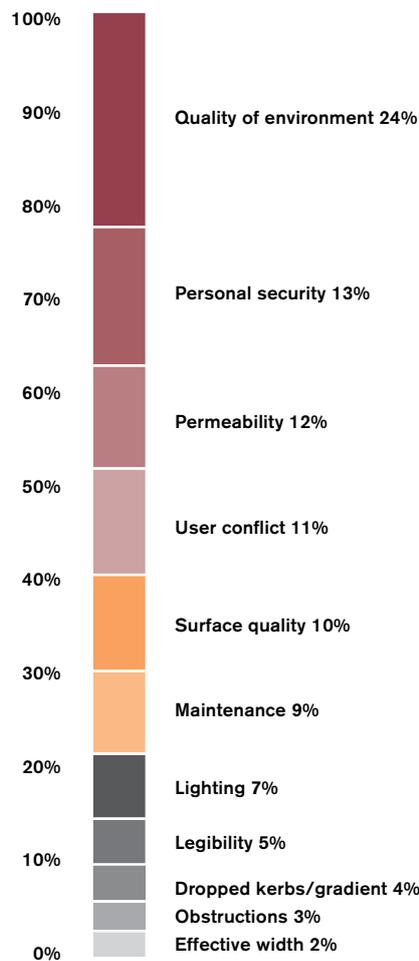
Fig 2: Individual importance of PERS categories

What makes a high-quality street?

- dropped kerbs
- tactile paving and colour contrast
- smooth, clean, well-drained surfaces
- high-quality materials
- high standards of maintenance
- pavements wide enough to accommodate all users
- no pinch points
- potential obstructions placed out of the way
- enough crossing points, in the right places
- traffic levels not excessive
- good lighting
- sense of security
- no graffiti or litter
- no signs of anti-social behaviour
- signage, landmarks and good sightlines
- public spaces along the street
- a street that is a pleasant place to be.

Fig 3: Average street design score (PERS)

Chiswick 0.98, North Finchley 0.88, Hampstead 0.60, Clapham 0.38, Streatham 0.14, Swiss Cottage 0.01, Kilburn -0.72, Tooting -0.77, West Ealing -1.02, Walworth -1.70
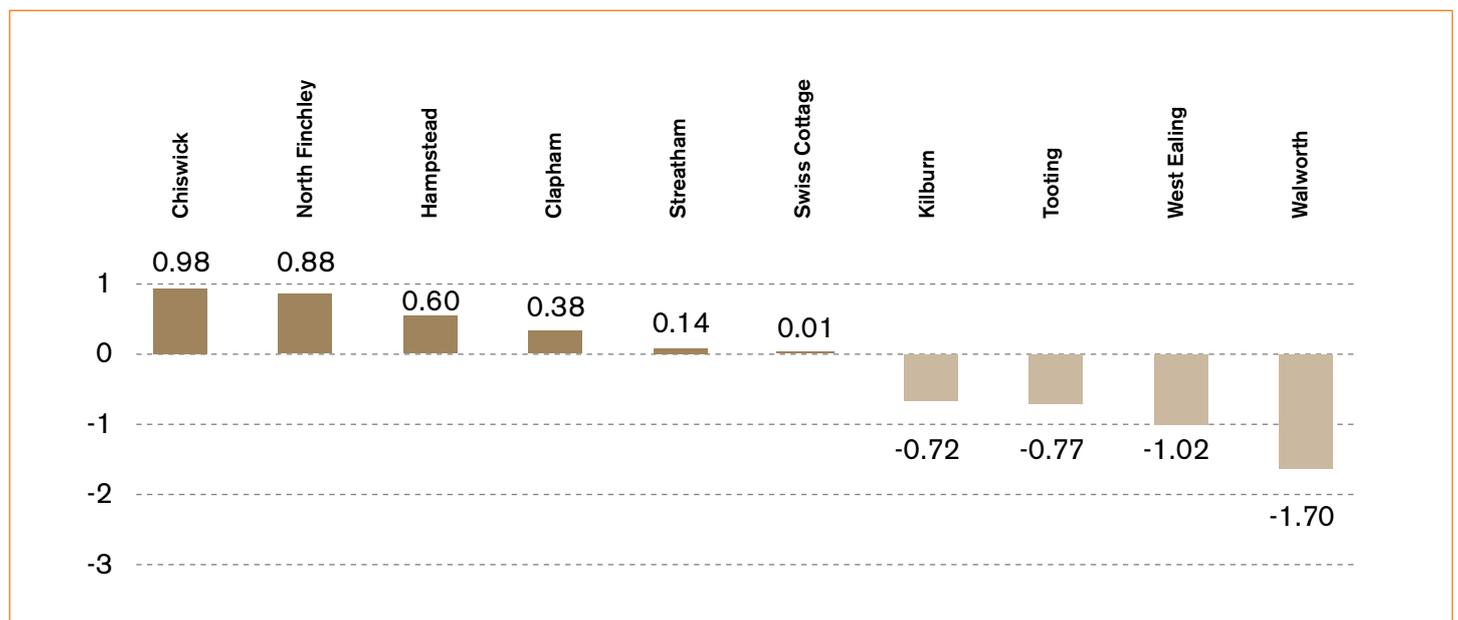
Analysis

Extensive additional data was collected for each case study to build a comprehensive statistical picture of every high street and its immediate neighbourhood.

The next research phase involved applying multiple regression analysis to the data collected. Regression analysis is used to find statistical explanations for variations in data. The research aimed to determine whether street quality is responsible for some of the variations in retail rents and in property prices seen across the 10 case studies. The results show direct links between street quality and both retail and residential prices.

In the case of homes on the case study high streets, improvements in street quality were associated with an increase in prices. Specifically, for each single point increase in the PERS street quality scale, a corresponding **increase of £13,600 in residential prices** could be calculated. This equates to a **5.2 per cent increase in the price of a flat** for each PERS point.

The analysis also showed also direct links between zone A retail rents (the rent for the most valuable space closest to the shop front) and street quality. For each single point increase on the PERS street quality scale, a corresponding **increase of £25 per square metre in rent per year** could be calculated. This equates to a **4.9 per cent increase in shop rents** for each PERS point.

Public value

Alongside these direct measures of value the research also included another assessment method – stated preference surveys. These were used to place a figure on the public benefit that could result from better quality streets. Prior to this project, Colin Buchanan had completed an extensive stated preference survey for Transport for London. It asked a sample of 600 people on two London high streets, Edgware Road and Holloway Road, whether they would theoretically be willing to pay for a series of improvements to the two streets. This survey work used the same categories as the PERS system, so that data could be compared.

The survey showed that, on average, pedestrians were willing to pay more for better streets. Local residents were willing to pay more council tax, public transport users would accept higher fares and people living in rented homes were happy to pay increased rents to improve the quality of their high streets.

The amount that pedestrians are willing to pay provides us with a way to assess the public benefits that result from better quality streets. If pedestrians are happy to pay, for example, an extra £2 every year, this shows us how much they value improved street design.

By counting the number of pedestrians using the sample streets, and the average time they spent in the street environment, it was possible to calculate a total public benefit value for improved design. The bar chart below represents what happens when the same calculation is applied to the ten case study high streets. It shows how pedestrians themselves would value the high streets if they were improved by a single point on the PERS scale. In the case of Tooting High Street, these benefits total £320,000, while for Walworth Road they total £286,000.

These user benefit calculations show how it is possible to quantify the overall benefit to pedestrians of street design improvements. The value that the public places on good design can be compared to the cost of improvements to show whether or not they represent a good investment.
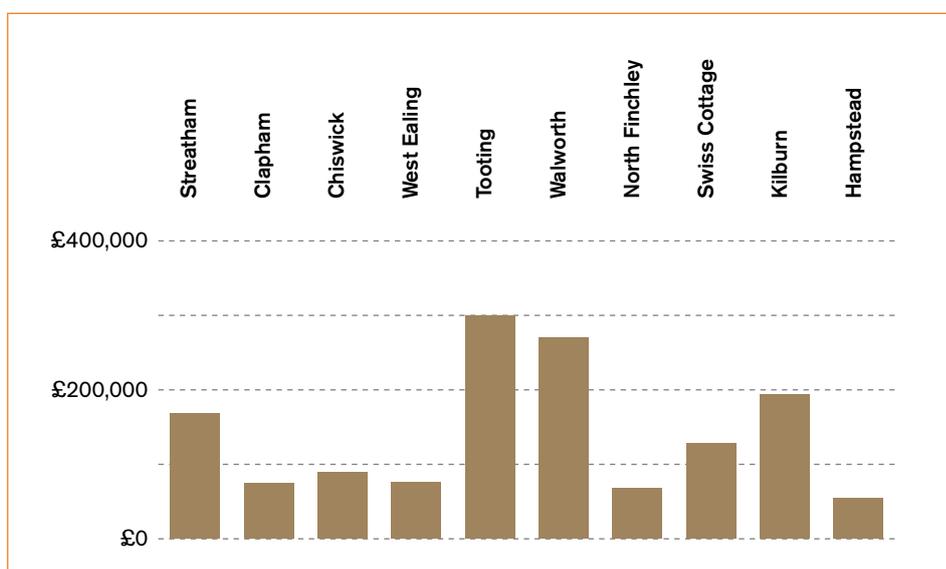
Fig 4: Calculated annual user benefit for improvement

Conclusions

- Better streets result in higher market prices. The research shows that in London an achievable improvement in street design quality can add an average of **5.2 per cent** to residential prices on the case study high streets and an average of **4.9 per cent** to retail rents. These findings have a central role to play in justifying investment. They make it possible to use an evidence-based approach to the design, appraisal and funding of street improvement works. It is clear from this work that the rewards from investing in design quality can be very significant.

- High property prices can have a downside, potentially restricting local access to home ownership and reducing retail diversity. However, this research clearly shows that good design is valued by the people who use the case study streets, and that this value can be measured. The findings should therefore be understood as only one element among the diverse values created by well-balanced places.

- The benefits of quality street design are clear and local authorities are already taking the initiative in realising the latent value in their high streets. In London, street design programmes such as the London Borough of Camden's boulevard project are setting high standards, while the London Borough of Southwark is tackling the lowest-scoring case study in this report through major improvement works to Walworth Road. The London Borough of Lambeth is due to publish its street design guide soon: a model for the way that local authorities can establish minimum design expectations through policy guidance. These are encouraging signs.

- However, there are some influential players who still need to understand the importance of well-designed streets:

  – We urge England's nine **regional development agencies** and **government offices for the regions** to use their influence to drive forward a design-led improvement agenda. Yorkshire Forward's renaissance market towns programme, for example, has shown what can be achieved with a clear vision for realising the potential of streets and public spaces.

  – **Developers** can help to realise the latent value in their schemes by investing in high-quality street design, increasing their margins as a consequence.

  – **Local authorities** have much to gain from investing upfront in street design. This research will help them to anticipate and capture the returns from their investment. Local area agreements could provide a catalyst for focusing investment on streets, addressing local priorities and contributing to place-making objectives.

  – **Businesses** can reap direct financial rewards from taking a close look at the street they're on. *Paved with gold* shows that it will be worth their while.

- Further work is needed to take this research forward. This project was designed as a demonstration to show how a new approach could be taken to assessing design value. The small sample size means that the results are not statistically significant in themselves and a larger study would be required to validate them. However, the results still demonstrate trends that the researchers are confident would be replicable elsewhere.

- A larger study could include a wider geographical selection of case studies to increase the applicability of the results. It could also allow individual elements of street design to be valued so that more information could be obtained about their relative influence on market prices and user preferences. Further research could also extend the investigation to include commercial property, looking at the relationship between office rents and street design quality.

Approach

This study is a demonstration project designed to show how to measure the impact of street design improvements on market prices as revealed through retail rents and residential flat prices. In total, 10 high streets in London were selected as a sample. A wide range of data were collected and tested and the replicability of the approach with a larger sample size was an important criterion from the outset.

The demonstration project builds on work undertaken by Colin Buchanan and Accent for Transport for London (TfL) on the valuation of pedestrian user benefits from improvements in street design. That work valued the benefits accruing to individuals from walking within a nicer street environment. This was based on two sets of inputs:

- a large stated preference research exercise with 700 separate interviews carried out on two London high streets
- using PERS (pedestrian environment review system) to provide a multi-criteria system for rating quality of public realm. PERS was developed by the Transport Research Laboratory.
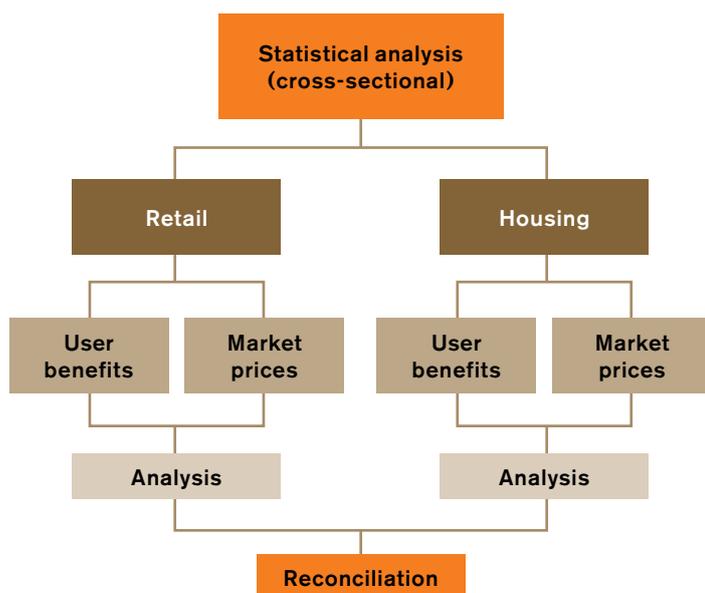
Figure 5: Schematic diagram of approach to statistical analysis

A major achievement of that previous project was bringing PERS scores and stated preference values together. PERS produces a numeric multi-criteria quality score which can be calculated both as the place is now and as it will look after proposed works. Combining that change in quality with the values from the stated preference survey and data on the number of street users enabled the monetary valuation of improvements.

Figure 5 illustrates the approach of this demonstration project. This is followed by an explaination of the market prices – revealed preference approach – and the pedestrian user benefit approach – stated preference.

Market prices approach – revealed preferences
The market prices study measures the monetary value of good quality street design through variations in actual market prices of property. The contribution of the quality of street design to the overall price of property is statistically demonstrated through multiple regression analysis. That analysis enables identification of the extent to which variations in property prices can be explained by each of the relevant factors, among them street design quality.

A range of criteria were employed to identify a best fit sample. In total, 10 London high streets were selected and data on retail rents, flat sales prices, type of shops and pedestrian activity were collected on a site by site level.

The results of this study provide the basis on which further research may be carried out to deepen our understanding of the impact of quality of street design on property prices. This will determine the revealed value increase of street design improvements.

Pedestrian user benefit approach – stated preferences
The results of the market price analysis were then compared to the results from a user benefit study previously developed by Colin Buchanan. Developed first for the Corporation of London and TfL, this applies values for user benefits derived from stated preference surveys. By asking interviewees to state their trade-offs between time, money and design quality, a value can be placed on street design improvements. It is possible to work out how much a particular improvement is worth to users. Factoring the change in street quality by the appropriate value and the time spent in that area by pedestrians enables quantification of total user benefits.

This approach is in line with the economic appraisal of most transport infrastructure. As a stand alone method, it is capable of contributing to more funding for public realm improvement for pedestrian users. In this study is it used purely as a cross-check on the values derived from the market prices analysis.

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Site selection

The sample of high streets was chosen in line with these criteria, all intended to ensure the sites were as comparable as possible:

- no major streetscape improvements since the 2001 census (aim: maximising data comparability)
- mainly retail uses at ground floor level and flats above (aim: maximising comparability of design characteristics)
- similar retail centre classification broadly in line with the CACI and Greater London Authority (GLA) retail centre hierarchy
- similar level of public accessibility to central London
- availability of data on retail turnover and average turnover as a potentially important performance measure for the retail study
- no significant off-street shopping mall in the study area as these would be unaffected by the quality of the public streetscape
- variation in street design quality.

A broad brush comparative study of over 50 London high streets resulted in the selection of the ten high streets illustrated in the map below.

For the purpose of assessing the street design quality, pedestrian activity, retail rents and flat prices, the high street itself was defined as the study area. However, a typical high street serves a local area. A secondary study area was therefore defined as a buffer zone of 800 metres around the high street. That buffer zone roughly corresponds with the average walking catchment area of a high street. Socio-economic data and housing sales data for this secondary study area were collected.

1 High Road, North Finchley
2 High Street, Hampstead
3 Finchley Road, Swiss Cottage
4 High Road, Kilburn
5 The Broadway, West Ealing
6 High Road, Chiswick
7 Walworth Road, Southwark
8 High Road, Streatham
9 High Street, Tooting
10 High Street, Clapham
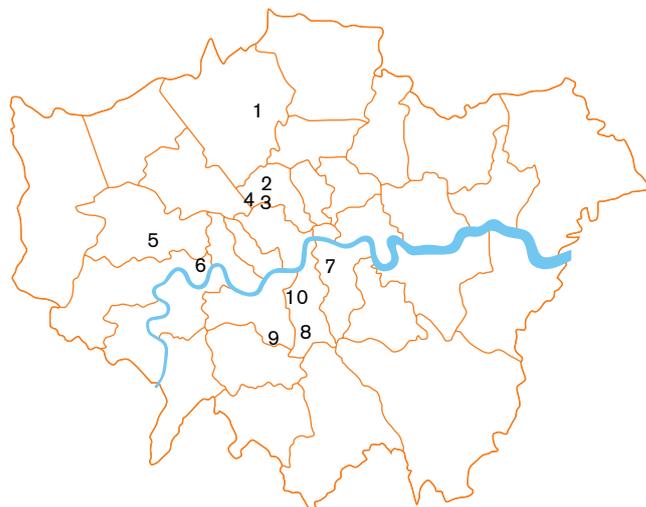
Figure 6: Sample of 10 London high streets

Data collection

The data collected comes under a number of sub-headings:

- socio-economic – measures of population, employment, deprivation, incomes and spending power
- retail – the mix and number of shops and data on the comparison good spend, the size of the retail catchment and the extent of retail competition
- accessibility – how many people were within specific travel times by public and private transport
- prices – analysis of flat prices on the high street, surrounding streets, retail rents and value of sales
- pedestrian data – counts of pedestrian activity at various points along each high street and throughout the day
- street quality measures – based on the pedestrian environment review system (see below).

In Appendix A we explain in more detail the sources and data collection methods used in this study. A brief summary of key data collected follows here.

Assessment of the pedestrian environment
The pedestrian environment review system (PERS) was used to assess the quality of each high street and an average score was calculated to assess the street design quality from a pedestrian's point of view. PERS is a multi-criteria assessment tool designed to assess the quality of the pedestrian environment by placing scores on a number of characteristics, assessing the qualities of a particular street regarding its link or place function.

In the context of this study a selection of assessment characteristics based on the link categories were used for the calculations of pedestrian user benefits generated by assumed street design improvements.

PERS – link	PERS – place
effective width	moving in the space
dropped kerbs/gradient	interpreting the space
obstructions	personal safety
permeability	feeling comfortable
legibility	sense of place
lighting	opportunity for activity
personal security	
surface quality	
user conflict	
maintenance	
quality of environment	

Figure 7: PERS categories assessed for the user benefit calculation

Figure 7 lists the categories assessed at each site. A subdivision of the street into subsections of similar quality was carried out to reflect the sometimes varying street design quality along a high street.

The PERS audit included the use of a scorecard system providing a series of prompts for each category, a comprehensive list of aspects to be considered in each of these categories and scenarios for each quality level. A seven point scale between -3 and +3 was used. The box below outlines the offered scenarios for quality of environment.

Quality of environment

Overall score: +3
The optimum score would be given where the environment is aesthetically pleasing and efforts have been made to foster a sense of place, by seating, high-quality materials and frontages or soft landscaping, for example, and activity and features to enjoy watching. The link would be quiet and enjoyable to use.

Overall score: 0
An average score for the quality of the environment would be gained by a reasonably well maintained link that used pleasant and durable materials and some good provision of public space. Overall it would not be an unpleasant place to be.

Overall score: -3
A score of -3 would be given where the link has harsh or uncomfortable surroundings. Contributory factors might be decaying buildings, the location of a major traffic corridor, excessive noise or spray. The link would not be pleasant for a pedestrian to spend any length of time in. It would be likely to be noisy or with heavy traffic.

The interviews conducted in the previous study for TfL have shown that users value PERS characteristics differently and so not every category is as important as the others. Figure 8 shows the importance of each individual category.

Individual scores were therefore weighted accordingly and factored up by the length of each sub-section of the street defined during the on-site audit. This was done to take account of the relative importance of the different characteristics from a pedestrian perspective and of the sometimes varying design quality along one street.

Street design qualities measured with PERS can be illustrated and evaluated as individual scores or as an average score over all categories. This enables an initial understanding of strengths and weaknesses to be illustrated to inform the design process and show the performance increase after completion.

The diagrams overleaf show the final PERS assessment results for each of the case study high streets. The wider the areas covered by the orange line, the higher the overall design quality of the street. The PERS scores for each case study high street are then shown alongside a summary of the data collected on flat and house prices, zone A rents, population and employment density and expenditure figures.
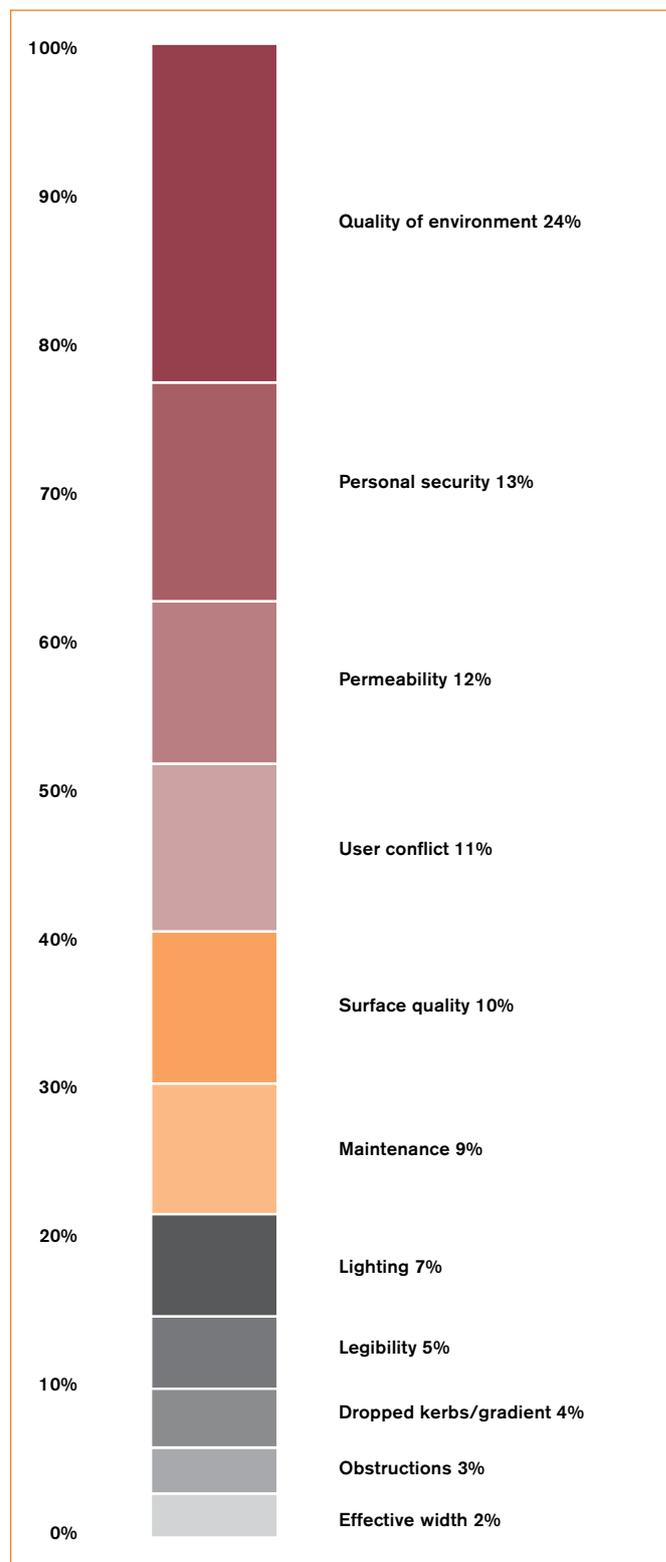
Figure 8: Individual importance of PERS link categories

Street design quality – PERS assessments

Clapham

Hampstead

Chiswick

Swiss Cottage

North Finchley

Streatham

Tooting

Radar chart with axes: Effective width, Dropped kerbs/gradient, Obstructions, Permeability, Legibility, Lighting, Personal security, Surface quality, User conflict, Quality of environment, Maintenance. Scale from -3 to 3.

Kilburn

Radar chart with axes: Effective width, Dropped kerbs/gradient, Obstructions, Permeability, Legibility, Lighting, Personal security, Surface quality, User conflict, Quality of environment, Maintenance. Scale from -3 to 3.

West Ealing

Radar chart with axes: Effective width, Dropped kerbs/gradient, Obstructions, Permeability, Legibility, Lighting, Personal security, Surface quality, User conflict, Quality of environment, Maintenance. Scale from -3 to 3.

Walworth

Radar chart with axes: Effective width, Dropped kerbs/gradient, Obstructions, Permeability, Legibility, Lighting, Personal security, Surface quality, User conflict, Quality of environment, Maintenance. Scale from -3 to 3.

Street design quality – average PERS score 2006, weighted

- fairly wide range of scores spanning from +0.9 and -0.9 across sample
- Chiswick and North Finchley around +1 and West Ealing and Walworth Road around -1.
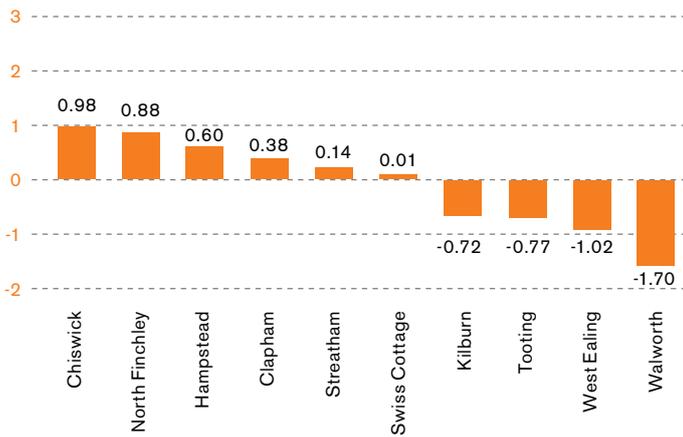
Figure 9: Average street design score (PERS), weighed

Average flat and house prices 2005

- compared to variations in terraced house prices the observed flat prices along high streets differ relatively little across the sample.
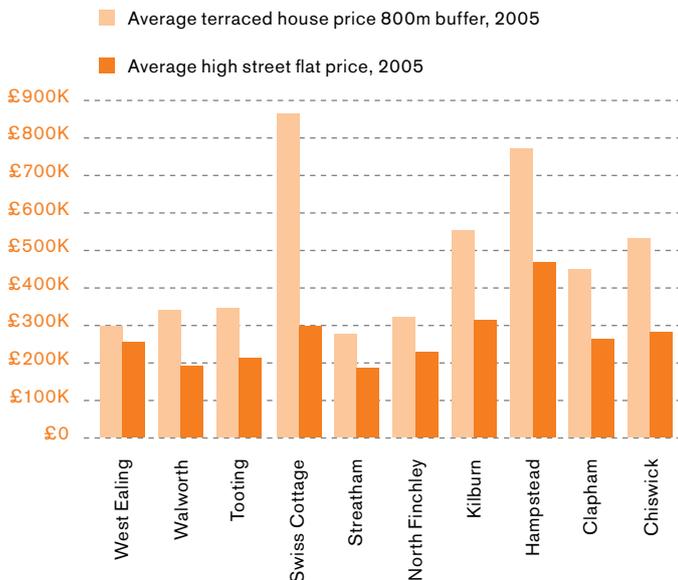
Figure 10: Average sales prices 2005: flats and terrraced houses in surrounding area

Average zone A shops rents, 2005

- Hampstead and Chiswick high street show relatively high average zone A rents (£ per m²) compared to the other high streets, where rents do not vary much.
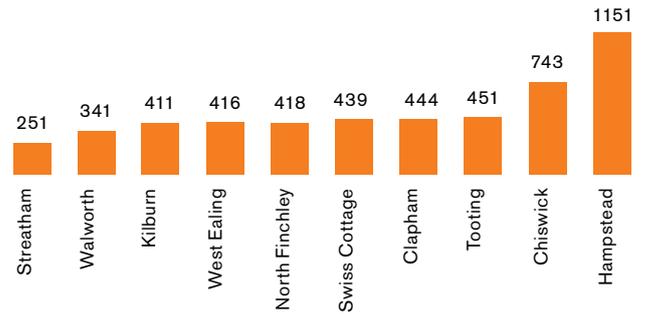
Figure 11: Average zone A shop rents 2005

Population and employment density 2001

- sample ranges generally between 10,000 and 14,000 people
- employee component is of moderate scale
- North Finchley shows the lowest density (7,000) and Walworth Road with around 15,000 the highest.
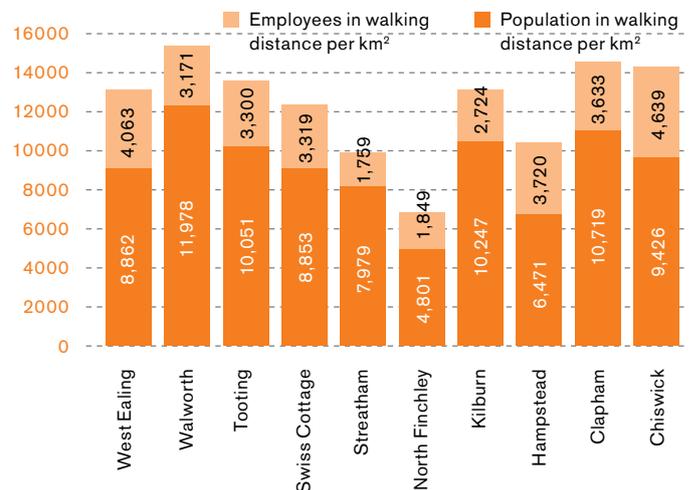
Figure 12: Population and employment density 2001

Total expenditure and expenditure per person 2003

- lower variance between sites regarding total expenditure than expenditure per person
- lower population density tends to go hand in hand with higher individual expenditure.
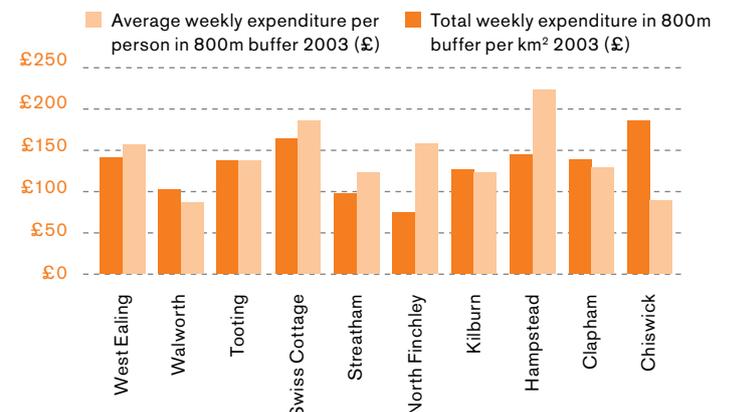
Figure 13: Total weekly expenditure and average weekly expenditure per person in 2003

Retail footprint data

CACI's retail footprint model provided a retail catchment area model. It is a gravity model based on four components:

- a combination of distance or travel time by car
- the 'attractiveness' of the retail offer
- the degree of intervening opportunities or level of competition
- the size of the population within an area.

Public transport accessibility model

Colin Buchanan's public transport accessibility model, ABRA, was used to calculate the number of people in catchment areas along the high street measured in journey time between the high street and their home. Figure 14 illustrates the output of the ABRA model for Swiss Cottage/Finchley Road high street.

Socio-economic data

This was collected from generally available data, primarily from the Office for National Statistics (ONS). It covered population and employment densities, incomes and expenditure.

Surveys

Colin Buchanan's survey team conducted pedestrian spot counts on each of the high streets. Pedestrians were counted at four cordons on each high street during six 15-minute intervals in three periods (07:30–09:30, 12:00–14:00, 16:30–18:30). The understanding gained of the number of pedestrians using the high street was then factored up to a full 24-hour day based on typical London high street usage patterns available to the project.

Surveys were also taken of the number and type of shops and land uses and along the high streets.

Price data

Prices for flats were taken from property websites and zone A retail rents were taken from the Valuation Office website. Appendix A describes data collection methods and sources in more detail.

Figure 14: ABRA model for Finchley Road, Swiss Cottage

Public transport journey time

- over 45 minutes
- 40 to 45 mins
- 35 to 40 mins
- 30 to 35 mins
- 25 to 30 mins
- 20 to 25 mins
- 15 to 20 mins
- under 15 mins
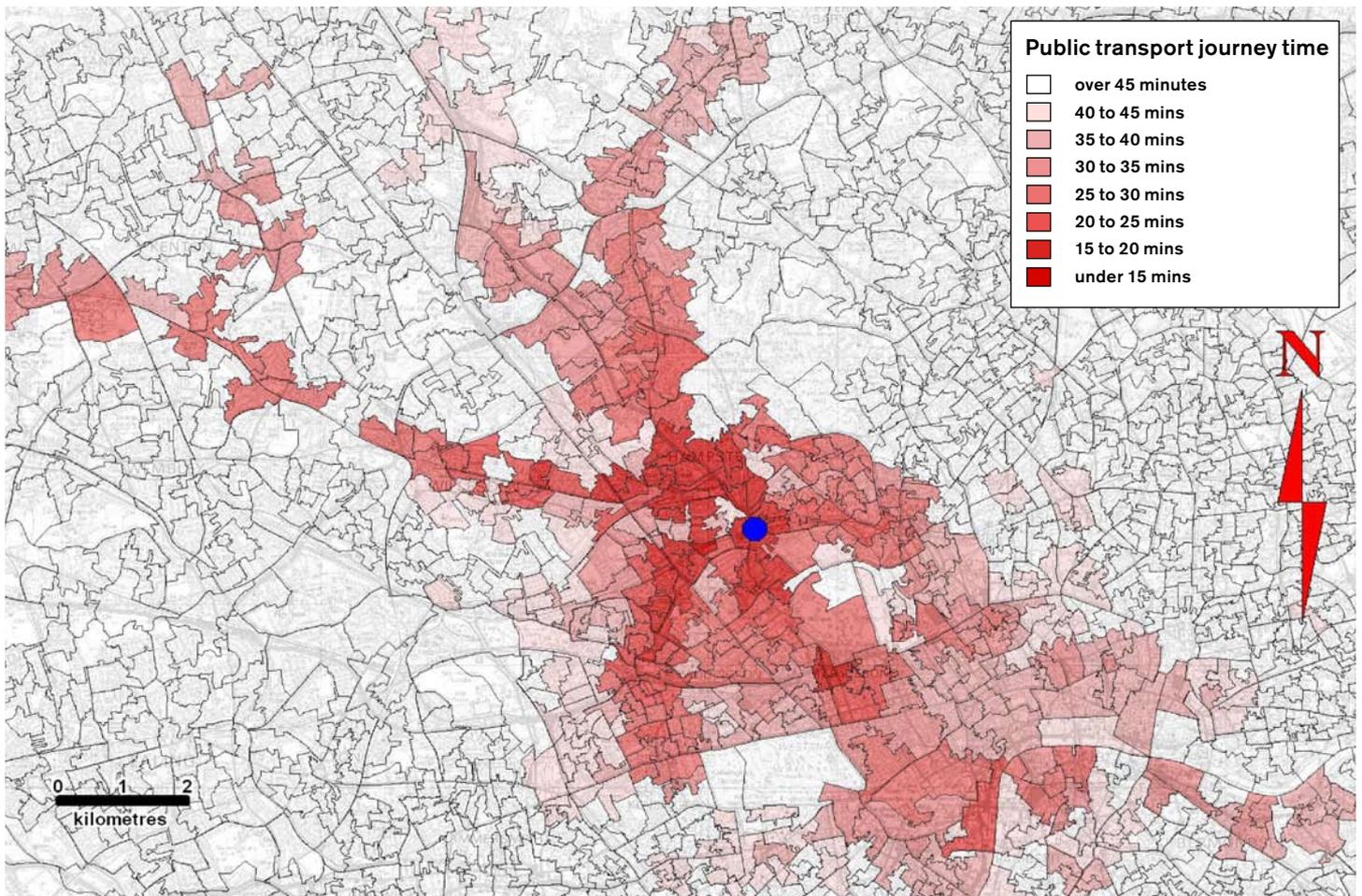
Profile of 10 high streets

The following section comprises an illustration of key data collected aiming to provide a context to the latter statistical analysis.

The high streets were profiled using data as follows:

- maps introducing study areas and the surveyed high streets (24 km of footpath)
- socio-economic characteristics of each local area using data published by Office for National Statistics based on the report *Creating the national classification of census data output areas*, 2005 University of Leeds
- primary data surveyed, such as the spider diagrams of the 10 street design quality audits, land-use surveys, visual footage of the high streets and surrounding housing areas
- length of high streets surveyed and other general data such as population and employment density
- key retail and housing data that were collated as part of the desktop research and/or provided by CACI.

🟧	Transient communities
🟥	Settled in the city
🟨	Thriving suburbs
🟫	Aspiring households
🟩	Multi-cultural: Asian communities
🟩	Multi-cultural: Afro-Caribbean communities

Study area and profile	High street		Housing on high street

Walworth

West Ealing

Kilburn

Clapham

Tooting

Streatham

North Finchley

Swiss Cottage

Chiswick

Hampstead

Sample profile

	Hampstead	Chiswick	Swiss Cottage	North Finchley	Streatham	Tooting	Clapham	Kilburn	West Ealing	Walworth
General data										
Population – residents[1]	22067	27505	38255	21800	41684	49370	37794	45342	27490	50992
Population – jobs / workplace[1]	12686	13536	14342	8396	9188	16211	12810	12055	12602	13498
Population density, no people per km[1]	116	131	169	75	116	139	143	161	108	239
Average weekly expenditure per head[2]	£219	£191	£181	£155	£120	£134	£127	£120	£154	£84
Total weekly expenditure	£4,831,554	£5,250,960	£6,923,678	£3,382,504	£5,007,539	£6,612,485	£4,801,777	£5,443,171	£4,233,328	£4,264,148
Total area km[2] of 800m buffer zone	3.41	2.918	4.321	4.541	5.224	4.912	3.526	4.425	3.102	4.257
Length of high street in km	1.517	2.552	2.848	2.460	3.457	3.644	1.947	2.410	1.378	1.715
Retail data										
Average zone A rent per m[2] [3]	1151	743	439	418	251	451	444	411	416	341
No. of shops: Comparison shops %[4]	40%	42%	30%	27%	22%	34%	15%	29%	29%	36%
No. of shops: Services and banking %[4]	30%	23%	33%	34%	32%	25%	32%	24%	26%	25%
No of shops: Catering %[4]	19%	20%	21%	19%	21%	18%	30%	21%	14%	16%
No of shops: Vacant, charity and betting %[4]	1%	6%	6%	10%	9%	8%	10%	8%	14%	9%
CACI retail offer footprint score 2005	140	129	86	106	97	163	28	146	90	86
CACI annual comparison spend 2005	£118,803,741	£85,984,723	£18,293,539	£52,779,492	£42,736,290	£78,073,230	£6,708,367	£37,539,726	£33,776,855	£20,164,444
CACI core catchment potential 2005	6.1%	2.9%	1.5%	6.5%	2.7%	5.5%	0.7%	2.4%	4.6%	1.7%
Housing data										
Average terraced house price 2005[5]	£761,191	£520,830	£841,659	£309,666	£266,396	£335,676	£440,330	£545,760	£298,310	£332,386
Average high street flat price 2005[5]	£454,000	£272,318	£279,050	£219,329	£179,860	£208,891	£254,879	£300,143	£246,791	£180,000
Public rented (% households)[6]	16%	14%	20%	11%	27%	16%	36%	36%	18%	70%
Private rented (% households)[6]	31%	23%	33%	23%	25%	27%	21%	25%	20%	10%

1 2001 Census
2 Expenditure figures from IMD Rank 2004 and ONS Family Expenditure Survey 2003
3 Rent figures from Valuation Office Agency 2005
4 Retail use breakdown from Colin Buchanan survey 2006
5 Property prices from Nethouseprice.com 2005
6 Rent breakdown from 2001 Census

Data processing

This chapter describes how the statistical analysis for the market price study was carried out and also presents the findings of the analysis including visual footage, data, maps and diagrams.

It concludes with the presentation of the regression functions that best explain the relationship between property price and the quality of street design and the calculation of user benefits accruing to pedestrians and the residents living along the high streets.

The table opposite provides a detailed illustration of the steps taken and the tasks dealt with in the study, particularly in the statistical analysis. It focuses on methods used to reduce the various datasets available down to the ones that had the highest explanatory value in the regression function.

The objective was to develop a model that helps to predict the property value performance of a high street and identify the contribution of street design quality to this performance. Generally, such a regression function is structured as follows:

> **Performance in £ =**
> **£ constant + £x + £z + £ street design quality**

A model like this would allow an estimate of the performance increase of a high street measured in £ and generated by street design improvements.

General criteria applied to determine the suitability of data were:

- the explanatory power of the data: to what extent did this data help explain property price?
- accessibility of data. Data were selected based on how accessible and available they were in order to ensure a replicable process in the future. Data that were costly to access were avoided
- quality and suitability of data for purpose. Where possible, data from commonly applied and regularly updated sources, and which were available at a suitable geographic scale were used.

Statistical analysis
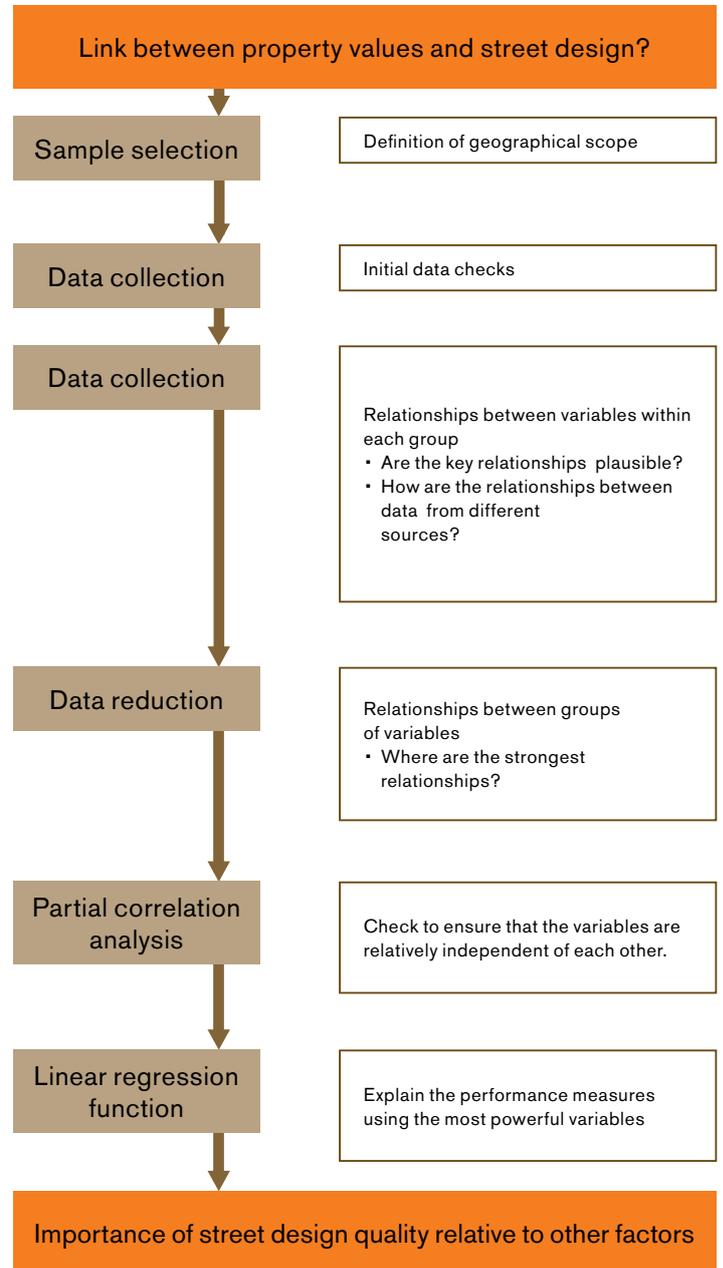
Data collection and analysis flow chart

Desktop research and data filtering

The statistical analysis of data aiming at the establishment of a regression model is a complex statistical procedure and aided by a special statistics software package. However, arriving at the best possible function is to some extent a matter of trial and error and naturally the larger the sample size the higher the statistical significance of the individual elements of the found regression model. The table below illustrates the range of data collected and shows how the filtering process reduces the data sets down to the ones that were most helpful in the statistical analysis. The next section on data processing describes this process in more detail with the following key milestones in process:

Establishing the right performance measure

Based on the comprehensive data made available in the data collection stages, a variety of potential housing and retail performance measures were considered. Where possible, all measures have been calculated on a per unit or per area basis to facilitate the interpretation of the results.

Data reduction

	Data collection	Performance measure and relationships explored	Data reduction	Data reduction
Retail	Retail offer score			
	% value, mass, premium	Retail offer score		
	Shopper population	Shopper population		
	Annual comparison spend	Annual comparison spend		
	Rent per zone A m^2	Rent per zone A m^2		
	Average rateable value	Average rateable value	Retail offer score	Retail offer score
	Average pedestrian flow	Average pedestrian flow	Annual comparison spend	Annual comparison spend
	Average façade quality	Average façade quality	Rent per zone A m^2	Rent per zone A m^2
	Core catchment market penetration	Core catchment market penetration	Core catchment market penetration	Core catchment market penetration
	% no. of shops vacant, charity or betting shops	% vacant, charity or betting shops	% vacant, charity or betting shops	% vacant, charity or betting shops
Housing	Average high street flat price	Average high street flat price	Average high street flat price	Average high street flat price
	Average terraced house price (800m buffer)	Average terraced house price (800m buffer)	Average terraced house price (800m buffer)	Average terraced house price (800m buffer)
	High street flat price / terraced house price (800m buffer)	High street flat price / terraced house price (800m buffer)		
PERS	Average PERS link score (weighted by SP priorities)	Average PERS link score (weighted by SP priorities)	Average PERS link score (weighted by SP priorities)	Average PERS link score (weighted by SP priorities)
Accessibility	Resident population (800m)	Resident population (800m)		
	Workplace population (800m)	Workplace population (800m)		
	Number of residents within x minutes (15, 20, 25, 30, 35, 40, 45 mins) PT	Number of residents within x minutes (15, 20, 25, 30, 35, 40, 45 mins) PT		
	Number of jobs within 45 minutes PT	Number of jobs within 45 minutes PT		
Socio-economic data	Population density	Population density	Total weekly expenditure (800m)	Total weekly expenditure (800m)
	IMD income	IMD income	Average weekly expenditure per person	
	IMD employment	IMD living environment		
	IMD living environment	Ethnic background		
	Professional categories / Qualifications	% public / private rent		
	Ethnic background	Total weekly expenditure (800m)		
	% public / private rent	Average weekly expenditure per capita		
	Total weekly expenditure (800m)			
	Average weekly expenditure per capita			

Correlations

Regression function

Sample equation

£ = x+y+street design quality

Housing: The property market is complex but it was assumed that the following factors are contributors to the market price:

- type of property
- accessibility to employment and local amenities
- socio-demographic characteristics of the local area
- school catchment areas
- access to green spaces
- building quality
- street design quality.

A good measure of the overall performance of a house within its marketplace is its sale price. This part of the research therefore focused on the questions of whether there is a relationship between street design quality and house/flat prices along high streets and, if there is, to what extent the street design quality explains the variance in price. For any given high street, many factors such as accessibility to public transport, green space and schools do not differ significantly between high street and surrounding areas. The average price of terraced houses in the surroundings of a sample high street therefore qualified as a good explanatory variable capturing the variations between the high streets allowing the flat prices and high street design quality to be isolated.

Retail: A variety of potential retail performance measures were considered based on the comprehensive data made available in the data collection stage. These are discussed in turn.

Retail rent is considered a good measure. Average zone A retail rent has been employed as a performance measure and explanatory variables such as local spending power and level of competition have been chosen to reflect wider supply/demand relationships. Retail data was collected for all shops and premises located on the high streets via the Valuation Office Agency (VOA) 2005 business rates, available on its website. The VOA works with a breakdown of floorspace within shops and premises. This approach involves putting different values on the main sales space based upon which zone it falls within. The most valuable zone (called zone A) is the area closest to the shop front.

Retail turnover or total turnover from all uses is assumed to be a good measure. However, the datasets available – Experian data and CACI retail footprint – are both modelled. They subsume many individual components and differ significantly. Therefore a range of questions regarding the significance of individual components arose.

Consumer spending is similar to turnover and is particularly useful when broken down by types of spending. An estimate of annual comparison spend from CACI's retail footprint has been employed as one performance measure. As this is based on comparison spend in multiple units, explanatory variables have been chosen accordingly.

Exploring data relationships

The first stage of the analysis involved examining the relationships between variables within the housing data and retail datasets separately. This type of analysis was used to assess the plausibility of the relationships observed. Where data came from a variety of sources a plausibility check was conducted. Furthermore, where variables correlated very strongly a reduction in the number of variables used was possible. For example, many of the socio-economic variables were strongly correlated to weekly expenditure per person and therefore of little additional use to the analysis.

Having reduced the number of variables within each data group the next step sought to explore the relationships between variables of different datasets. This method was used to establish which variables could be best used in the regression functions. Initial linear regression tests were conducted in order to check combinations of variables. A number of variables were filtered out because they showed no or only a very weak relationship to rental performance.

Local public transport accessibility was one of the variables that contributed very little to the explanation of retail performance and therefore was not further applied in the models tested. We assume this is related to the relative local character of the selected high streets. In other words, it seems that the market size of the high streets in the sample is small.

A linear regression model requires that the variables included do not overlap substantially in their explanatory power. Therefore, it is important to conduct a partial correlation analysis beforehand.

Finding a good linear regression model

All linear regression models were developed in a step-wise process aimed at identifying the combination of variables with the strongest explanatory power. A further explanatory variable was only added if a better fit could be achieved.

R squared is the standard statistical measure used, running from 0 to 1, to establish how well a model predicts the actually observed data. The closer R squared is to 1 the better the fit between model and observed data. However, even achieving a reasonable R squared value for the models in this study, the transferability will be limited. This is related to the small sample size that results in a high variability of the individual elements of the model.

Correlation analysis of high streets

Correlation analysis is a statistical method to capture the relationship between variables.

Correlations range from (-1) to (+1), whereby values closer to (+1) or (-1) have a stronger correlation and the direction of the relationship is expressed as +/-. Figure 15 illustrates the relatively strong relationship between flat prices along the sample high streets and house prices in the surrounding area. The statistical analysis showed a high correlation of +0.76 between them.

Housing

- A positive relationship between flat prices and street design quality is evident.
- Average house prices are correlated both with spending power and with public transport access to jobs.
- There is a very strong correlation between terraced house prices in the surrounding areas and flat prices on the high streets themselves. The exception to this relationship is Swiss Cottage. This is not altogether surprising as flats on the high street. are characterised by high levels of noise and air pollution, whereas some of the surrounding areas are in desirable residential areas combining proximity to Central London with a high quality of environment.
- Lower variance between sites regarding total expenditure than expenditure per person. This qualified the total expenditure variable to be taken forward as a more suitable element for the statistical analysis.
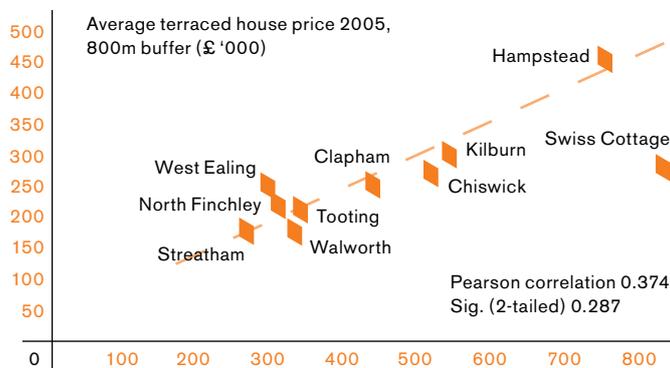
Figure 15: Correlation between sales prices: flats and terraced houses in surrounding area
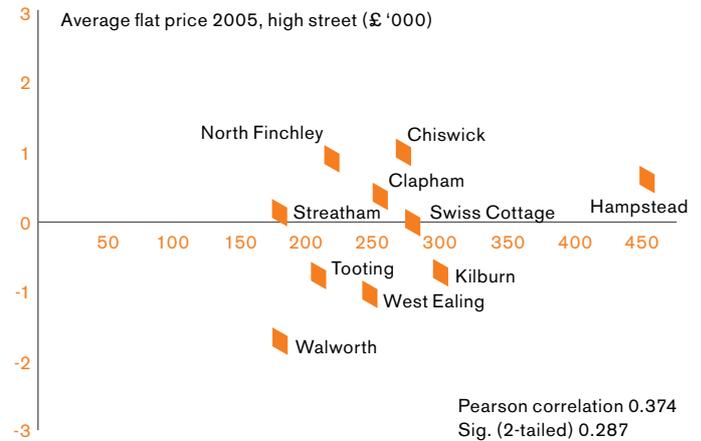
Figure 16 : Correlation between PERS score and flat sales prices

Retail

- There is a clear negative relationship between average zone A rents and the proportion of units either vacant or occupied by charity shops or betting/amusements shops.
- The link between street design quality and average zone A rents is less strong.
- Further, there is a strong relationship between average zone A rents and expenditure per person. The relationship with total local expenditure is less strong.
- The relationship between CACI's core catchment market penetration, measuring the extent of completion between high streets, and average zone A rents shows the expected direction, albeit with a weak relationship. The CACI's competition factor appears to gives sensible results: for example, Clapham is surrounded by strong competition whereas North Finchley has fewer strong town centres nearby.

Figure 17: Correlation between PERS score and average zone A shop rents 2005

Figure 18: Proportion of low rent premises and average zone A shop rents 2005

Figure 19: CACI market penetration and average zone A rents 2005

Regression models

Housing
The best fit model found has the following function:

> **High street flat price in £ =
> £129k + 0.28 x terraced house prices in surroundings +
> £13,600 x street design quality score**

The R squared value for this regression is 0.605. The standardised coefficients which explain the relative explanatory power of each variable are as follows:

Variable	Standardised beta coefficient
Average terraced house price in 800m buffer 2005 (£)	0.717
PERS score	0.153

These results indicate that environmental improvements at a high street in London raising the street design quality by one PERS score would add around £13,600 or 5 per cent to the value of a high street flat. Figure 20 shows the observed values compared to those calculated using the regression function. There is a relatively close fit except for Swiss Cottage and Hampstead.
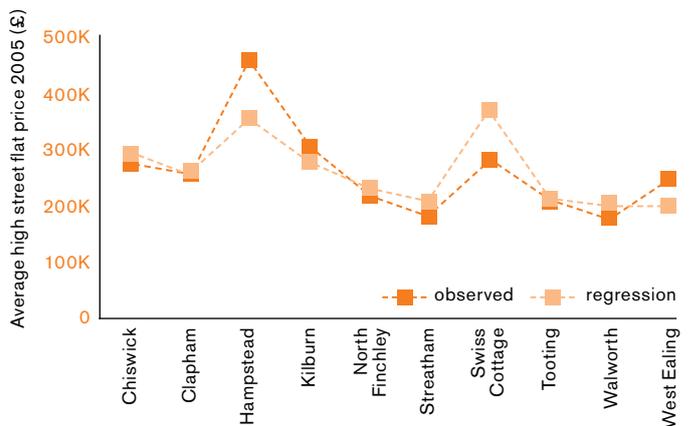
Figure 20: Regression model prices and observed flat prices

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Swiss Cottage and Hampstead high street are outliers and the rationale is not conclusive. However, in the case of Swiss Cottage, the analysis suggests that this is due to the considerable price difference between the high street and the surrounding area. For Hampstead, the research suggests that the high street flats are generally larger and very popular and, therefore, for an average high street flat in our sample, relatively expensive. A larger sample of high streets with a greater variety of average flat prices would probably produce a more robust best fit model. The inclusion of a further variable (for example, daily traffic flow) could be used to explain this better. West Ealing appears to differ from the best fit model, suggesting that further explanatory variables might be available.

A reasonable R squared value has been obtained for the model as a whole. However, as shown below, the variability of the individual elements is high. That variability is measured as standard deviation of the regression model and shown as follows:

Variable	Coefficients	Standard deviation
Constant	129,000	158,000
Average terraced house price in 800m buffer 2005 (£):	0.283	0.31
Street design quality score (PERS score)	13,600	70,000

Considering the sample size of 10 the high variability represents an anticipated result.

Retail
The best fit model found for retail rents has the following function:

**Zone A rent of shops in £/m² =
(-£4600 x V)+ 0.26 x E + £5000 x C +
£25 x street design quality score**

where:
V = Proportion of units vacant, charity shops or betting shops/ amusements
E = Total weekly expenditure in 800m buffer per km² (£000)
C = CACI core catchment market potential (measure of competition)
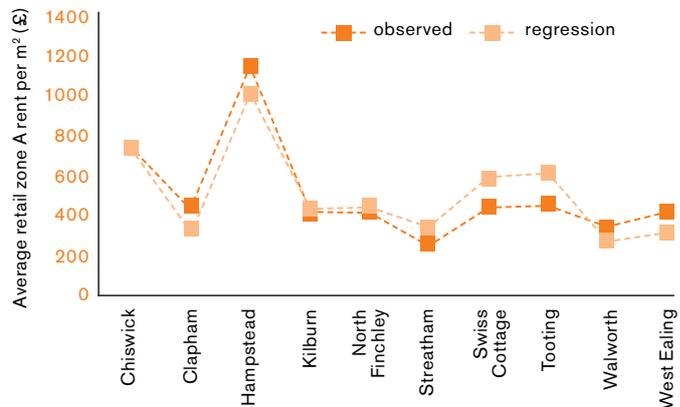
Figure 21: Regression model prices and observed zone A shop rents

The R squared value for this regression function is very high at 0.825. This is partly explained by the small sample size. Figure 21 compares the observed values with those calculated using the regression model.

The standard deviation of the regression model per element of the model is as follows:

Variable	Coefficients	Standard deviation
Proportion of units vacant etc.	4600	5663
Core catchment market penetration	4990	8077
Total weekly expenditure per km² ('000)	0.26	0.57
Street design quality score (PERS)	25	80

The retail model based on collected data of the 10 sites suggests that an increase by one street design score would equate to a £25 per square metre or equivalent of 5 per cent of annual rent increase of retail zone A floors space per squared metre. When Hampstead is excluded, the relative explanatory power of the street design variable remains virtually unchanged but the value of one score increases to around £40. A larger sample of high streets with a greater variety of retail rents filling the gap between Hampstead high street and the remainder would be likely to result in less variance and would produce a more robust model.

Conclusions

Whilst not producing statistically significant findings, the regression analysis clearly shows that:

- it is possible to derive the value of street improvements
- in this particular sample that value appears to be strongly positive.

Reconciliation

This chapter describes the derivation of the user benefits that would be derived from improvements in street quality at each of the high streets and attempts to reconcile those findings with the variations described in the chapter on data processing.

User benefits for pedestrians

For the purpose of this study the user benefits for pedestrians were calculated for each high street using two different scenarios portraying the value of a potential user benefit generated:

- all the different PERS categories for each high street are improved to the best possible score (+3)
- all the individual street design characteristics are improved by one.

In each scenario the benefits per individual pedestrian were then converted into total user benefits taking the annual pedestrian footfall and the average time spent on the high street into account. Figure 22 illustrates the varying levels of pedestrian user benefits created per year for both scenarios.

The total value of pedestrian user benefits is highly correlated with two factors:

- number of pedestrians
- the scale of improvement realised (+1, +2, +3, +4, +5).

Benefits in the scenario 'all observed scores up to level +3' are therefore particularly high at Walworth Road and Tooting and Kilburn high streets. Partly due to their length, they have high numbers of pedestrians but relatively low levels of street design quality. Hampstead high street, on the other hand, is comparatively short and offers good pedestrian provision and so the increase in pedestrian user benefits is comparably low.

It is worth noting that the monetised pedestrian user benefits do not currently cover all benefits to all types of pedestrians that might be generated by the street design improvements. There are currently no monetary values available indicating user benefits for disabled pedestrians and wheelchair users as well as for cyclists and to some extent for young people.
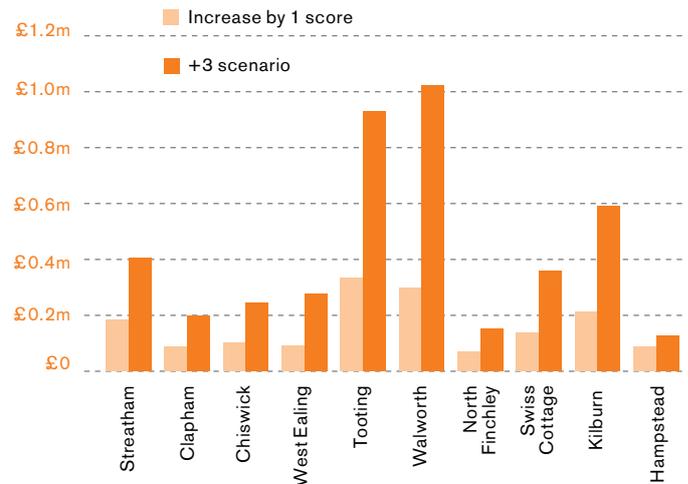
Figure 22: Calculated annual pedestrian user benefits for two improvement scenarios

User benefits for residents in flats

In order to provide a comparison with the market price impact on flats, an estimate of the scale of user benefits accruing to the occupants of an individual flat was required.

This calculation is based on a number of simple assumptions about occupancy and usage of the street. The values produced are only for the time spent in the street and do not consider benefits that might accrue to residents within their homes from improved street quality, such as noise, air quality and visual attractiveness.

Assumptions:

- average occupancy of flat: two people
- average time per person per day spent in street: 30 minutes
- value per minute from scenario 'each score up by one': 0.017 pence per minute*
- days of usage per year: 300

Value of residents user benefits per year per flat (estimate): £306 (2 x 30min x 0.017 x 300)

* Vary by site, these numbers are an average over all sites in the sample.

Market prices for flats compared to residents user benefit calculated

The statistical analysis found that on average across the ten sites an increase in street design quality by one score would result in an anticipated increase in high street flat prices of approximately £13,600, equivalent to 5 per cent of the property value.

The figure below shows the user benefits accruing per high street flat, capitalised over a period of 12 years. Based on the assumptions outlined above the residents of one flat would value an improved street design (one PERS score up) by about £3,000.
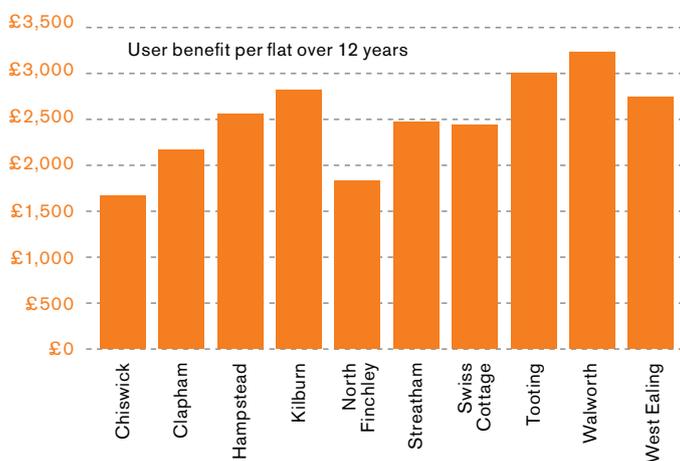
Figure 23: User benefit per flat over 12 years

The market price value looks to be significantly higher than that derived from the user benefits. The likely explanations for this are:

· That there are benefits that accrue to residents whilst they are inside
· That capitalising benefits over 12 years is too short a time period.

Market prices of retail rents compared to pedestrian user benefit

The regression analysis found that across the ten sites, an increase in the street design quality (PERS score) by one was correlated with an increase in zone A rentals of £25 per square metre and per year. On average over the ten sites that works out as a 5 per cent year increase in rental values of zone A area in shops. Figure 24 illustrates the calculated annual rent increase by site, assuming street design improvements by one street design score.
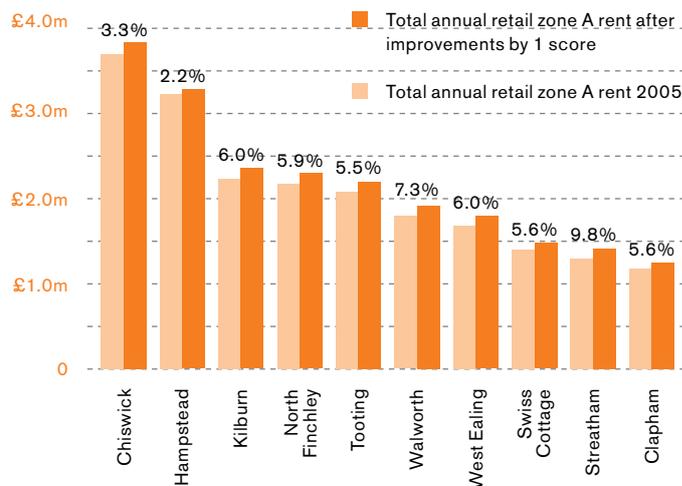
Figure 24: Zone A shop rents current and after improving the street design by one PERS score

Based on these individual results it is possible to compare the value of pedestrian user benefits with the calculated annual increase in zone A retail rents.
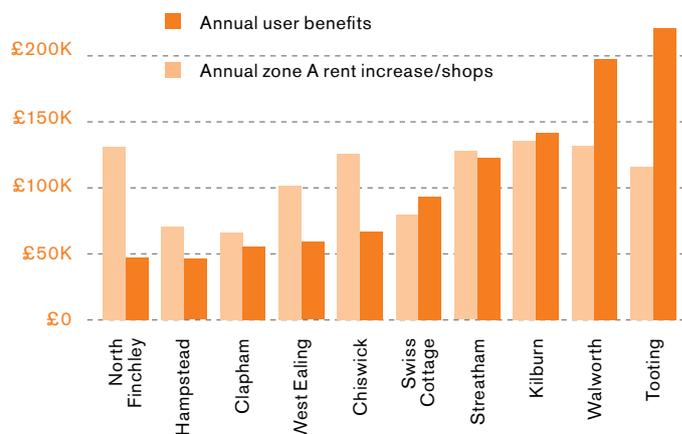
Figure 25: Zone A shop rents 2005 and pedestrian user benefits

The figure above shows that total user benefits and the increase in retail zone A shop rents vary significantly from one high street to another, although on average the two are quite close. There is no simple reconciliation at this stage of the research between the two findings, but they are not out of line and hence are broadly consistent. Differences could be explained by a number of factors such as differences in average spending per pedestrian, other socio-economic characteristics and variations in the land use mix at the sites (shop/restaurant/service/public sector).

Appendix A
Data and method

A. Surveys

Pedestrian environmental review system (PERS)

The pedestrian environment review system (PERS), developed by Transport Research Laboratory, creates a systematic framework so that pedestrian provision can be assessed, reviewed and audited. With PERS, reviews are quick to conduct and present a cost-effective method for assessment of pedestrian routes with information that is consistent, easily comparable and clearly presented. PERS can:

- identify deficiencies in levels of service and provision of suitable pedestrian support
- systematically assess pedestrian needs and prioritise improvements
- strengthen objectivity in the decision making process
- produce focussed and transparent project proposals based on a clear and consistent evaluation framework.

In this demonstration study we used a simplified version of PERS comprising paper-based assessment forms and PERS summary sheets, including scoring charts assisting the review process. PERS in its full version is a powerful software tool that is flexible enough to help quickly capture and structure traditional pedestrian issues, such as town centre access, safe routes to school and the establishment of home zones. Individual assessment of each link/place in the pedestrian route and crossing acts to create a comprehensive environment review and includes rating a variety of criteria on a seven-point scale. This allows for positive and negative deviations and the flexibility to assess the perceived importance of individual elements. The type of pedestrian environment to be reviewed defines each specific link, so a town centre may be categorised into several links for walkers as the environment and surroundings change. The pedestrian environment is then assessed using four overall parameters:

- capacity
- safety
- quality
- legibility

These parameters are rated alongside a range of relevant criteria such as surface quality, lighting, conflict with traffic, pedestrian facilities, obstructions, cleaning and drainage. Crossings are assessed in terms of crossing type, deviation from the desired route and refuge quality. Surveys of a particular route also cover additional assessment criteria such as rest points, public spaces and permeability, and other factors such as road safety. All these aspects are combined by PERS to provide a comprehensive, quantitative assessment of the pedestrian environment and its key elements. The entire analysis enables objective comparisons of the level of service for pedestrians along different routes, so that effective strategic

decision making and targeting of investment at a town and borough level can be made towards a best value approach. PERS is not just an appraisal tool, it provides a graphical output suitable for public consultation (full version).

PERS is adaptable and flexible to meet the needs of pedestrian situations providing high rates of return. For example, in reviewing the pedestrian environment around a school, assessment issues, such as safety can be given a greater weighting in order to place increased emphasis on the importance of this factor on a walking journey to school.

Similarly, in assessing a home zone, the headings can be appropriately adapted to be of relevance to this sort of walking environment.

The PERS approach consists of three integrated components

- a comprehensive handbook for users giving guidance on the physical review
- data collection sheets for use on-site
- specially designed and developed software to allow for rapid analysis and comparison of routes.

Pedestrian activity on the high street

Colin Buchanan's survey team conducted pedestrian spot counts on each of the high streets. Pedestrians were counted at four cordons on each high street during six 15-minute intervals in three periods (07:30–09:30, 12:00–14:00, 16:30–18:30). The gained understanding of the number of pedestrians using the high street was then factored up to a full 24-hour day based on typical London high street usage patterns available to the project.

Retail survey

Colin Buchanan's survey team conducted a full land-use survey on each of the high streets (24km of high street facades). In total, 17 categories with an additional 42 sub-categories were considered including vacant premises. This comprehensive survey captured the mix of uses along a high street and aided an analysis of the ratio between independent and multiple retail premises. Additionally, the visual attractiveness of each ground floor frontage was assessed on a scale from -3 to +3 matching the PERS scoring system.

Public transport accessibility

Public transport accessibility data was generated using Colin Buchanan's ABRA model. This was initially considered as important for the statistical analysis due to the fact that accessibility is considered a key factor in the determination of property values. Average journey times including walking and waiting times between the high streets and all locations in Greater London lower super output areas were calculated. This was then used as the number of people in the catchment area of 20, 30 and 45 minutes to the high street.

B. Socio-economic data

The main source used to collect socio-economic data was the Office of National Statistics 2001 census at output area (OA) level. Initially a wide range of census data was collected for all the output areas is situated within the 800 metre buffer around a high street. This included for some of the data the geocodes which allowed the reproduction of maps.

Leeds University has developed a socio-demographic profiling methodology at the output area level, the smallest geographical level on which 2001 census data is publicly available. The actual dataset is published on the Office of National Statistics website and is based on the whole census data as opposed to ACORN, which is based on a sample only. It develops seven different socio-economic profile groups with 21 sub-groups. A mapping exercise of those provided the study with a useful picture of the key socio-economic features of the 800 buffer zones. These maps are presented in section 4 of this report.

Indices of deprivation

Indices of multiple deprivation (IMD), based on census data and published by the Office of the Deputy Prime Minister (ODPM) in 2004 were collected at super output area level for the 800 metre zones along the high streets . The indices are based on seven domains of deprivation: income, employment, health and disability, education, housing, living environment and crime.

Each index and score is produced from a number of indicators, mainly derived from 2001 census data. The scores and the rank for the following themes were collected:

- income
- employment
- living environment
- education

Income data and household expenditure

Retail performance and house prices are both closely linked with household income. Income data is available only at borough level, which was considered as not geographically detailed enough for the purpose of this study. Therefore, weekly household expenditure data were calculated using two data sources:

- The ONS family spending survey for 2002/03 provides information on household expenditure by income decile – the population divided into 10 groups of 10 per cent. This can be used to understand the national distribution of household income.
- The national index of multiple deprivation score for income is available and provides a recognised measure of income deprivation. Scores are also available as a ranking.

Figure 26 demonstrates how a weekly expenditure estimate was calculated for each super output area in the 800 metre buffer zones along the sample high streets. Based on position in the IMD income ranking, the average weekly household expenditure of each output area was estimated from the Office of National Statistics family expenditure survey. This average was then multiplied by the number of households in each output area to calculate the weekly expenditure of that output area.

This data were used to create two key measures:
- Average weekly expenditure per person can be calculated by dividing the weekly expenditure of the output area by the population resident there. An average for the whole 800 metre buffer zone can then be calculated giving an average per person.
- Total weekly expenditure for the 800 metre buffer can be calculated by summing the weekly expenditure of all the output areas. This gives a measure combining both income levels and population density.

Figure 26: How weekly expenditure was estimated

SOA – ED1000897 (LB Camden)
UK IMD Income ranking: 29750th (91.589%)
Estimated av. weekly household expenditure: £673.79

(765 households in SOA/6 OAs – 127.5)
Total weekly expenditure per each OA within ED1000876:
£673.79 127.5 households – £85,908

SOA – ED1000876 (LB Camden)
UK IMD Income ranking: 2457th (7.564%)
Estimated av. weekly household expenditure: £161.15

(726 households in SOA/6 OAs – 121)
Total weekly expenditure per each OA within ED1000876:
£161.15 121 households – £19,499

ONS family expenditure survey 2003 by decille

C. Market price data

Housing

Publicly available housing sales price data was collected from two internet sites:

- nethouseprices.com
- rightmove.co.uk

These sites allow users to collect data on sold prices of dwellings by type (flat, terraced houses, semi-detached and detached housing) for a street or a postcode area. All sales data used is based on published data by the UK Land Registry and each of the used sources provided specific advantages regarding ease of extracting data and time period covered.

Data on house sales was not collected for high streets as they represent only a marginal percentage of dwellings in the various streets studied. Although, information for all six years was gathered, only 2005 sales was used in the final analysis, as it represented the most complete and largest dataset for all high streets.

For reasons of practicality, nethouseprices.com was used to collect data for flat sales on the different high streets. Flat sales data was collected for flats situated on the portion of the high street determined by the PERS study area. A small number of flat sales below £100,000 were excluded as these are assumed to represent affordable or key worker sales that do not represent true market value.

Rightmove.com was used to collect data on (terraced) house prices in the area surrounding the high streets. The 800 metre zone was used as the geographical reference. The average sales prices in 2005 for all four digit postcodes contained within the 800 metre zone was retrieved from the internet site, which was then used to calculate the overall average for the surrounding area.

Retail

Data availability, accessibility and suitability for the purpose of this part of the study was less clear than for the housing case study. A wide range of data held both by private and public sector agents was collected and tested regarding their suitability. Additionally, a retail survey and pedestrian counts where conducted. Data sources were as follows:

Retail rents – Valuation Office Agency (VOA)

Retail data was collected for all shops and premises located on the high streets via the Valuation Office Agency 2005 business rates, available on their internet site. The VOA works with a breakdown of floorspace within shops and premises. As it explains on its website (www.voa.gov.uk): 'This approach involves putting different values on the main sales space based upon which 'zone' it falls within. The most valuable zone (called zone A) is that area which is closest to the shop front. The next zone (zone B) is the area of sales space which lies beyond zone A and, where the shop is large enough, the remaining sales space may be included in zone C and a "remainder" zone. In general, the depth of each zone is 6.1 metres (20 feet) so the total amount of space within each zone will depend upon the width of the sales space within that zone. However, the depth of the zone A space may vary from 6.1 metres depending upon the position of the shop and its location. Generally, the value per square metre adopted for the zone A part of the shop is reduced by 50 per cent to value the sales space in zone B and reduced by a further 50 per cent to value sales space within zone C etc.' (www.voa.gov.uk)

The valuation of all shops and premises along the high street was extracted, which enabled calculations as follows:

- total number of shops and premises
- number of retail zone A units
- total of retail zone A rent value [£/m^2]
- average retail zone A rent value [£/m^2]
- average rateable value [£/m^2]

This data is publicly available and is updated in a five year cycle. Details of the VOA principles for calculating business rates can be found in volume 4 of the instruction manual available on-line
The three main methods of valuation are based on rental evidence, the receipts and expenditure method, or the contractor's basis of valuation.

CACI retail footprint data

CACI's retail footprint model provided a retail catchment model. In principle, it is a gravity model based on four components:

- a combination of distance or travel time by car
- the 'attractiveness' of the retail offer
- the degree of intervening opportunities or level of competition
- the size of the population within an area.

The retail footprint model has been calibrated against observed credit card spending data and calculated four catchments for each retail centre:

- primary – 50 per cent of expenditure flows to a centre
- secondary – 75 per cent of expenditure flows to a centre
- tertiary – 90 per cent of expenditure flows to a centre
- quaternary – Remaining expenditure flows to a centre.

A series of data was extracted from the model for each of the sample high streets to test the suitability of the data for the purpose of this study:

- retail footprint score – a measure of the retail offer based on the type and size of comparison shopping units
- percentage of value, mass and premium units residential population – total population in all four catchments
- shopper population – total comparison expenditure expressed as the number of shoppers
- annual comparison spend – total annual comparison expenditure
- core catchment market penetration – percentage of comparison expenditure 'caught' from the primary and secondary catchments.

Retail turnover data
Observed turnover data was thought to be a good retail performance indicator, but no published data was found. Turnover figures (modeled by both CACI and Experian for comparison goods floorspace need assessment conducted as part of the GLA London town centre assessment 2001) were available for nine of the ten high streets.

Appendix B
Statistical analysis

The tables in this appendix show how each of the regression analyses were conducted, explaining the models used at each stage.

Zone A retail regression model

Regression

Variables entered/removed[b]

Model	Variables entered	Variables removed	Method
1	PERS score, total weekly expenditure in 800m buffer per km^2, core attachment market penetration, proportion of retail units vacant, charity or betting[a]		Enter

a. All requested variables entered
b. Dependent variable: average zone A rent per m^2 (£)

Model summary

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	.908[a]	.825	.685	145.085

a. Predictors: (Constant), total weekly expenditure in 800m buffer per km^2, core catchment market penetration, proportion of retail units vacant, charity or betting

Anova[b]

Model	Sum of squares	df	Mean square	F	Sig.
1 Regression	495420.18	4	123855.044	5.884	.039[a]
Residual	105248.32	5	21049.665		
Total	600668.50	9			

a. Predictors: (Constant), PERS score, total weekly expenditure in 800m buffer per km^2, core catchment market penetration, proportion of retail units vacant, charity or betting
b. Dependent variable: average zone A rent per m^2 (£)

Coefficients[a]

Model	Unstandardised coefficients		Standardized coefficients	t	Sig.	95% confidence interval for B	
	B	Std. error	Beta			Lower bound	Upper bound
1 (Constant)	383.625	364.888		1.051	.341	-554.349	1321.600
Proportion of retail units vacant, charity or betting	-4643.418	1791.757	-.582	-2.592	.049	-9249.277	-37.560
Total weekly expenditure in 800m buffer per km^2,	.000	.000	.319	1.454	.206	.000	.001
Core attachment market penetration,	4950.866	2556.310	.395	1.937	.111	-1620.339	11522.070
PERS score	24.771	60.380	.086	.410	.699	-130.441	179.983

a. Dependent variable: average zone A rent per m^2 (£)

Flat price regression models

Regression

Variables entered/removed[b]

Model	Variables entered	Variables removed	Method
1	PERS score, average terraced house price in 800m buffer 2005 (£)[a]		Enter

a. All requested variables entered
b. Dependent variable: average high street flat price 2005 (£)

Model summary

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	.778[a]	.605	.492	56737.743

a. Predictors: (constant), PERS score, retail officer (CACI score), total weekly expenditure in 800m buffer 2005 (£)

Anova[b]

Model	Sum of squares	df	Mean square	F	Sig.
1 Regression	3.5E+010	2	17257515960	5.361	.039[a]
Residual	2.3E+010	7	3219171483.4		
Total	5.7E+010	9			

a. Predictors: (constant), PERS score, average terraced house price in 800m buffer 2005 (£)
b. Dependent variable: average high street flat price 2005 (£)

Coefficients[a]

Model	Unstandardised coefficients		Standardized coefficients	t	Sig.	95% confidence interval for B	
	B	Std. error	Beta			Lower bound	Upper bound
1 (Constant)	129380.34	50123.452		2.581	.036	10857.212	247903.472
Average terraced house price in 800m buffer 2005 (£)	.283	.099	.717	2.872	.024	.050	.517
PERS score	13612.738	22280.668	.153	.611	.561	-39072.670	66298.147

a. Dependent variable: average high street flat price 2005 (£)

Retail regression model with CACI data

Regression

Variables entered/removed[b]

Model	Variables entered	Variables removed	Method
1	PERS score, retail officer (CACI score), total weekly expenditure in 800 m buffer per km², core catchment market penetration [a]		Enter

a. All requested variables entered.
b. Dependent variable: annual comparison spend per zone A m² 2005 (£)

Model summary

Model	R	R Square	Adjusted R square	Std. error of the estimate
1	.799[a]	.639	.350	9614.599

a. Predictors: (constant), PERS score, retail officer (CACI score), total weekly expenditure in 800m buffer per km², core catchment market penetration

Anova[b]

Model	Sum of squares	df	Mean square	F	Sig.
1 Regression	8.2E+008	4	204416728.85	2.211	.204[a]
Residual	4.6E+008	5	92440520.198		
Total	1.2E+009	9			

a. Predictors: (constant), PERS score, retail officer (CACI score), total weekly expenditure in 800m buffer per km², core catchment market penetration
b. Dependent variable: annual comparison spend per zone A m² 2005 (£)

Coefficients[a]

Model	Unstandardised coefficients		Standardized coefficients	t	Sig.	95% confidence interval for B	
	B	Std. error	Beta			Lower bound	Upper bound
1 (Constant)	-21582.599	17079.022		-1.264	.262	-65485.623	22320.424
Retail officer (CACI score)	64.971	113.416	.213	.573	.592	-226.574	356.516
Total weekly expenditure in 800m buffer per km²	.013	.012	.336	1.073	.332	-.018	.043
Core catchment market penetration	319054.24	228471.99	.552	1.396	.221	-268251.717	906360.189
PERS score	2663.352	4006.996	.199	.665	.536	-7636.960	12963.663

a. Dependent variable: annual comparison spend per zone A m² 2005 (£)

Partial correlation analysis PERS

Correlations

Control variables			Average zone A rent per m² (£)	Average high street flat price 2005 (£)	PERS score	Average weekly expenditure per head 2003 in 800m buffer (£)
none[a]	Average zone A rent per m² (£)	Correlation Significance (2-tailed) df	1.000 0	.889 .001 8	.465 .176 8	.808 .005 8
	Average high street flat price (£)	Correlation Significance (2-tailed) df	.889 .001 8	1.000 0	.374 .287 8	.756 .011 8
	PERS score	Correlation Significance (2-tailed) df	.465 .176 8	.374 .287 8	1.000 0	.666 .035 8
	Average weekly expenditure per head 2003 in 800m buffer (£)	Correlation Significance (2-tailed) df	.808 .005 8	.756 .011 8	.666 .035 8	1.000 0
Average weekly expenditure per head 2003 in 800m buffer (£)	Average zone A rent per m² (£)	Correlation Significance (2-tailed) df	1.000 0	.720 .029 7	-.167 .668 7	
	Average high street flat price 2005 (£)	Correlation Significance (2-tailed) df	.720 .029 7	1.000 0	-.266 .490 7	
	PERS score	Correlation Significance (2-tailed) df	-.167 .668 7	-.266 .490 7	1.000 0	

a. Cells contain zero-order (Pearson) correlations.

Appendix C
Acknowledgements

This report presents new research that shows how good street design contributes both economic benefits and public value. It shows that investment in design quality brings quantifiable financial returns and that people value improvements to their streets.
It is intended for local authorities, regional government, business, developers and investors. For the first time we can see that the best streets really are paved with gold.

Design better streets

Paved with gold is part of a wider CABE programme that provides research, guidance and case studies aimed at promoting high-quality street design. For more information see www.cabe.org.uk/streets

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