A sustainability assessment framework for the high street

Abstract

High street decline is a topic that has received a great deal of political and media attention within the last decade in the UK. External factors, such as the growth in online retail and changing economic conditions, have contributed to the shift in consumer needs and expectations, while many high streets have struggled to sustain the pace of the change. The sustainability of high street is influenced by a range of complex economic, environmental and social factors. As consumer needs and expectations increasingly favour social and experiential high street functions, the need to review the perception of high street success is vital. Here we identify, characterise and evaluate a set of criteria that can be used to assess the high street sustainability. By conducting the survey amongst professional experts and residents, the significance of these criteria is determined. Through the application of multiple criteria decision making (MCDM) method COmplex PRoportional ASsessment (COPRAS), the sustainability of several towns' high streets in England is assessed. Altogether, this study for the first time develops a sustainability assessment framework for the high street. It can be used to assist policy makers and key stakeholders in making effective decisions regarding the allocation of resources and identifying locations that require investment and development. The sustainability assessment framework for the high street can assist in achieving national and global commitments for the sustainable development.

Keywords: high street, sustainability, sustainable development; multiple criteria decision making; assessment framework

1. Introduction

The creation of thriving sustainable high streets has been a key aspiration and driver of UK planning policy since the early 1990s. However, various factors including the emergence of online retailing and competition from out-of-town shopping centres have drawn people away from the high street (Jones and Livingstone, 2018; Jones, 2021). Whereas some high streets have adapted to these circumstances, the general trend remains in decline. The pressure has been placed on the government to respond to the 'high street crisis' (Portas, 2011; Carmona, 2021). The "Future High Streets Fund" was launched in December 2018 (MHCLG, 2018) aiming to support town and communities in the transformation of their high streets, pointing to the need for better understanding of the key influencing factors that will help achieve this task.

The term 'high street' is ambiguous and can cause some confusion as it can apply across geographic scales from smaller market towns or suburban centres to larger industrial towns and cities. Wherever it is located, the high street plays a multi-functional role (URBED, 1994). It is usually the main place for commercial activity, including shopping, business and financial services and administration. High street is often the principal location for cultural and leisure activities including artistic and entertainment venues, bars, cafes and restaurants. It usually provides public transport hubs for local services and regional connections. High streets of historic centres, and increasingly metropolitan cities can also be a focus for tourism. Notably, a residential function of many high streets has increased in recent years with more opportunities for students and young professionals to live in the town centre. It should also be noted that the term 'high street' is often used interchangeably with other term such as 'town centre' that in essence plays a traditional multi-functional role. For the purpose of this paper 'high street' is the preferred term although occasionally, particularly when citing other work, 'town centre' may be used. Notwithstanding of the multi-functional role and elasticity of the high street, changing trends of retailing continue to exert the most significant pressure on high street sustainability.

Fast paced changes of consumer trends and economic conditions lead the high street to evolve, extinct or survive with little change if interventionist strategy is taken (Carmona, 2021). The progressive approach, however, steers the high street to evolve from one that is focused largely on the retail activities, to the one that facilitates social and cultural experiences supported by economic and environmental drivers. It is, therefore, apparent that the ability of high street to respond to this changing landscape in a sustainable way depends widely on the combination of complex and sometimes conflicting economic, environmental and social factors that are influential to the high street evolution.

Multiple criteria decision making (MCDM) methods can be used to assess, find solution and facilitate the decision making when the problem comprises multiple and conflicting factors (Mulliner et al., 2016), such as those influencing the high street sustainability. MCDM methods can handle the varying significance of decision criteria through weightings. By utilizing stakeholder opinions to inform weightings and criteria values, these methods enable criteria with less available data to be analysed. The ability to incorporate stakeholder opinions is particularly noteworthy for this study, given that expert and consumer views can be hugely influential to the high street development. MCDM methodology has become popular in applications for sustainability issues given the multi-dimensionality of the concept (Wang et al. 2009, Mulliner et al., 2016; Zavadskas et al., 2016) and with specific reference to the built

environment there have been a number of recent applications (Mulliner et al., 2013; Zavadskas et al., 2017; Dičiunaite-Rauktiene et al., 2018). For example, a range of MCDM methods were applied to assess sustainable housing affordability (Mulliner et al. 2016) and to evaluate the usage and perception of pedestrian zones (Dičiunaite-Rauktiene et al., 2018), whereas Moghadam (2017) adopted a similar approach to develop a spatial decision support tool for low carbon cities. MCDM utilises various different models such as Weighted Sum Model (WSM), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) and COmplex PRoportional ASsessment (COPRAS) and many others (Maliene et al. 2018).

This study extends recent research (Carmona, 2015; Parker et al., 2017) by establishing a comprehensive set of criteria required to assess the sustainability of high street. It is aimed to offer a sustainability assessment framework supported by the MCDM approach, which can be applied to the problem of assessing high streets. This methodology enables to inform interested parties, i.e. residents, retailers, developers and any decision makers; on the holistic performance and sustainability of high streets.

2. The high street and sustainability

Over recent decades the high street has faced multiple pressures including changing consumer trends, competition from retail-park and out-of-town developments, and increased costs associated with occupying high street locations, whilst the last decade has seen the emergence and rapid growth of online internet-based shopping. Hallsworth and Coca-Stefaniak (2018) advise that it is misleading to assume that all the troubles of the high street are caused by the rapid evolvement of online shopping habits but the year-on-year increase in internet sales accounts for an ever greater share of all retail sales in the UK, and an associated trend is the emergence of 'click and collect' shopping (Couch, 2016). Wrigley and Lambiri (2015) reported further acceleration of sales via online channels during 2014 amounting to an annual increase of over 12%, but at the same time argued that the internet could be used as 'a tool to enhance the vitality of town centres'. Despite this optimism, almost every town centre in England and Wales has declined since 2013, with an average loss of 8% of shops. As Parker et al. (2017) concluded, 'UK high streets are facing a period of turbulent change'.

Audretsch (2015) highlights that policy plays an important role influencing economic performance of places. The policy intervention in the strategic management of places can be driven through institutions, which facilitate decision-making, and in implementing the strategic management of a place by intervening the particular resources, modifying the structure and organisation of economic activity, or brand the place with particular image or identity (Audretsch et al., 2015). In the UK there have been numerous government backed reports and policy initiatives designed to combat the threat to high streets and town centres (Hallsworth and Coca-Stefaniak, 2018; Parker et al., 2017). Central to the debate is to develop a better understanding of how the performance of high streets can be measured more effectively in order to provide a basis for the development of strategies and interventions to improve town centres (Wrigley and Lambiri, 2014). In the development of town centre planning policy, the government recommended local authorities undertake town centre health checks using a range of quantitative indicators such as the proportion of vacant units, commercial yields and rents, diversity of uses and pedestrian flows, combined with more qualitative indicators such as environmental quality and the perception of crime and personal safety (DETR, 1996). More

recently, Carmona (2015) developed a similar but more comprehensive approach to the analysis of high streets with particular reference to London, whereas Parker et al. (2017) identified a large set of factors influencing on the vitality and viability of UK high streets. Notably, both studies identify the need for broader, all-inclusive high street performance analysis that can reflect not only on the requirements and expectations of key interested parties including residents, retailers and developers, but also acknowledge the contribution of high streets to the sustainability agenda of built environment.

The term 'sustainability' arises from the notion of 'sustainable development' that has come to the prominence over the last several decades (Hopwood et al., 2005; Maliene et al., 2008; Pašakarnis et al., 2013; Riahi et al., 2017; Moyer and Hedden, 2020). It has originally been instigated by environmental concerns and defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report, 1987). However, due to its multi-functional nature, the definition of 'sustainability' perceives a limited agreement amongst competing perspectives of geographers, economists, sociologists, politicians or other parties involved in the urban planning and science (Ritch, 2015; Moore et al., 2017; Huovila et al., 2019; Barata-Salgueiro and Guimarães, 2020). High streets (or town centres) bring in a wider range of socio-economic interpretations by confusing the issue further (Griffiths, S et al., 2008; Wrigley and Lambiri, 2014; Sparks, 2021).

Owing to the broad range of definitions of sustainability and the lack of clarity in the literature, in this study we take flexible approach by engaging with a wide range of generic social, economic and environmental factors that are favourable to the viability and health of the high street. The sustainability is interpreted here as a complex of high streets characteristics imbedded within a diverse range of socio-economic activities and enabling this concept in the context of sustainable urban development. We seek to emphasize a wide range of criteria that contribute to the high street sustainability (Table 1 and references within), which can help to create a balance between social, economic and environmental factors. At the same time, it has been recognised that interactions between diverse factors can be complex and received differently by interested parties (Dassen et al., 2013; Dičiunaite-Rauktiene et al., 2018).

3. Materials and Methods

3.1. Criteria identification and validation

Criteria contributing to high street sustainability were identified through the extensive literature review and relevant references are listed in Table 1. Questionnaire-based survey involving industry professionals (e.g. planners, surveyors, architects etc.) was carried out as described below to validate criteria and their contribution to the high street sustainability.

3.2. Survey

Two groups of respondents, professionals and residents, were invited to complete online questionnaire during the period of January-June 2018.

The survey involving professionals was aimed to validate the criteria identified by the review of literature, and to obtain criteria importance scores for estimating the criteria weights. This

group of participants comprised industry professionals based in England including planners, surveyors, architects, managers, etc. The potential participants were identified through the online searches and directories of professional accreditation bodies such as Royal Town Planning Institute and Royal Institution of Chartered Surveyors, aiming to obtain balanced representation from different professional groups. A total of 300 professionals were invited to complete the questionnaire compiled using Bristol Online Surveys.

High streets from eight towns in different location of England including Basingstoke, Birkenhead, Corby, Gosport, Great Yarmouth, Rotherham, Shrewsbury and Southport were selected for analysis. These are further referred to as 'alternatives' in this study.

Questionnaire for both the professionals and residents invited to allocate importance scores to each of the criteria using an ordinal scale of measurement. Each criterion was rated using a 5-point scale ranging from 1 (not important at all), 2 (slightly important), 3 (fairly important), 4 (very important) to 5 (extremely important). This enabled to establish importance of each criterion to high street sustainability from the perspective of both interested parties, the professionals and the residents.

For survey involving residents, the primary purpose was to obtain criteria importance scores, and values by which each high street could be compared against the criteria. The participants were people living within towns selected for this study. 300 flyers, containing information how to complete questionnaire online, were distributed in each location totalling 2,400.

3.3. Multiple criteria decision making (MCDM)

A comparative analysis of MCDM methods by Mulliner et al. (2016) highlighted the benefits of using COPRAS compared to other methods; for example it is transparent, simple to use and can more easily be adopted for future use by other interested parties. Based on that research, and noting its use in other decision making problems in the built environment, the COPRAS method has been selected for this research. Its application enabled to establish the ranking of high streets in respect of their performance using fairly large set of criteria. In this study, it was utilised approach that included the following stages: 1) identification of criteria for the assessment of high street sustainability; 2) determination of criteria weights to reflect their relative importance; 3) selection of high street alternatives for analysis; and 4) application of MCDM method for high street ranking and decision making.

The initial decision making matrix was normalised by multiplying each criterion value by its corresponding weight. That figure was then divided by the sum of its row. A weighted, normalised decision matrix was subsequently constructed. By creating a normalised decision matrix, values of different units could be assessed together. Normalised, weighted values (d_{ij}) were calculated using the following equations:

$$d_{ij} = \frac{x_{ij} q_i}{\sum_{j=1}^{n} x_{ij}}, \qquad i = \overline{1, m,}\ j = \overline{1, n,} \tag{1}$$

and,

$$q_i = \sum_{j=1}^{n} d_{ij}\,, \qquad i = \overline{1,m},\ j = \overline{1,n}, \tag{2}$$

Where x_{ij} represents the value of the *i*-th criterion with respect to the *j*-th alternative, q_i represents the weight of the i-th criterion, *m* represents the number of criteria, and *n* represents the number of alternatives. The sum of the normalised weighted values (d_{ij}) for each criterion is equal the weight (q_i) of that criterion.

The following equations were used to calculate the sums of the maximising criteria values (S_{+j}) and the minimising criteria values (S_{-j}):

$$\begin{gathered} S_{+j} = \sum_{i=1}^{m} d_{+ij}, \\ S_{-j} = \sum_{i=1}^{m} d_{-ij}, \\ i = \overline{1,m},\ j = \overline{1,n}, \end{gathered} \tag{3}$$

The relative significance of each alternative was then calculated using the following equation:

$$Q_j = S_{+j} + \frac{S_{-\min} \sum_{j=1}^{n} S_{-j}}{S_{-j} \sum_{j=1}^{n} \frac{S_{-\min}}{S_{-j}}}, \qquad j = \overline{1,n}, \tag{4}$$

The greater the significance value (Q_j), the higher the alternative is ranked, and the better the alternative in terms of the criteria being assessed. Q_{max} represents the best alternative. The ranking of the alternatives and their significance values is presented in table 7.

The utility degree (N_j) of each alternative was calculated as follows:

$$N_j = \frac{Q_j}{Q_{\max}} \times 100 \tag{5}$$

The alternative ranked the highest (Q_{max}) is considered the best performing alternative in terms of the criteria. Q_{max} has a utility degree (N_j) of 100%. The utility degrees of the remaining criteria fall between 0% and 100%.

4. Results

4.1. Identification of criteria contributing to the high street sustainability

By following an approach developed previously (Mulliner and Maliene, 2015, Prochorskaite et al., 2016) and through an extensive literature review, forty two factors contributing to the

high street sustainability were initially identified as criteria (Table 1). All identified criteria were grouped into nine main categories comprising physical fabric; movement; exchange; real estate; psychology; safety & security; management, environmental protection, and economic viability as shown in Table 1 and they were discussed below.

Table 1. Criteria contributing to high street sustainability and their grouping into categories

Category	Nr.	High street criteria	References
Physical fabric	1a	Streets	Pigg, 1992; BIS, 2010; Hart et al., 2014
	1b	Signage	Pigg, 1992; Jones et al., 2007; BRC, 2009; BIS, 2010
	1c	Buildings	Trancik 1986; Jones et al., 2007
	1d	Trees and landscape	Weinstein et al., 2009; Cillier et al., 2010; Hinds and Sparks, 2011
	1e	Public open space	Gehl, 2004; Arslanli et al., 2011; Brunnberg and Frigo, 2012; Mehta, 2014
	1f	Infrastructure	Pigg, 1992; Jones et al., 2007
	1g	Design	Pigg, 1992; ODPM, 2004; Jones et al., 2007
Movement	2a	Pedestrian pavement/walkways	Pigg, 1992; BIS, 2010; Portas, 2011; Koohsari et al., 2018; Fathi et al., 2020
	2b	Cycling facilities	ODPM, 2004; Li et al., 2012; Hull and O'Holleran, 2014; Lusk et al., 2019
	2c	Public transport	BRC, 2009; BIS, 2010; DCLG and ATCM, 2014; Wrigley and Lambiri, 2015
	2d	Parking facilities	Baker, 2002; BRC, 2009
	2e	Goods/ service vehicles	Pigg, 1992; BRC, 2009
	2f	Traffic management	BRC, 2009
Exchange	3a	Social space	Halpern, 1995; Barker, 2009; Graffikin et al., 2010
	3b	Economic space	Jones et al., 2007; Griffiths et al., 2008; Hart et al., 2014; Knight Frank, 2017
	3c	Political space	ODPM, 2004
	3d	Cultural space	Smith, 2000; Bailey et al., 2004; BIS, 2010
	3e	Community space	Guite et al., 2006; Thompson and Kent, 2014; Santi et al., 2019; Wang et al., 2020
Real estate	4a	Retail	Powe and Gunn, 2008; BIS, 2010
	4b	Entertainment	Powe and Gunn, 2008; Hart et al., 2014
	4c	Work places	Raco, 2003; BRC, 2009; BIS, 2010
	4d	Civic venues	Hart et al., 2014; Greed, 2016
	4e	Residential	Powe and Gunn, 2008
	4f	Health and social facilities	ODPM, 2004; Barton, 2009; Wang et al., 2020
Psychology	5a	Identity/image	Martineau, 1958; Runyan and Huddleston, 2006; Hart et al., 2007; Mullis and Kim, 2011
	5b	Experience	De Nisco et al., 2008; Verhoef et al., 2009; Hart et al., 2014; Knight Frank,

			2017
	5c	Atmosphere	BIS, 2010; Hart et al., 2014
Safety and security	6a	Actual crime	Powe and Hart, 2009; BRC, 2009; BIS, 2010; Matijosaitiene et al., 2019
	6b	Perceived crime	Jones et al., 2007; BIS, 2010; Wrigley and Lambiri, 2015; Matijosaitiene et al., 2019
	6c	CCTV and security presence	Pigg, 1992; Raco, 2003; BRC, 2009
	6d	Street lighting	Pigg, 1992; BRC, 2009; Svechkina et al., 2020
Management	7a	Town centre management team	Stubbs et al., 2002; Whyatt, 2004; BRC, 2009; BIS, 2010; Blackwell and Rahman, 2010; Carmona, 2015
	7b	Partnership/stakeholder involvement	ODPM, 2004; BIS, 2010
	7c	Marketing	Powe and Hart, 2009; DCLG and ATCM, 2014; Hallsworth and Coca-Stefaniak; 2018
	7d	Digital connectivity/internet presence	ODPM, 2004; DCLG and ATCM, 2014; Parker et al., 2017
Environmental protection	8a	Environmental initiatives/carbon reduction schemes	BRC, 2009; Rehan, 2013; Moghadam et al., 2017; Lusk et al., 2019
	8b	Environmentally sustainable materials	Rehan, 2013
	8c	Waste management and recycling schemes	Pigg, 1992; Jones et al., 2007; BRC, 2009
Economic viability	9a	Commercial rent	Carmona, 2015; Wrigley and Lambiri, 2015
	9b	Business rates	BRC, 2009; Portas 2011; Wrigley and Lambiri, 2015
	9c	Trading hours	Burt and Sparks, 2003
	9d	Evening and night-time economies	BIS, 2010; DCLG and ATCM, 2014; Hart et al., 2014

The first four main categories (physical fabric; movement; exchange and real estate) were defined by following the analytical framework proposed previously (Carmona, 2015). Namely, the 'physical fabric' refers to the nature, character and design of the public realm, including criteria assigned as streets, signage, buildings, trees and landscape, public open space, infrastructure and overall design quality. The 'movement' indicates the convenience of accessing the high street via different modes of transport and traffic management issues. The 'exchange' in the context of the high street refers to the capacity for social, economic and cultural interaction noting that these frequently overlap, as for example, a town hall may act as a space for political, cultural, community and social interaction at different times, or even all at once, whereas a designated market promotes economic and social interaction. Such spaces are critical to support the sustainable high street by connecting high street users and creating a

sense of community (Thompson & Kent, 2014). The 'real estate' category includes criteria that represents open places, buildings and facilities with a diverse range of uses and attractions, which are key for a resilient high street (Sparks, 2021). BIS (2010) notes the importance of diversity to ensure that the visitor's requirements and expectations are sufficiently met. Notably, as consumer's trends shift to the shopping online, the entertainment is emerging as a key factor to encourage longer visits and spending in the high street (Hart et al. 2014). Reflecting the debate on 'clone towns', where high streets have become uniform offering same retailers and brands (Tallon, 2013), criteria in 'psychology' category refer to the concept of image, identity and atmosphere. According to Hart et al (2014) atmosphere is the "intangible, sensory aspects of the customer experience invoking feeling and emotions – not all of them positive". The sense of distinctiveness is thought to be important in generating a positive experience but equally shoppers will not be attracted to high streets that are deemed to be unsafe (BIS, 2010). For 'safety and security' category, the crime and the perception of crime were therefore included as criteria, along with means to make users feel safer such as CCTV and effective street lighting. The 'management' category includes criteria that focuses on the competent and coordinated management of high street, which can assist in addressing the decline. The presence of a town centre management team is therefore included as an influencing factor along with the wider partnership or stakeholder involvement, for example via an approved Business Improvement District and the marketing strategy (if any) used for the high street. The final two categories, namely environmental protection and economic viability, include criteria that link the high street to wider goals for sustainable communities enabling the protection and enhancement of natural resources and biodiversity (OPDM, 2004) and ensuring economic sustainability (Das, 2020). According to Rehan (2013) a streetscape should be environmentally efficient and materials used in streetscapes should minimise the requirement for excessive maintenance and replacement. To be economically sustainable affordable rents are important to attract and keep smaller, local independent businesses alongside the typical high street retailers to help create a diverse high street, with complementary daytime, evening and night-time economies. DCLG and ATCM (2014) reported that the evening and night-time economy develops a leisure and cultural offering to complement and run parallel to retail, although this may require a programme of events and attractions to bridge the gap between daytime and evening activities (Hart et al., 2014).

The survey involving professionals was conducted to validate the criteria derived from literature review, allowing to identify criteria considered as not important. From 42 criteria identified through the literature review, all the criteria but one were adjudged at least 'fairly important' with criterion 8b (environmentally sustainable materials) subsequently dispensed leaving 41 criteria to be utilised for further analysis. It should be noted that the previous research has identified other important factors such as street's liveability (Appleyard, 1981; Arpan and Sen, 2020; Istrate and Chen, 2021) and location (Berry, 1966) contributing to urban design and planning. Nonetheless, the location of high street, commonly associated with town centre, appears to be non-essential criterion for high street evaluation and therefore was not included in the further analysis. Whereas, the liveability, which typically refers to spaces "fit to live in", is reflected in different categories of high street criteria including movement, exchange and real estate.

4.2. Selection of high streets for comparison study

High streets from eight towns in England were selected for the evaluation. Towns and their characteristics are listed in Table 2. The geographic distribution of towns is shown in Figure 1, whereas example images of high streets are in Figures 2-5. Figure 1 assigns each town with high street a reference label from A1 – A8 referring to the alternatives selected for comparison.

To minimise the potential effects of external factors such varying social issues, population densities, geographic features and variations between planning systems, the study was limited to the geographical spread of selected towns in England. It was important for the purpose of the methodology that the selected cases were of a similar size and fell into the same category of the settlement hierarchy. However, they provide a representation of a range of high streets in terms of their character, history, architecture and regional location.

Table 2. Towns from which high streets were selected for the study

Town	Population (ONS figures for 2011)	Geographical range of population (hectare)	Character of town	Region of England
Basingstoke	107,996 (parliamentary constituency)	5,919	Historic market town	South-East
Birkenhead	88,818 (parliamentary constituency)	2,518	Former industrial/ historic market town	North-West
Corby	61,225 (local authority)	8,028	Former industrial town	East-Midlands
Gosport	96,699 (parliamentary constituency)	3,631	Former naval town/ seaside resort	South-East
Great Yarmouth	75,139 (total population of central wards)	4,647	Seaside resort/ former fishing port	East-Anglia
Rotherham	89,697 (parliamentary constituency)	4,832	Former industrial town	South Yorkshire
Shrewsbury	71,715 (parish)	3,799	Historic market town	West-midlands
Southport	90,381 (parliamentary	4,421	Seaside resort	North-West

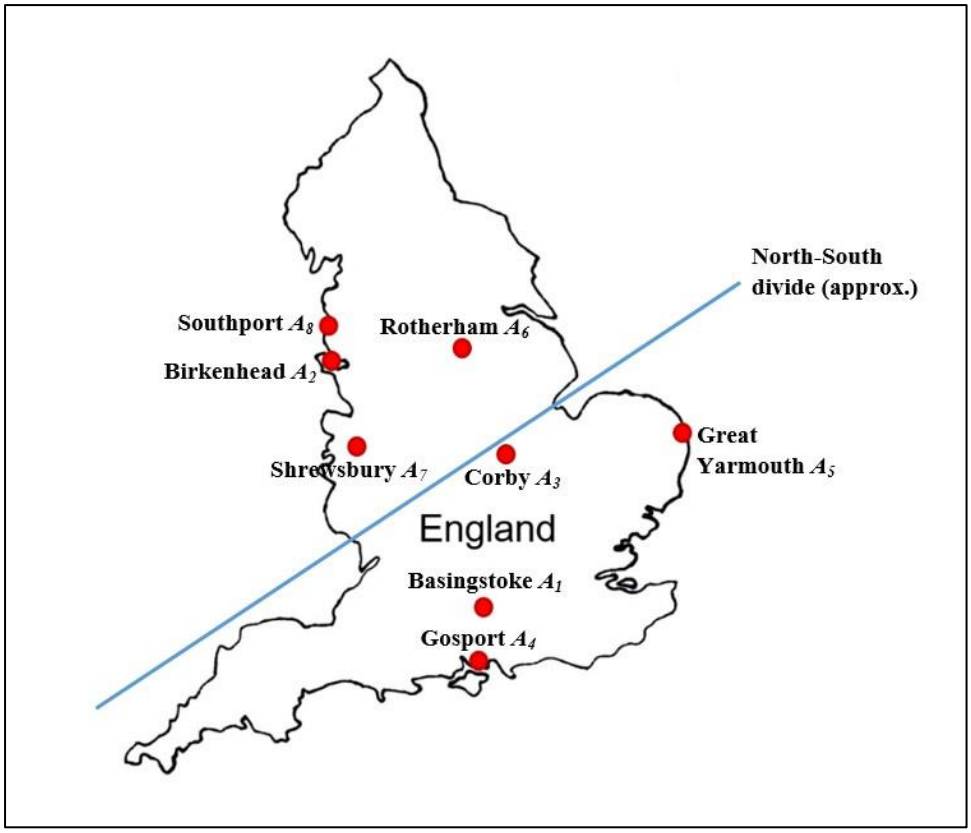

Figure 1. Geographical distribution of the towns across England, from which high streets were selected

Figure 2. Semi-covered pedestrianised street in Birkenhead (author's own)

Figure 3. Pedestrianised high street in Gosport (author's own)

Figure 4. Market Square in Great Yarmouth (author's own)

Figure 5. Lord Street, Southport (author's own)

4.3. Determination of criteria weights

For the purpose of MCDM it is essential to consider the relative importance of the criteria and apply appropriate weightings so that the more critical factors are afforded more significance and vice versa. The questionnaire was distributed to professionals and residents. Responses were received from 75 professionals drawn from the public sector (e.g. local authority planners, town centre managers) and the private sector (e.g. surveyors and developers) with response rate of 25% and 280 residents from eight different towns in England with response rate of 11.67%, providing a combined total of 355 responses. It should be noted that the response rates from each individual town ranged from as low as 5% to a maximum of 13%. Respondents rated each criterion using the 5-point scale as described in Materials and Methods. Cumulative results from both surveys allowed to establish how important the respondents considered each criterion to high street sustainability, and to calculate the weighed score of each criterion as shown in Table 3.

Table 3. Criteria contributing to high street sustainability and their weighted score

Number	High street criteria	Mean score from survey	Weighted score
1a	Streets	3.94	0.024289
1b	Signage	3.77	0.023212
1c	Buildings	4.19	0.025851
1d	Trees and landscape	4.03	0.024809
1e	Public open space	4.23	0.026042
1f	Infrastructure	3.88	0.023889
1g	Design	4.13	0.025469

2a	Pedestrian pavement/walkways	4.41	0.027205
2b	Cycling facilities	3.31	0.020417
2c	Public transport	4.35	0.026823
2d	Parking facilities	4.30	0.026528
2e	Goods/ service vehicles	3.76	0.023177
2f	Traffic management	3.56	0.021962
3a	Social space	4.31	0.026546
3b	Economic space	4.31	0.026563
3c	Political space	3.01	0.018559
3d	Cultural space	3.91	0.024098
3e	Community space	3.99	0.024601
4a	Retail	4.52	0.027865
4b	Entertainment	4.20	0.025886
4c	Work places	3.85	0.023734
4d	Civic venues	3.90	0.024028
4e	Residential	3.28	0.020226
4f	Health and social facilities	3.52	0.021702
5a	Identity/image	4.13	0.025469
5b	Experience	4.17	0.025730
5c	Atmosphere	4.38	0.027014
6a	Actual crime	4.17	0.025712
6b	Perceived crime	4.32	0.026598
6c	CCTV and security presence	3.83	0.023577
6d	Street lighting	4.28	0.026355
7a	Town centre management team	3.83	0.023629
7b	Partnership/stakeholder involvement	3.91	0.024080
7c	Marketing	3.46	0.021337
7d	Digital connectivity/internet presence	3.69	0.022761
8a	Environmental initiatives/carbon reduction schemes	3.36	0.020694
8c	Waste management and recycling schemes	3.93	0.024219
9a	Commercial rent	4.20	0.025868
9b	Business rates	4.14	0.025487
9c	Trading hours	3.97	0.024462
9d	Evening and night-time economies	3.82	0.023525
	$\sum$ =		1

Measurement units are required to provide a quantitative value for each of the alternatives (high streets) in terms of each of the criteria. For the majority of the criteria, these values were derived from the results of questionnaire, where respondents were asked to rate criteria for high street sustainability. For seven criteria, respondents rating scores were not suitable as a measurement unit and were replaced with different measurement units derived as shown in Table 4.

Table 4. Measurements units used to assign a criteria value for certain criteria

Criteria	**Measurement units**
Work places	Part 1 – average number of employees per km^2 of high street

	Part 2 – mean resident agreement score
Residential	Part 1 – number of householders per km^2 of high street Part 2 – meant resident agreement score
Actual crime	Average number of criminal incidents per km^2 of high street
Partnership/stakeholder involvement	Part 1 – points based on existence of Business Improvement District and/or neighbourhood plan Part 2 – mean resident agreement score
Environmental/carbon reduction scheme	Part 1 – points based on existence of environmental initiatives and registration with Transition movement Part 2 – number of BREEAM certified building per km^2 of high street Part 3 – mean resident agreement score
Commercial rent	Part 1 – average commercial rent per m^2 Part 2 – average % yield
Business rates	Average commercial rent per m^2
All other criteria	Respondents agreement with assessment statement

4.4. Application of MCDM method for assessing high street sustainability

Once the criteria weights were calculated according to the professionals and residents responses, the initial decision making matrix was constructed as shown in Table 5, where A1, A2 etc. refer to the alternatives (high streets) discussed in section 3.2. Then MCDM method was applied as described in Materials and Methods to identify the relative significance value for each town high street and perform ranking of all alternatives.

Table 5. Initial decision making matrix

Criteria		Weight	+/-	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8
1a	Streets	0.024289	+	3.14	2.77	3.56	3.42	2.86	3.07	2.64	2.96
1b	Signage	0.023212	-	1.87	2.32	2.13	2.00	1.80	1.95	1.85	2.23
1c	Buildings	0.025851	+	2.59	1.59	3.00	1.96	2.54	2.64	3.71	3.28
1d	Trees and landscape	0.024809	+	3.13	1.93	3.00	2.68	2.62	2.64	3.62	3.58
1e	Public open space	0.026042	+	3.42	2.20	3.20	2.78	2.48	2.96	3.74	2.76
1f	Infrastructure	0.023889	+	2.68	2.07	2.44	2.32	2.32	2.29	2.97	2.60
1g	Design	0.025469	+	2.59	1.44	2.78	1.87	2.16	2.26	3.41	3.04
2a	Pedestrian pavement/ walkways	0.027205	+	3.26	2.59	3.22	2.97	2.64	2.88	2.92	3.14
2b	Cycling facilities	0.020417	+	2.40	1.57	2.33	2.63	1.91	1.64	2.35	2.95
2c	Public transport	0.026823	+	3.41	3.42	3.10	3.10	2.76	3.10	3.05	3.26
2d	Parking facilities	0.026528	+	3.53	3.03	3.10	2.83	2.61	2.11	2.98	2.11
2e	Goods/ service vehicles	0.023177	-	1.54	2.19	1.60	2.25	2.05	2.05	2.64	2.05
2f	Traffic management	0.021962	+	2.83	2.60	3.25	2.75	2.75	2.67	2.80	2.59
3a	Social space	0.026546	+	2.82	1.68	2.44	2.19	1.82	1.88	3.58	2.86
3b	Economic space	0.026563	+	3.17	1.68	2.60	1.52	1.92	1.79	3.24	2.57
3c	Political space	0.018559	+	1.76	1.52	1.75	1.35	1.45	1.43	1.50	1.55
3d	Cultural space	0.024098	+	2.57	1.76	2.13	1.92	2.00	1.70	3.17	2.57
3e	Community space	0.024601	+	2.31	1.36	1.88	1.68	1.71	1.54	2.60	1.82

a	Retail	0.027865	+	2.88	1.66	2.27	1.48	1.50	1.40	2.94	2.43
4b	Entertainment	0.025886	+	3.22	1.57	2.75	1.38	1.74	1.21	3.25	2.73
4c	Work places (Part 1)	0.011867	+	2910.52	2302.04	989.22	1365.67	1781.93	1834.41	1710.89	2324.16
	Work places (Part 2)	0.011867	+	3.32	1.57	3.00	1.45	1.32	1.50	2.52	1.79
4d	Civic venues	0.024028	+	3.47	2.04	3.14	3.00	2.32	2.17	3.25	2.68
4e	Residential (Part 1)	0.010113	+	830.17	1531.99	280.78	2502.05	3514.03	390.50	1599.67	3448.10
	Residential (Part 2)	0.010113	+	2.54	2.16	2.50	2.31	2.10	2.06	2.74	2.22
4f	Health and social facilities	0.021702	+	2.72	2.48	2.67	2.36	2.22	2.72	3.00	2.76
5a	Identity/ image	0.025469	+	2.56	1.46	2.50	1.57	1.48	1.23	3.60	2.73
5b	Experience	0.025730	+	3.15	1.46	2.67	1.79	1.86	1.59	3.56	2.65
5c	Atmosphere	0.027014	+	3.06	1.47	2.60	1.69	1.71	1.44	3.62	2.60
6a	Actual crime	0.025712	-	4380.00	5924.00	5217.65	4869.23	6075.00	7533.33	4534.62	3873.08
6b	Perceived crime	0.026598	-	1.94	3.21	1.88	2.50	2.71	3.09	1.40	2.32
6c	CCTV and security presence	0.023577	+	3.29	2.73	2.86	2.63	2.45	2.13	3.29	2.67
6d	Street lighting	0.026355	+	3.20	2.45	2.78	2.61	2.40	2.16	3.13	2.96
7a	Town centre management team	0.023629	+	3.39	2.13	2.89	2.08	1.89	2.00	2.97	2.00
7b	Partnership/ stakeholder involvement (Part 1)	0.012040	+	2.00	2.00	2.00	1.00	2.00	1.00	2.00	2.00
	Partnership/ stakeholder involvement (Part 2)	0.012040	+	3.09	2.27	3.00	1.73	2.06	2.14	2.92	2.38
7c	Marketing	0.021337	+	2.82	1.77	3.25	1.71	1.77	1.55	2.90	2.17
7d	Digital connectivity/ internet presence	0.022761	+	2.73	2.00	2.25	1.72	1.91	1.53	2.64	2.14
8a	Environmental initiatives/ carbon reduction schemes (Part 1)	0.006898	+	3.00	1.00	2.00	1.00	1.00	1.00	3.00	1.00
	Environmental initiatives/ carbon reduction schemes (Part 2)	0.006898	+	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Environmental initiatives/ carbon reduction schemes (Part 3)	0.006898	+	2.30	2.14	3.00	1.71	1.89	1.62	1.93	1.92
8c	Waste management and recycling schemes	0.024219	+	3.00	2.61	2.80	2.71	2.29	1.59	2.60	2.23
9a	Commercial rent (Part 1)	0.012934	-	267.48	211.94	151.02	150.05	144.67	164.47	182.13	178.36
	Commercial rent (Part 2)	0.012934	-	8.50	9.80	7.50	8.70	12.80	11.40	7.50	10.10
9b	Business rates	0.025487	-	267.48	211.94	151.02	150.05	144.67	164.47	182.13	178.36
9c	Trading hours	0.024462	+	3.53	2.93	3.27	2.79	2.50	2.31	3.26	3.12
9d	Complementary daytime, evening and night-time economies	0.023525	+	3.18	1.95	3.11	1.77	1.78	1.74	2.90	2.61

Table 6. Relative significance values, utility degrees and ranking positions of alternatives

High street (alternative) location		Significance value, Q_j	Utility degree, N_j (%)	Rank
A_1	Basingstoke	0.14642	96.3	2
A_2	Birkenhead	0.10454	68.7	7
A_3	Corby	0.13810	90.8	3
A_4	Gosport	0.11279	74.2	5
A_5	Great Yarmouth	0.11090	72.9	6
A_6	Rotherham	0.10197	67.1	8
A_7	Shrewsbury	0.15206	100.0	1
A_8	Southport	0.13322	87.6	4

As shown in Table 6, MCDM results using COPRAS method revealed the best performing and sustainable high street was in Shrewsbury (A7), whereas the high street in Rotherham (A6) was ranked last amongst eight alternatives analysed in the study. The utility degree provided a qualitative measure beyond simple ranking. At 96.3%, the utility degree of high street in Basingstoke (A1) was only 3.7% inferior to the high street in Shrewsbury (A7).

Furthermore, the profile difference in the criteria importance depending on the town high street (alternative) is highlighted in Table 7. The overall distribution of criteria weight is shown in blue colour scale. This can be compared to the profile of criteria importance obtained for each alternative, which is illustrated by green colour scale with the highest importance represented by the darkest shade and the lowest importance - by the lightest. Notably, these data allows decision maker to identify that such criteria as identity/image (5a), atmosphere (5b), experience (5c), social space (3a), retail (4a) and entertainment (4b) are the main contributors to the highest ranking of high street in Shrewsbury (A7) (Table 7). Whereas, identity/image (5a), experience (5c), retail (4a) and entertainment (4b) have the lowest importance profile for the bottom ranked high street in Rotherham (A6).

Table 7. Profile of criteria importance for each town high street (alternative)

Criteria		Weight	Profile of criteria importance for each town high street (alternative)							
			A1	A2	A3	A4	A5	A6	A7	A8
1a	Streets	0.0243	0.0031	0.0028	0.0035	0.0034	0.0028	0.0031	0.0026	0.0029
1b	Signage	0.0232	0.0027	0.0033	0.0031	0.0029	0.0026	0.0028	0.0027	0.0032
1c	Buildings	0.0259	0.0031	0.0019	0.0036	0.0024	0.0031	0.0032	0.0045	0.0040
1d	Trees and landscape	0.0248	0.0033	0.0021	0.0032	0.0029	0.0028	0.0028	0.0039	0.0038
1e	Public open space	0.0260	0.0038	0.0024	0.0035	0.0031	0.0027	0.0033	0.0041	0.0031
1f	Infrastructure	0.0239	0.0033	0.0025	0.0030	0.0028	0.0028	0.0028	0.0036	0.0032
1g	Design	0.0255	0.0034	0.0019	0.0036	0.0024	0.0028	0.0029	0.0044	0.0040
2a	Pedestrian pavement/ walkways	0.0272	0.0038	0.0030	0.0037	0.0034	0.0030	0.0033	0.0034	0.0036
2b	Cycling facilities	0.0204	0.0028	0.0018	0.0027	0.0030	0.0022	0.0019	0.0027	0.0034
2c	Public transport	0.0268	0.0036	0.0036	0.0033	0.0033	0.0029	0.0033	0.0032	0.0035
2d	Parking facilities	0.0265	0.0042	0.0036	0.0037	0.0034	0.0031	0.0025	0.0035	0.0025
2e	Goods/ service vehicles	0.0232	0.0022	0.0031	0.0023	0.0032	0.0029	0.0029	0.0037	0.0029

2f	Traffic management	0.0220	0.0028	0.0026	0.0032	0.0027	0.0027	0.0026	0.0028	0.0026
3a	Social space	0.0265	0.0039	0.0023	0.0034	0.0030	0.0025	0.0026	0.0049	0.0039
3b	Economic space	0.0266	0.0046	0.0024	0.0037	0.0022	0.0028	0.0026	0.0047	0.0037
3c	Political space	0.0186	0.0027	0.0023	0.0026	0.0020	0.0022	0.0022	0.0023	0.0023
3d	Cultural space	0.0241	0.0035	0.0024	0.0029	0.0026	0.0027	0.0023	0.0043	0.0035
3e	Community space	0.0246	0.0038	0.0022	0.0031	0.0028	0.0028	0.0025	0.0043	0.0030
4a	Retail	0.0279	0.0048	0.0028	0.0038	0.0025	0.0025	0.0024	0.0049	0.0041
4b	Entertainment	0.0259	0.0047	0.0023	0.0040	0.0020	0.0025	0.0018	0.0047	0.0040
4c	Work places (Part 1)	0.0119	0.0023	0.0018	0.0008	0.0011	0.0014	0.0014	0.0013	0.0018
	Work places (Part 2)	0.0119	0.0024	0.0011	0.0022	0.0010	0.0010	0.0011	0.0018	0.0013
4d	Civic venues	0.0240	0.0038	0.0022	0.0034	0.0033	0.0025	0.0024	0.0035	0.0029
4e	Residential (Part 1)	0.0101	0.0006	0.0011	0.0002	0.0018	0.0025	0.0003	0.0011	0.0025
	Residential (Part 2)	0.0101	0.0014	0.0012	0.0014	0.0013	0.0011	0.0011	0.0015	0.0012
4f	Health and social facilities	0.0217	0.0028	0.0026	0.0028	0.0024	0.0023	0.0028	0.0031	0.0029
5a	Identity/ image	0.0255	0.0038	0.0022	0.0037	0.0023	0.0022	0.0018	0.0054	0.0041
5b	Experience	0.0257	0.0043	0.0020	0.0037	0.0025	0.0026	0.0022	0.0049	0.0036
5c	Atmosphere	0.0270	0.0045	0.0022	0.0039	0.0025	0.0025	0.0021	0.0054	0.0039
6a	Actual crime	0.0257	0.0027	0.0036	0.0032	0.0030	0.0037	0.0046	0.0027	0.0023
6b	Perceived crime	0.0266	0.0027	0.0045	0.0026	0.0035	0.0038	0.0043	0.0020	0.0032
6c	CCTV and security presence	0.0236	0.0035	0.0029	0.0031	0.0028	0.0026	0.0023	0.0035	0.0029
6d	Street lighting	0.0264	0.0039	0.0030	0.0034	0.0032	0.0029	0.0026	0.0038	0.0036
7a	Town centre management team	0.0236	0.0041	0.0026	0.0035	0.0025	0.0023	0.0024	0.0036	0.0024
7b	Partnership/ stakeholder involvement (Part 1)	0.0120	0.0017	0.0017	0.0017	0.0009	0.0017	0.0009	0.0017	0.0017
	Partnership/ stakeholder involvement (Part 2)	0.0120	0.0019	0.0014	0.0018	0.0011	0.0013	0.0013	0.0018	0.0015
7c	Marketing	0.0213	0.0034	0.0021	0.0039	0.0020	0.0021	0.0018	0.0034	0.0026
7d	Digital connectivity/ internet presence	0.0228	0.0037	0.0027	0.0030	0.0023	0.0026	0.0021	0.0036	0.0029
8a	Environmental initiatives/ carbon reduction schemes (Part 1)	0.0069	0.0016	0.0005	0.0011	0.0005	0.0005	0.0005	0.0016	0.0005
	Environmental initiatives/ carbon reduction schemes (Part 2)	0.0069	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
	Environmental initiatives/ carbon reduction schemes (Part 3)	0.0069	0.0010	0.0009	0.0013	0.0007	0.0008	0.0007	0.0008	0.0008
8c	Waste management and recycling schemes	0.0242	0.0037	0.0032	0.0034	0.0033	0.0028	0.0019	0.0032	0.0027
9a	Commercial rent (Part 1)	0.0129	0.0024	0.0019	0.0013	0.0013	0.0013	0.0015	0.0016	0.0016
	Commercial rent (Part 2)	0.0129	0.0014	0.0017	0.0013	0.0015	0.0022	0.0019	0.0013	0.0017
9b	Business rates	0.0255	0.0047	0.0037	0.0027	0.0026	0.0025	0.0029	0.0032	0.0031
9c	Trading hours	0.0245	0.0036	0.0030	0.0034	0.0029	0.0026	0.0024	0.0034	0.0032
9d	Complementary daytime, evening and night-time economies	0.0235	0.0039	0.0024	0.0038	0.0022	0.0022	0.0021	0.0036	0.0032

It should be noted that due to the relative comparison of the high streets, the COPRAS results indicate how well the high streets of these towns perform against each other. Therefore, if a different selection or a greater number of high streets had been assessed, the rankings may

have been different, and Shrewsbury (A_7) may not have come out most superior and Rotherham (A_6) as least superior. It is also possible for the decision maker to introduce a hypothetical superior case study in order to compare high streets against an absolute ideal solution. A further means of applying the framework is as a self-reviewed tool (Figure 6). The decision maker may acquire new input data at set intervals (e.g. annually, biannually etc.) and compare that data against the previous, therefore enabling the mapping of a high street's sustainability over time.

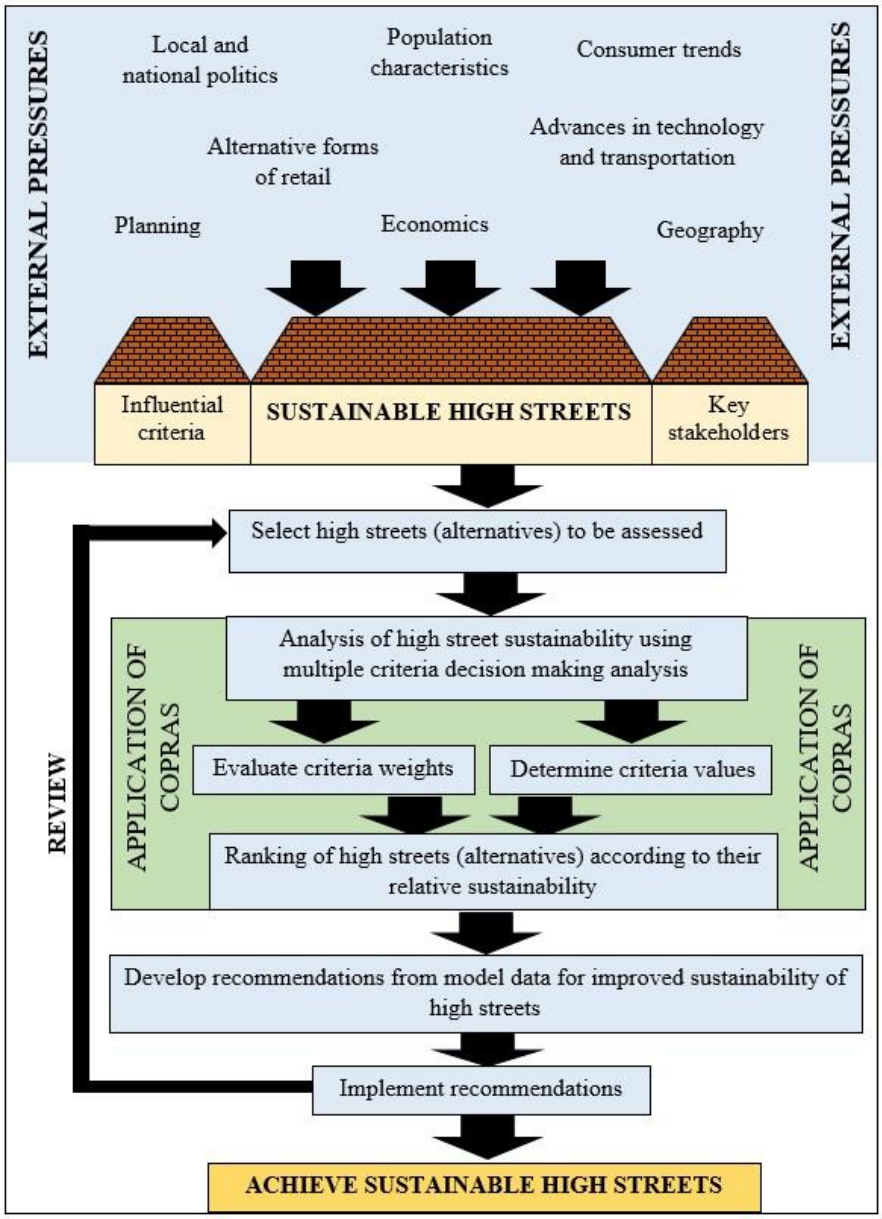

Figure 6. A sustainability assessment framework for the high street

5. Discussion and conclusions

The ongoing shift of UK shopping trends continues to undermine the retail sector, particularly the high street retailing as underperforming stores close. At the same time, successive governments have sought to protect and support the high street using planning policy to guide

new retail development towards town centres, and by promoting initiatives such as Town Centre Management schemes (Jones, 1990) and the recent Future High Streets Fund (MHCLG 2018). Underpinning this approach is the ongoing, broad commitment to sustainable development, and the understanding that the high street retains a key role as the multifunctional hub of sustainable communities (Cassidy and Resnick, 2020).

In this study, by acknowledging the needs and expectations of local residents, the factors contributing to the high street sustainability were identified and the assessment framework developed. The expert opinion's survey of those working in the sector was carried out to establish relative significance of different criteria for the assessment of high street. Through the process of weighting and attributing values to the criteria, the application of multiple criteria decision making methodology such as COPRAS was demonstrated by ranking high street alternatives and assessed according to their sustainability's criteria. The method also produced utility degrees to indicate the extent to which one alternative was better or worse than the others.

The steps taken are shown in the framework (Figure 6), which the authors consider to have wider applicability beyond this study. Whilst it is important that high streets compared are as comparable as possible in terms of their size and wider external factors, the framework can be generalised for use in other areas by a variety of stakeholders. Different alternatives can be selected and criteria values relating to the new alternatives can be input, therefore enabling different locations to be assessed. Different criteria weights can also be obtained to reflect the needs and expectations of consumers in different high street locations. The assessment criteria can also be adapted to reflect varying circumstances. Criteria may be added or removed depending on the relevance to the high streets being assessed. Furthermore, by incorporating alternatives that reflect the same high street at set intervals, the framework can indicate the improvement or decline of a high street's sustainability over time. The adaptability of the framework means that it can be applied in a variety of settings in other areas of England, the wider UK, and internationally.

The high street sustainability assessment framework developed in this study can assist key stakeholders and policy makers in identifying necessary high street improvements. Due to the weightings allocated to each criterion, the framework provides a hierarchy of factors that reflects on the high street sustainability. This information enables decision makers to recognise and to some extent quantitatively evaluate the relative importance of these factors. For example, this enables the decision maker to identify the factors which have the greatest impact upon high street sustainability. Therefore, if the decision maker seeks to develop the most efficient means of improving high street sustainability, such factors should command the greatest attention and resources. In our study, the criterion 'retail' was identified to be the most important factor to high street sustainability. Rotherham (*A6*) was the lowest scoring high street in terms of this criterion, therefore developing strategies and initiatives that assist in developing Rotherham's retail offering into one that better satisfies the needs and expectations of the local consumer base would be beneficial to the improvement of the high street's sustainability. Similarly, the criterion 'political space' was considered to be the least important factor to high street sustainability. Shrewsbury (*A1*) was the best performing high street in terms of this criterion. Consequently, it would make little business sense to allocate funding/resources to improving the political space in Shrewsbury. The sustainability assessment framework can therefore assist policy makers and key stakeholders in making effective decisions regarding the

allocation of funding and resources, and could help local authorities to identify suitable locations in which to pursue investment and development. Significantly, whereas investment and development strategies are largely the domain of local authorities and policy makers, the incorporation of social and environmental criteria into the proposed framework presents opportunities for local communities and small businesses to assist in improving the sustainability of their high streets.

Furthermore, as the input data comprises the views of both professionals and local residents, the framework accounts for the expert opinions of those working in relevant professions, as well as the needs and expectations of those living near to the high streets selected for assessment (therefore accounting for consumer trends). Notably, proposed sustainability assessment framework can be adopted by planning policy makers for assessment of "out of town retail", developed over the last few decades in different countries (Dolega and Lord, 2020; Jones, 2021), and extended beyond the high street application. This is in particular become important in recent years due to change in consumers shopping habits and trends (Dolega and Lord, 2020; Parker et al., 2017). Significantly, by incorporating a range of economic, environmental and social criteria into the assessment of high street performance, the framework supports national and global commitments for sustainable development.

Drawing on empirical study and using data, acquired through literature analysis and surveys involving professionals and residents, the research presented in this paper contributes to the knowledge on several levels, as following: determining a set of weighted criteria that influence the high street sustainability in UK and worldwide; developing a tool for analysis and evaluation of high street performance by the application of multiple criteria decision making approach based on COPRAS method; establishing a framework, which can be used by planners and urban policy makers helping inform the local authorities, governmental and non-government agencies involved in urban planning and development. The developed framework can be easily applied for assessment of high streets in UK and internationally and adapted for other retail and enterprise-related entities. Finally, this is first report on the sustainability assessment framework for the high street.

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