A Comparative Study on Historic Building Regeneration Between the UK and China: A Perspective of Energy Efficiency

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Abstract: In the UK, retrofitting, or 'retrospective refitting' has become a central strategy in reducing energy inefficiency and carbon emissions. However, whilst implementation has increased, research shows that there are still several problematic barriers to the full implementation and embedding of retrofitting policies. Likewise, international ecological commentators, developers and policy-makers have also pointed to the growth of retrofitting ideas and policies in modernising nations such as China; however, as investigations are beginning to show, the full implementation of retrofitting practices in modernising countries is also difficult, with local policy-makers and developers showing much more interest in new build, as opposed to retrofitting existing buildings and/or heritage sites. Taking the UK and China as two key examples of earlier and more recent retrofitting cultures, this paper reflects on the different barriers to retrofitting historic buildings in these countries and explores the potential drivers for retrofitting in each of these contexts.

Keywords: Old City Retrofitting; Historic Buildings; Energy Consumption; Heritage Conservation; International Comparative Analysis

1 Introduction

In China, the aesthetic qualities of historic buildings are increasingly valued, yet the rapid course of urbanisation requires extensive new build at higher densities to accommodate the larger city populations. Nevertheless a growing environmental awareness and historical consciousness support greater conservation of the historic fabric of the nation in an energy efficient way. The UK has a lengthy experience of large-scale conservation of historic buildings, and more recently industries are developing to provide historically sensitive retrofit solutions. This article lays out some of the problems and opportunities found in both UK and China for making historic buildings more energy efficient and concludes with reflection on the role that can be played civil society groups in achieving this in both nations.

Regardless of the national context, there are sound environmental and cultural arguments for improving the energy efficiency of historic buildings. When 'embodied'[1] energy is factored into the calculations, existing buildings have the edge on most newbuild dwellings in terms of energy conservation – this is the case in both the UK and China (Power, 2008; Ding, 2013). This is additional to their positive role in representing and conserving cultural capital and collective memory (Silberman, 2011). Retrofitting (or 'retrospective refitting') of existing buildings and infrastructure is a key strategy for reducing both energy demand and carbon emissions. Retrofit is more than mere 'restructuring', but is an approach to upgrading that shows sensitivity to the value of existing social, environmental and physical capital (Mukhopadhyay and Crawford, 2012).

There are many definitions of retrofit, but one provided by Gleeson *et al.* (2011) brings together several important dimensions:

The refurbishment of buildings to improve their sustainability, in particular their energy efficiency and carbon dioxide emissions. Retrofitting takes place sometime after original construction and incorporates or substitutes more up-to-date parts and new elements where appropriate. Retrofitting technologies include those that are 'fit and forget' and those that require attention to control systems, management and maintenance. Retrofit elements may include those that contribute to wider networked decentralized energy systems such as PV panels (with or without the incentive of feed-in tariffs). (Gleeson et al., 2011: p.6).

It should be noted that in line with Gleeson *et al.*'s definition, retrofit is not just about 'fit and forget' elements, but is also about the efficiency of heating systems used in buildings, such as boilers, lighting systems such as occupant sensor systems, and renewable energy generation technologies; it can also apply to larger scale projects. For example, rather than working at single-building level, some evidence supports the value of improving whole blocks or neighbourhoods of historic housing (Zavadskas *et al.*, 2008).

Within the limitations of this review, we will focus on retrofit as an aspect of conserving and extending the viability of historic buildings, without consideration of its actual impact on energy reduction that may be due to complex factors such as fluctuating energy prices and the 'rebound effect'. Furthermore, due to the relatively marginal contribution that renewable generation can make in this area (due to its generally strong visual presence), we will mainly focus on improving the efficiency with which energy drawn from existing sources is used in single and grouped historical buildings.

2 Background to retrofit policy in the UK

In response to contracting energy resources and an ageing and historic building stock, Europe and the UK have emphasised increasing energy efficiency and reducing energy demand through

[1] Embodied energy is energy has gone into the creation of an existing building. It includes energy used in extracting, processing, manufacturing, transporting and installing building materials or equipment.

retrofit since the 1970s (Foresight, 2008; EC, 2011). Since the 1990s, an increasing role has been played by EU and national policy commitments to mitigate climate change by reducing carbon emissions (HMG,2009), while the conservation benefits of improving the weather-fastness of older buildings and cutting their running costs are just beginning to be acknowledged (English Heritage, 2008; Mukhopadhay and Crawford, 2012).

The UK's 2008 Climate Change Act commits to a reduction in CO_2 emissions of 80% by 2050, putting the UK at the forefront of countries espousing a low-carbon economy. The UK's housing stock is among the oldest and least energy-efficient in the world (DECC, 2011). Around 1 in 5 houses in the UK were built prior to 1919, the date when more energy efficient cavity construction and damp course building was introduced (ECHS, 2007). Over the course of the 20th century, homes became more incrementally energy efficient, so that, on average, a house built post-1990 has around half the annual emissions of one built pre-1919 (that is, 4.5 compared with 9 tonnes of CO_2 for heating and lighting per year) (ibid.). In the UK, domestic buildings are one of three sectors targeted by the government to reduce emissions (the others are transport and energy) and they account for 23% of emissions (CCC, 2010). Given the proportion of older housing in the UK, the greatest potential for ameliorating the energy consumption and carbon footprint of the national building stock in the next few decades would seem to be presented by the opportunity to retrofit the existing historic stock (Jackson and Judson, 2011). This is backed up by several studies that factor the 'embodied energy' of the manufacture, transport and construction of the built environment into the calculation of building energy use and find a significant benefit for conservation (Ireland, 2008 Mickaityte 2008). Power (2008) finds that if embodied energy is included in the calculation it is more sparing of energy to conserve than to rebuild. Not only does this prevent excess waste being deposited in landfill, but the retention of historic environments also has benefits for social and cultural wellbeing.

3 Current retrofit problems in the UK

3.1 Fragmented and discontinuous retrofit initiatives

Architectural heritage is fiercely protected and defended in the UK and the historic built environment is a large part of the country's attraction for tourism, its fifth biggest industry. The UK's strength in building conservation has roots in the 19th century but really took off from the 1930s onwards, when development blight and mass demolition of important buildings, followed by considerable bomb destruction during WWII, led to civil society and government response.

A recent survey found that four in ten overseas visitors cite heritage as the main reason for their trip to the UK; while 53% of the population make a trip to experience the atmosphere of a historic town or city at least once a year (HLF and Visit Britain, 2010). Indeed, around 60% of the estimated £12.4 billion per year spent in this sector is spent by UK residents taking day trips and making holidays in the UK. A reflection of this degree of economic importance and popular interest is a proliferation of civil society organisations and agencies concerned with, and advising upon, the upkeep of the historic built environment.

Through these agencies, grant funding is available for historically sensitive maintenance and building upgrades of older buildings. The grants, of various sizes, are offered by a very wide range of charitable and civil society organisations, meaning criteria and procedures vary and several applications may be needed to secure sufficient resources for the work in hand (FFHB, 2013). Understandably, the guidance and advice promoted is not necessarily compatible between these independent organisations; some more traditional organisations may, furthermore, give historical authenticity greater value than energy efficiency in their criteria for funding upkeep (see the example of the National Trust for Scotland in the account of retrofitting listed buildings in Edinburgh – Changeworks, 2010).

To compound the problem, the nationally-available state support for domestic retrofit has undergone a series of shifts and changes that may have weakened both the continuity of the domestic retrofit industry (e.g. Gosden and Marsden 2012) and the consumer understanding of what is available, resulting in low uptake and poor standards (see Brooks and Davoudi, 2013, this issue). The result of this fragmentation of both advice and funding, in terms of reducing energy demand and consumption, may be that the owners of historic homes will prefer simpler, lower-cost interventions to improve energy efficiency (thick curtains, draft-proofing windows), of which the marginal impact on energy efficiency will do little to diminish their proportional contribution to CO_2 emissions and energy consumption (Changeworks, 2010).

3.2 Cost-to-benefit ratio

The second issue arises from the fact that the costs of carbon emissions are dispersed while investment in retrofit is generally undertaken individually by householders and businesses seeking a financial benefit in terms of reduced energy costs, rather than purely ethical gains in terms of climate change mitigation. The problem is that for many forms of retrofit, there is a relatively low cost-to-benefit advantage in the short term, and the timescales within which investment can be recouped are lengthy. This applies in particular to the complex, disruptive and comprehensive retrofit schemes, described by Gleeson (2011) as ‘deep retrofitting’, and to the retrofit of rented properties where the tenants may not be able to sustain a rent rise although they, not the landlord, will benefit from lower energy consumption (Lloyd-Jones, 2010).

3.3 Compatibility with other retrofit agendas

In the UK context there is considerable concern about streamlining retrofit for emissions mitigation with climate change adaptation retrofit agendas, such as creating living environments that can also withstand the increased incidence of extreme weather events, such as intense downpours and heat waves (Mukhopadhyay and Crawford, 2012). Furthermore, with long life-spans leading to a far longer period of independent living, homes must also be accessible throughout the life course, which includes building accommodation to be navigable and fittings to be useable by those with the kinds of flexibility and mobility problems that are strongly associated with senior years, as well as safe for the proportion that will suffer with cognitive impairment.

Both issues come together when considering retrofit to improve insulation in contexts where the occupants tend to stay indoors in the day time, for example, disabled or frail older people. Long exposure in highly insulated properties during heatwave can be dangerous to this group (Wheeler, 2013). Porrit *et al*, (2012) have demonstrated how retrofit for mitigation can be combined with climate adaptation to produce more energy efficient homes that are nevertheless adapted for periods of heatwave. Nevertheless, as yet no official UK guidelines exist for retrofitting existing buildings so that they are both energy efficient and heatwave adapted (Davoudi et al., 2010).

4 Potential drivers in the UK

4.1 Social and economic value of the historic built environment

Tourism is one of the UK's fastest growing sectors, and the third largest export earner, providing £52 billion of GDP in 2010, and 4.4% of jobs (Deloitte, 2010). The current Tourism Policy cites the Nations' Brand Index Survey of 50 nations, which ranks nations according to how their reputations are perceived globally, where the US comes top and the UK ranks 3rd, being considered in the top five percent on many criteria including 'rich in historic buildings and monuments' (ibid. , p. 51).

With the current government's investment in furthering the value and potential of the UK's tourism industry (Department for Culture, Media and Sport, 2011), the importance of the historic built environment to the national economy is high on the agenda.

To own a historical building or to live in a city rich in these has high status, implying both changes of use, as for example, formerly domestic dwellings are acquired by businesses for prestige reasons, and cultural and economic incentives to invest in ongoing maintenance and repair. Both are more likely contexts for retrofit of historic buildings to take place than a wish to reduce energy costs alone (Lloyd-Jones, 2010, Lubeck and Francis, 2010).

4.2 Financial drivers

As a signatory to the Kyoto Protocol and member of the European Union, the UK is committed to raising the sustainability and energy efficiency of its built environment. This is guided through EU Directive 2002/92/EC (Energy performance in buildings), which is seen as an essential part of the EU's response to Kyoto. This has led to an incremental improvement in energy standards for fuel and power within building regulations (specifically, Part L of the Building Regulations) which apply to any new building and also to those undergoing alteration, extension or a change of use (English Heritage, 2011). Certain listed buildings and monuments are, however, exempt where compliance with energy efficiency requirements would unacceptably alter their character or appearance.

All buildings that are offered for sale must also now secure Energy Performance Certificates (rating their actual and potential energy efficiency and carbon emissions, respectively, on two

scales from A to G, where A is the best performance). This regulation potentially adds to the financial drivers for retrofit. Modelling at single-building level, Booth *et al.* (2012), have found that while retrofitting can improve the market value of properties, this will vary considerably with the socio-economic characteristics of the intended population.

4.3 Green awareness and governance

Besides regulation, civil society plays an important role in driving forward initiatives such as retrofit. The environmental movement in the global north is often traced back to the social upheavals of the 1960s in Canada and the United States, subsequent to which the first Friends of the Earth and Greenpeace groups were set up in those countries. Greenpeace and Friends of the Earth launched their UK branches in the 1970s are now the two most powerful campaigners for environmental issues in the UK context, alongside a host of smaller and single-issue focused groups campaigning on the environment.

While government may waver, governance, which embraces the significant role of non-state, including civil society actors, in governing – for example, steering debate, monitoring policy, and mobilising change − continues to gather force. The current economic crisis may be eroding the public's willingness to fund environmental initiatives (e.g. Smithers, 2013), and there is undoubtedly conflict within the current UK Coalition government about whether green policies are compatible with the drive to re-establish economic growth (e.g. Bawden 2013). But, in spite of this, the combined influence of European law to which the UK is subject, and the plethora of civil society groups concerned with the environment, help to maintain green awareness on the policy agenda.

5 Old city retrofitting and energy usage in China

5.1 Brief background to Retrofit Policy in China

Compared with Europe and the UK's built environment, China has a far greater proportion of modern housing, although given the vastness of the construction programme, not all new buildings have met current energy efficiency standards – for example, only 38% of new build in urban areas did so in 2006 (Price *et al.*, 2012).

In terms of built heritage, although there is a continuing widespread practice of demolishing historic buildings in order to construct to modern standards, still around one half to one third of China's floor space (20 billion m^2) consists of old buildings requiring upgrade and retrofit (Yang *et al.*, 2013).

Compared with Europe, China started relatively late on energy efficiency initiatives for the built environment. Concerns were first raised in the 1980s and the first state-level building code for energy-efficiency, the Energy-efficient Design Standard for Civil Buildings (for heating residential buildings), was introduced in 1986. Afterwards, a three-step programme for building

energy efficiency was launched, with the aim of reducing building energy consumption progressively by increments of 30%, 50% and 65% (Ministry of Construction, P. R. China, 2006). Over the years since 1986, a series of codes and standards for building energy efficiency have been issued to further these targets, which address both residential and public building types and cover the various climate zones in China. However all these codes have a scope of application that is limited to new, renovated and expanding buildings, which means these codes mainly guide and affect the design of new buildings. Since there are around ten thousand million square meters of new construction every year in China (TU, 2010), it is easy to understand that policy makers were more focused on the energy efficiency of new buildings during that period.

Nevertheless, it is the existing buildings that account for the majority of total building energy consumption (TU, 2010). Energy efficiency was not a consideration for most of the existing buildings during the design stage, and thus, in most of China's five climate zones, the indoor environment requires greater heat input to achieve thermal comfort. It has been argued that the majority of existing buildings have high energy consumption.

A start was made through the 11th Five-year Plan for energy savings and emissions reduction, although under the provisions of this plan, only 180 million m^2 of existing buildings in North China were successfully retrofitted for energy-efficiency. China released its 12th Five-year Plan for energy saving and emissions reduction in August 2012 (China Briefing, 2012).

This latest Five-year Plan aims to reduce energy consumption by 16% from a 2010 baseline and by 32% from a 2005 baseline (China Briefing, 2012). It features the retrofitting of existing buildings as a major target, which includes both continued work in the cold zone of North China and pilot projects in a bi-climate zone. According to the Plan, most buildings dating from before 2000 are non-energy-efficient and the extent of exterior envelope insulation is only one third of that in developed European countries with a similar altitude. Given the colder climate in north China, it is estimated that 2,000 million square meters of existing buildings are in need of retrofitting for energy efficiency retrofitting (TU, 2010; 12th Five-year Special Plan for Energy-Efficiency in Buildings). Although some demonstrative pilots for energy retrofitting have been undertaken since the late 1990s (Liu, 2011), energy efficiency issues relating to existing buildings were not given sufficient attention until the middle of the first decade of the 21st century. Thus by 2010, only a small proportion of existing public and residential buildings had been retrofitted for energy-efficiency (Tu, 2010). The first state-level retrofitting guidance for such buildings, the Guidance on Energy retrofitting for Existing Residential buildings, was issued in 2012, which is 26 years after the first building code for energy efficient design.

5.2 Current retrofit problems

5.2.1 The drive to modernisation as a threat to the historical built environment in China

Since the acceleration in growth and drive for modernisation that took off in the 1980s, great numbers of important historical buildings have continued to be demolished or spoiled (Yisan, 1993). At the same time, when Deng Xiaoping, introduced his 'Open Door' policies in 1978 a new

attitude to built heritage developed in Chinese social and political culture. In 1982 the state took a first batch of historic cities, including Beijing and Xi'an, and work began on their conservation (Jia, cited in Chen, 2011). By 2009, 111 cities were included in the scheme (Chen, 2011). However, the guidelines for historic conservation are loose and subject to local interpretation. While the drivers for conservation have gradually ramped up, they nevertheless continue to be trumped by the forces of modernisation and marketisation (ibid.). Looking at four case study urban conservation projects, Chen found that as land prices rose, the restored historic properties became unaffordable to the original inhabitants, the carriers of tradition and continuity. Developers were given a free hand and the original historic details were often reimagined and recast, so that historicity of place became a purely aesthetic attribute, supporting the aims of profit-making and political advantage sought by the city governments (Chen, 2011).

With the aesthetic qualities and novelty value of historical buildings given greater value than their authentic preservation in many current conservation projects, it seems that, in many cases, historically sensitive retrofitting for energy conservation is unlikely to be a priority.

5.2.2 Inadequate financial incentives

A target of 20% in heating energy use through retrofit was intended to be realised in the 11th Plan by the year 2010 using the following means: metering of heat supply, pricing reform, and retrofitting to realise a 50% heat intensity reduction (Price *et al.*, 2012). While more stringent enforcement is said to have rapidly raised the energy efficiency standards of new buildings (and an energy efficiency rating system is educating homebuyers about the potential running costs of their prospective new home), at the time of Price's assessment, based on unofficial figures, the retrofit measures appeared to be failing for primarily economic reasons: the financial incentive offered by the Chinese government to retrofit for energy efficiency was set at 50RMB per m^2 in the *severe cold* zone[2] and at 45RMB per m^2 in *the cold zone* while retrofit measures for heat efficiency typically cost 300RMB per m^2. This was not enough to motivate people and as a result households tended to install heat metering rather than embark on expensive retrofitting (Price *et al.*, 2012, p.2170).

5.2.3 Lack of systematic data gathering

The final result of policies towards retrofit is unclear as official figures are not available, highlighting another problem with retrofitting in China: unlike the UK, it does not have a system for systematically gathering data about energy use in buildings. This needs to include a method of assessing the energy efficiency potentials of a number of different modifications, gathering data at baseline and after retrofit initiatives, that can show what, if any improvements have been made (as suggested by Price *et al.*, 2012).

[2] China has been divided into five thermal zones for the purposes of building design (cold, severe cold, moderate, summer hot and winter cold, and summer hot and winter warm). However, the severe cold and cold zones represent most of the landmass.

6 Drivers for retrofit in China

6.1 Historic and increasing appreciation of built heritage

The value of ancient heritage has a long history in China, with a tradition of pilgrimage to venerated ancient sites subsisting over millennia up to the upheavals of the 20th century (Sofield and Li, 1998). The recommendations of one of the original members of the (historic artefact) Salvation Society, set up in the 1930s, ultimately led to the development of national 'lists' of protected buildings and artefacts that were further developed in the new era of the PRC (Yisan, 1993). However, during Mao's rule, there was a project of 'totalistic iconoclasm' which sought to renew society by repressing traditional culture and curtailing travel (Sofield and Li, 1998).

More recently, improving air quality has become an urgent driver in China's domestic policy - energy-saving and emissions reductions are clearly linked together in China's five-year plans. There is ample evidence that retrofit interventions are effective in bringing about cleaner air, a phenomenon that has been described as a 'co-benefit' of retrofit (Rafaj et al., 2013; Ma *et al.*, 2013). But in spite of the pressure to improve air quality, as well as a generally more positive attitude towards historical buildings, the predominant cultural investment in futurity might seem to separate energy efficiency initiatives from the conservation of the historic infrastructure.

But the approach may yet be becoming increasing integrated. Ouyang *et al.* (2011), for example, have made a joint assessment of improvements in market value alongside the savings to be made from increased energy efficiency in ageing residential buildings in China. Agarwal (2012) has noted that the contemporary administration has suggested that it will 'build 54 smart cities in the nation, with a total investment of US$153 billion to meet the target of reducing energy consumption by 16% and carbon emissions by 17% for every unit of GDP' (ibid.). Notably, as Agarwal has pointed out, these new smart cities will include energy efficient buildings with 'significant investments in the construction and *retrofitting* of green buildings' (ibid.; authors' emphasis). Despite smart cities' neo-liberal and exclusionary connotations, commentators such as Hollands (2008) have suggested that if reconfigured in the right way, the smart city could serve a variety of social, cultural and most importantly environmental interests. Where smart refers to efficiency, marketed in the right way, notions of the smart city could be used to convince developers and government officials to invest in smart retrofit technologies which could be, in turn, embedded in existing and historic building stock.

6.2 Green consumerism and business

One driver for energy efficiency retrofit lies in consumers' willingness to invest in green products. While there is certainly a very strong interest in green consumption in contemporary China as shown in current research (see for instance Kan, 2010 or Zhang, 2012), some surveys have also suggested that historically there has been a 'low degree of actual commitment to green purchases' (see Chan, 2001: 408); following this work, other commentators have remarked that despite the commitment of many Chinese citizens to green values, often Chinese people still pay more

attention ‘to the functions and price of merchandise, instead of environmental protection’ (see Zhang, 2012: 62).

Moreover, despite the rise of new central environmental policies, commentators have also pointed out that a green business and marketing culture could go much further (Ma and Liao, 2007; Lin and Ho, 2011; Miao, *et al*. 2012); specifically, Zhang (2012) and Miao et al (ibid) have argued the creation of new cultures of corporate social responsibility, environmental ethics and indeed, ‘green marketing’ might offer some pathways to creating a greener culture (Miao, ibid.; Zhang, 2012: 62-63). Likewise, Zhao et al (2013) have argued that ‘Businesses should take up the cause of green education… [given that] …the arousal of the consideration for the nature and environment would be useful in selling ecologically safe products’ (Zhao, 2013: 7). Green businesses do play a substantial role in both the availability of practical capacity for retrofit and for the normalisation of green values in society; and thus a real engagement with business is needed if green initiatives, such as retrofitting, are to succeed.

However, as Ma and Liao have warned new forms of ethical consumerism still might play the strongest part in encouraging businesses in China to take a stronger stance against corporate polluters (Ma and Liao, 2007). Thus with regard to the current social climate, demands for retrofitting might more likely arise from the meeting of NGOs such as the Institute of Public and Environmental Affairs, and new kinds of environmentally concerned citizens (Zhang and Barr, 2013).

7 Conclusion

The main advantages and disadvantages for each nation with regard to retrofit of existing and historic buildings can be summarised as relating to three factors: 1) ability of the state to promote, develop and sustain a coherent and integrated policy long-term; 2) the capacity of governance to create real financial gains for domestic households undertaking retrofit; 3) the degree of cultural value placed on both the historic built environment and the natural environment.

In terms of the first factor, China seems to have some advantage over the UK as the stable, one-party central state can gradually develop and improve upon retrofit programmes, ironing out initial flaws. By contrast, the UK context is one in which by the very nature of the multi-party political system, schemes will chop and change in line with the ideological commitments of the government in power and in the process, business capacity and know-how are easily dissipated. However, one advantage that the UK currently has over China in this respect is a strong and continuous tradition of statistical monitoring (admittedly simpler to organise in a country of 63 million than one of 1.35 billion). The feedback from UK monitoring data can quickly show to what extent policies are effective and allow ongoing adjustments to improve effectiveness. Without introducing a similar process of data-collection and analysis, the PRC will be hampered in understanding to what extent retrofit is taking place and whether supplementary measures to support consumer behaviour change are also required to achieve substantial results in terms of emissions reductions.

In neither country, however is it straightforward to counter the divisionism induced by the 'silo effect', whereby general, fluid and shape-shifting problems like climate change are dealt with issue by issue, for example, first addressing climate change mitigation and only then moving on to consider what is required for adaptation (see Brooks and Davoudi, this issue). Indeed, in situations such as these, there will only belatedly be recognition for the need to retrofit for each issue serially as it rises up the policy agenda; first for energy efficiency, then climate change adaptation, and perhaps finally to make lifetime dwellings.

The second factor, the capacity of governance to create real financial gains for the consumer undertaking retrofit, emerges because an ethical argument alone will not be sufficiently motivating for many households. Clearly prospective data-gathering on energy consumption before and after retrofit is central here; as is a sensitive energy pricing policy.

With regard to the third factor, cultural conditions in both the UK and China are very different. As we have said in the UK, there is a long standing built conservation culture, which moves beyond a specialised conservationist community to the general public (Bonnett and Alexander, 2013). However, in China, it is likely that the cultural association between historic buildings and poor, even slum-like living conditions will take more than one generation to eradicate. As it recedes in vividness, so greater numbers of people are likely to be attracted back to the character and distinctiveness of the historic built heritage. Nevertheless, in China, where the aesthetic qualities of historic buildings are winning an increasing market, the kind of sensitive retrofit that tampers as little as possible with the authentic fabric of buildings that is promoted in the UK, is unlikely to become an investment priority for anything but a very small minority of Chinese households.

Finally, in both China and the UK it is clear that the environment tends to come lower down on people's list of priorities when income is limited or low. While Britain has experienced slower economic conditions, many Chinese people today still live in relative poverty and along with long and protracted government discourses idealizing new middle class lifestyles – the *Xiaokang* Society – the priority for many Chinese people is economic improvement. But in spite of this, Chinese people may find it harder than their UK counterparts to entirely put aside the claims of the environment: while in the UK, the effectiveness of European air pollution mitigation policies has removed the immediacy of environmental contamination from most people's awareness, many Chinese citizens experience this as a palpable (and habitual) factor of everyday life (Zhang and Barr, 2013).

In both nations, a vibrant civil society sector may suggest the way forward. Civil society has been highlighted by organisations such as the UN as playing a key role in environmental governance (see Gemmill and Bamidole-Izu, 2002) Although the fragmentation between different 'third sector' groups and organisations can be a source of confusion and dissipation of energies, their increasing understanding of how to gain voice and exert influence means that the value and importance of the issues they champion - such as built heritage and climate change mitigation - is never seriously at risk of being overlooked. China has seen a massive growth of civil society organisations (and environmental NGOs) since the 1990s and the development of a greater multiplicity of voices speaking for the value of the past, as well as those defending the

environment of the future. The increase in size and voice of these new movements could yet be the way forward for the future of retrofitting in both nations.

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