

## Title – **A methodology to plan resilient urban development**

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**Abstract** - *Urban resilience connotes the capability of cities to cope with change and uncertainty. Such a powerful concept can be used to generate an urban model fit for the societal and environmental challenges of this age. It can also be used to develop an alternative to planning and urban design that moves away from the attainment of a static vision of urban development in favour of one that focuses on processes enabling reorganization in response to changing conditions. This paper presents a comparative analysis of three case studies in the UK, developed using a scenario-based tool for assessing the long-term performance of urban development and identifying solutions that account for uncertainty ([www.urban-futures.org](http://www.urban-futures.org)). In doing so, the tool facilitates an approach to planning that is open-ended and receptive to rapid socio-economic and environmental shifts. The use of scenarios also enables a systemic view of the social, economic and environmental aspects that come into play in the planning process. Through the comparative analysis some principles for urban resilience emerge such as redundancy and diversity. Some of these principles have been previously debated in studies about the resilience of social-ecological systems. Herein, they are discussed from an urban perspective and as potential generators of a different view to planning.*

Keywords: urban resilience, future scenarios, planning tools

### **1 – Introduction**

One of the most recurrent themes within the planning debate is the dichotomy between objective and process, determinism and open-endedness (Ferreira, 2009; see also Fainstein, 2005; Albrechts, 2003; Galloway, T. D. and Mahayni, R. G., 1977). Is planning a practice that should focus on the spatial configuration of urban development (and the way it can accommodate social needs) or one aiming at the stipulation of more effective processes of decision-making? Ferreira et al. argue (2009) that in reality there is no real dichotomy between objective and process, rather different gradients of both. For example, from the 1990s, under the label Urban Renaissance, concerns about the spatial organisation of cities came again to the fore, with promoters of this latest turn in planning invoking a mixture of place-making and higher quality of urban design together with a new emphasis on community building, sustainability, and joined-up thinking (Ferreira, 2009; Urban Task Force, 1999). If we accept that in reality, planning will always utilise normative tools to govern spatial development and regeneration even when the attention of planning efforts shifts on the mechanisms for collective engagement, then perhaps the dichotomy objective/process should be understood as static/dynamic. To put it simply: is planning driven by the attainment of a particular end-state enabling desirable socio-economic arrangements on which all actors can converge? Or is it rather finalised to the design of those conditions (institutional, procedural, normative, etc.) that can facilitate a process of urban transformation over time, following lines of evolution that are shared and desirable?

The distinction between static and dynamic is pertinent to the condition that society is living today, typified by Baumann as liquid (2000). If Western society until not long ago was relying on 'solid' and (relatively) immutable set of values as a reference for framing and choosing individual trajectories of life, by contrast this current form of modernity offers a condition in which values, meanings and even individual roles rapidly fluctuate. In this age, change and unpredictability are collectively experienced as the norm, part of the narrative of everyday life. Likewise, 'long-term' as a concept carries no meaning and as such it has been replaced by a prevailing 'short-termism' guiding actions and even the perception of time (Baumann, 2000). If permanence is no longer achievable, perhaps not even desirable, governing urban development can no longer be functional to the simple delivery of the built asset necessary for current needs. Rather, if driven by sustainable aims, it becomes a dynamic exercise of long-term adaptation.

Together with Bauman's parallel between societal processes and laws of physics, another one mediated by ecological studies was recently successfully introduced in many fields (and promoted as a paradigm change), including planning. Resilience is today an umbrella-term under which a variety of meanings and strategies are gathered, tackling economy, communities, governance, infrastructure (Rogers et al., 2012), man-made hazards (Coaffee, 2008) flooding (Hamilton, 2009) and more. The ubiquity of the term makes it likely to become an empty box that can be filled with any sort of meaning (Porter and Davoudi, 2012). Some scholars have analysed the contradictions of urban policies and reports promoting resilience (and expounding measures for its attainment) as a form of resistance to protect existing social and spatial arrangements against natural and man-made hazards (Walker and Cooper, 2011; Caputo et al., in review). Still, this article maintains, resilience is a valuable conceptual tool when it comes to plan for the long-term and for adaptation. It is also a powerful concept that captures the relationships between the spatial development of cities and the social and ecological dynamics underpinning it. However, if the potential of urban resilience to transform planning practice has been discussed in a number of academic studies, approaches to operationalise it are still largely under-investigated (Wilkinson, 2012).

This article presents a comparative analysis of three case studies developed using a methodology to analyse the long-term performance of urban development in order to ensure that initial objectives can be attained no matter what the future holds. If these objectives, as desirable, conform to principles of sustainability, the methodology will identify those conditions that are likely to strengthen the adaptive capacity of the development over its potentially long lifetime. The methodology is scenario-based and adopts a complex systems approach. It envisages urban development as a system nested within a wider set of systems outlined within scenarios. It relies on an analytical sequence designed to identify the real, precise objectives motivating plans for development (i.e. the purpose of the system) and the spatial boundaries of the plan in relationship to broader spatial contexts (i.e. the definition of the system's configuration). The following section briefly discusses the concept of urban resilience, identifying the innovative aspects and the drawbacks that this can bring in terms of a 'dynamic' approach to planning practice. Subsequently, the methodology for assessment and the case studies are presented. Finally, in the discussion section, the validity of the resilience approach with regard to urban planning will be discussed.

## **2 - Resilience and urban resilience theories**

Studies on the resilience of ecological systems led to the identification of a continuous oscillation of state as one of their defining characteristics. This apparent instability is in reality a response to external threats: as a consequence of disturbances, resilient ecosystems can change within a 'stability landscape' and still retain their functioning (Holling, 1973). Two important consequences of this systems' behaviour are that: a) ecosystems (and all living things) are open systems: they cannot be studied in isolation but only in relationship to their outer environment and as they evolve in time; and b) resilience is a mechanism for adaptation. There are at least two ways in which resilience can be conceptualised. The first one has been termed ecological resilience and has been identified with the time lapse in which systems maintain a recognisable configuration before precipitating towards an entirely different system. In this time lapse, internal features may vary in response to external factors but functionality and general configuration are maintained (Holling, 1996). Eventually, the feedback mechanism enabling responses to disturbances will generate conditions that are no longer recognisable as those characterising the original system. Engineering resilience (the second conceptualisation) is from physical sciences: therein is defined as the velocity with which systems spring back to their original configuration after a shock (see Norris et al., 2007). The former encapsulates the dynamic nature of evolutionary processes whereas the latter describes a static form of balance, in which systems retain their original qualities until higher shocks deform them (see Figure 1).

Some scholars have warned against the danger of grafting ecological theories onto disciplines that investigate different areas of knowledge (Adger, 2000; Wilkinson, 2012). How can properties of ecological systems apply, for example, to the artificial, multilayered organisation of cities, in which

human agency does not follow laws of nature but rather values and power dynamics? How can socio-cultural constructs such as democracy and aesthetics (all elements which influence the making of the built environment) be accounted for in a theory derived by ecosystems studies? Nonetheless, biological laws utilised as heuristic devices to explore alternatives to prevailing patterns of urban development have been used in urban studies from Geddes onwards. Mumford (1961) utilised natural metaphors to support his critique on the unmanageable growth of modern cities. McHarg (1967) devised a planning methodology by using as a parameter the ecological value of land. In a different field of knowledge, Shumacher (1973) used biology laws to support his case for a contained dimension of national boundaries and institutions. By linking natural dynamics of growth and adaptation to the socially constructed processes of urbanisation and governance, these approaches brought to the fore issues of scale, flows of resources, and environmental management with consequent innovation in planning theories and practice.

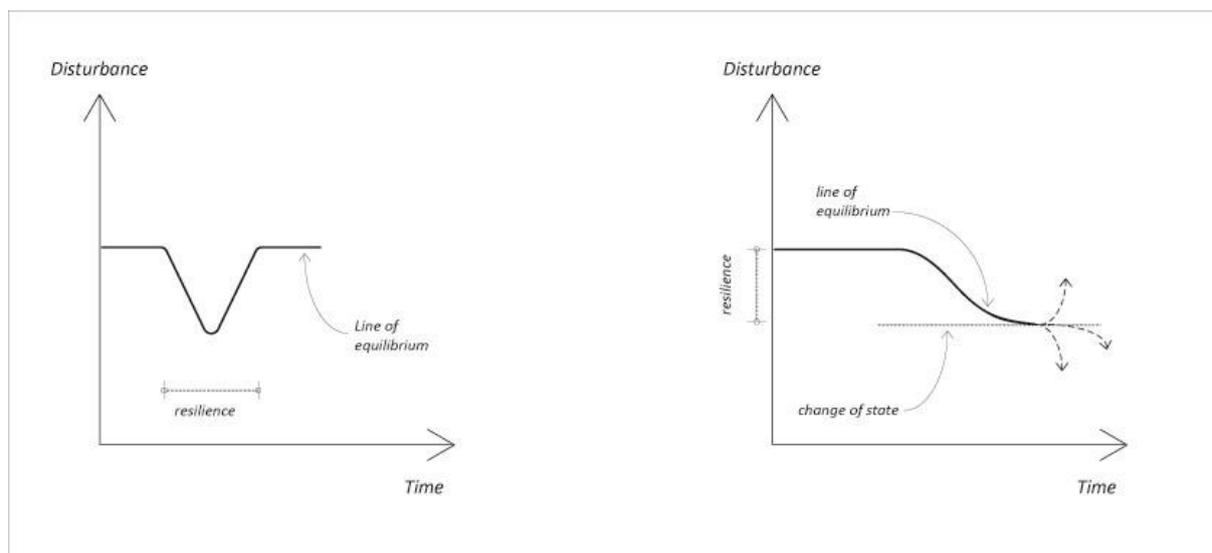


Figure 1- Diagrams showing systems' behaviour under engineering resilience (left) and ecological resilience (right) (adapted from Adger, 2000)

Inherent to this 'ecological thinking' is a strong accent on relationships (e.g. urban growth in relationship to the wider region), stewardship (e.g. responsible use and conservation of resources through ecological management) and complex systems. Through the ecological lens the city is viewed within a web of connections, sensitive to changes of use in surrounding areas and material flows. The investigation of Alberti et al. (Alberti and Marzluff, 2004; Alberti et al., 2003; see also Alberti, 2005) which focuses on the impact of different patterns of urban growth on the ecosystems of the region and on the urban ecology at large, is one of the latest streams of investigation in line with this tradition. Drawing from Holling's studies on ecological systems, they identify density, connectivity, grain, and urban form as urban parameters that can determine the degree of environmental damage or strengthen the resilience of cities and surrounding natural environment. The scope of this investigation (i.e. the interplay of socio-economic and ecological dynamics within urbanisation processes) is connected to another prolific and highly influential stream of investigation which focuses on social and ecological systems (SES). Folke et al (2002a; 2010), building on the observation of communities across the world and their processes of adaptation to a changing environment, identified principles to build adaptive capacity of SES. These principles enable a resilient system of governance, with communities managing carefully resources, monitoring change and adjusting to it in order to maintain livelihood and stocks of resources. Principles include: 'Learning to live with change and uncertainty'; Diversity'; 'Combining different types of knowledge for learning'; and 'Creating opportunity for self-organization'.

Wilkinson (2010) argues that SES resilience theories are of high relevance for planning, because they deal precisely with issues such as complexity and change that are at the fore of the latest planning

debate. The strategic navigation theorised by Hillier (2011), for example, is predicated on the non-linearity of events and the acceptance of uncertainty as inevitable. It is a strategic tool enabling an open-ended approach to planning, based on multiple plans of investigation. Portugali (2012) theorises a self-organising city, which can be planned by focusing on the relationships between the diverse urban elements and the dynamics through which they affect each other. Jabareen (2013) draws on several strands of SES theories in order to outline a framework for urban resilience that addresses urban economics, social equity and spatial configuration, thus attempting to draw the boundaries of a comprehensive urban system. Porter and Davoudi (2012) identify at least four factors that can advance planning theories and practice, which can be found in SES theories. These are: a) change and adaptation as a positive value, rather than obsessive maintenance of the status quo; b) acknowledging the non-linear nature of reality and the futility of plans based on cause-and-effect analysis of contextual conditions; c) socio-ecological interplay, which also requires d) complex systems thinking. However, both ecological and SES theories on resilience do not address aspects which are critical for any theoretical model for urban planning. These aspects, as mentioned above, are those that characterise human agency as intentional and political, and that cannot pertain to the natural realm, in which regulating laws are strictly biological. SES theories promote a higher ethical attitude as well as a sense of purpose to human agency, directing it toward the stewardship of ecosystems. Yet, issues that are not developed in those theories such as intentionality (a resilient urban system must have purposes collectively recognised as meaningful); power (who decides finalities and objectives); and system boundaries (the definition of the system can include or lock out important factors) are key factors in planning.

The neutrality of resilience as a concept was already highlighted by Carpenter et al. (2001), when they observed that it lends itself both to positive and negative connotations. Ultimately, the eutrophication of lakes can be a very resilient state. Likewise, authoritarian regimes can resist significant external changes over time (Holling and Walker, 2003). For example, China is today fully integrated within the global economy and still maintains some form of undesirable dictatorship. It is therefore necessary to endow purposefulness and ask: resilience for what and to what? What is the ultimate finality for which resilience is sought? It could be argued that urban resilience, if taken to its ultimate consequences, is a metaphor for the transient nature of cities, which will have to adapt until changing dramatically their configuration in order to support entirely different social systems. In contrast with an illusion of circularity depicted by some sustainability theories (e.g circular urban metabolism, circular economy, etc.), and in line with bio-economic theories of Georgescu-Roegen (2003) which deem an endless availability of resources impossible (even if sustainably managed), the resilience metaphor offers a more realistic approach to govern a perpetual evolutionary process which will inevitably lead to radical transformations.

The new planning theories outlined above stem from a reaction to the positivist thinking embedded in much planning practice, which is reinforced by tools such as quantitative models of forecasting, often used as evidence supporting decision-making. These models support a linear pattern of evolution (Balducci et al., 2011) suggesting that the future can be predicted and determined by analysing, in continuity, past, present and future. Yet, reality is more sophisticated and complex, thus contradicting and often undermining planned options for development. Other tools can be used in order to take into account uncertainty. These include: scenarios (see Myers and Kitsuse, 2000; Börjesona et al., 2006) and exercises to map future trajectories (Hillier, 2011). Such tools enable an open-ended planning process, in the recognition that any determined end-vision of the future can fail. As a further contribution to this debate, the following section presents some case studies developed using a scenario-based tool that can help understand more in-depth the spatial, economic and organisational consequences of an approach to planning based on non-linearity, uncertainty and systems thinking (i.e. an ecological view to resilience). The peculiarity of this tool lies in its analytical sequence enabling the identification of aspects requiring resilience, the identification of the system boundaries as well as the elicitation of those economic and social factors that can impede adaptation.

### **3- Case studies**

The methodology used in the case studies presented in this section was developed within the EPSRC funded research programme ‘Sustainable Regeneration: from Evidence-based Urban Futures to Implementation’. It consist of a five-step sequence aimed at analysing the long-term performance of urban development, which utilises four future scenarios (see Table 1) depicting the Western European

<b>Market Forces</b>	<b>Policy Reform</b>	<b>New Sustainability Paradigm</b>	<b>Fortress World</b>
Well-functioning markets are the key to resolving social, economic and environmental problems. It assumes the global system in the 21st century evolves without major surprise and incremental market adjustments are able to cope with social, economic and environmental problems as they arise	There is belief that markets require strong policy guidance to address inherent tendencies toward economic crisis, social conflict and environmental degradation. The tension between continuity of dominant values and greater equity for addressing key sustainability goals will not be easily reconciled	New social-economic arrangements and fundamental changes in values result in changes to the character of urban industrial civilization, rather than its replacement	The world is divided, with the elite in interconnected, protected enclaves and an impoverished majority outside. Armed forces impose order, protect the environment and prevent a collapse

*Table 1- Short abstracts of the narratives of the four scenarios derived by the GSG global scenarios*

urban context in 2050 (Boyko et al., 2012). These scenarios were derived from those developed by the Global Scenario Group (GSG) (Gallopin et al., 1997). The original GSG scenarios were further detailed in order to represent the urban environment in all its dimensions (i.e. socio-political, spatial, economic, etc.). Although based on the GSG work, research demonstrated that the four scenarios used in the methodology recur in all major futures studies, hence showing their reliability (Hunt et al, 2012). The five-step sequence (see Figure 2) is designed to: 1) identify the purposes underpinning plans for urban development option; 2) identify the conditions to attain such purposes; 3) compare these conditions against the future scenarios and ascertain whether they are supported or impeded. If they are impeded, causes should be identified; 4) establish if the planning strategy for the urban development appraised ensures its long-term purposes and functionality; and 5) modify the initial strategy in the event the analysis demonstrates its vulnerability to changes.

This exercise transcends the mere identification of possible risk factors. Rather, it is meant to trigger a broader reflection on the consequences of taking design decisions that are not adaptable. By posing different ‘what ifs’, scenarios offer the possibility to explore causes of failures and, by addressing such causes, more resilient alternatives. Within the methodology, scenarios are complemented by a thorough list of quantitative and qualitative urban indicators (e.g. domestic energy consumption, air quality, dwelling density, system of governance, urban form, etc.) that can support with robust evidence final findings of the analysis (see [www.urban-future.org.uk](http://www.urban-future.org.uk)). The analytical process enables something similar to the strategic navigation outlined by Hillier (2011) and Wilkinson (2012) through which the horizon of the possibilities is scanned, and a map of possible evolutions of the present is drafted against which strategies for adaptation can be designed.

In the course of the research programme and beyond, local administrations and urban design practices showed interest in this methodology and collaborated in order to trial it. Case studies were developed in collaboration with these partners and some of them documented in journal articles (see Caputo et al., 2012; 2013). The remainder of this section presents three of such case studies. A summary of the outcomes of the analysis is presented in Table 2, in which some keywords capturing the type of approach used to attain resilience is marked in red. These keywords refer to approaches to resilience

that are used also in SES and biology studies (see Table3), although with regard to planning they have different implications.

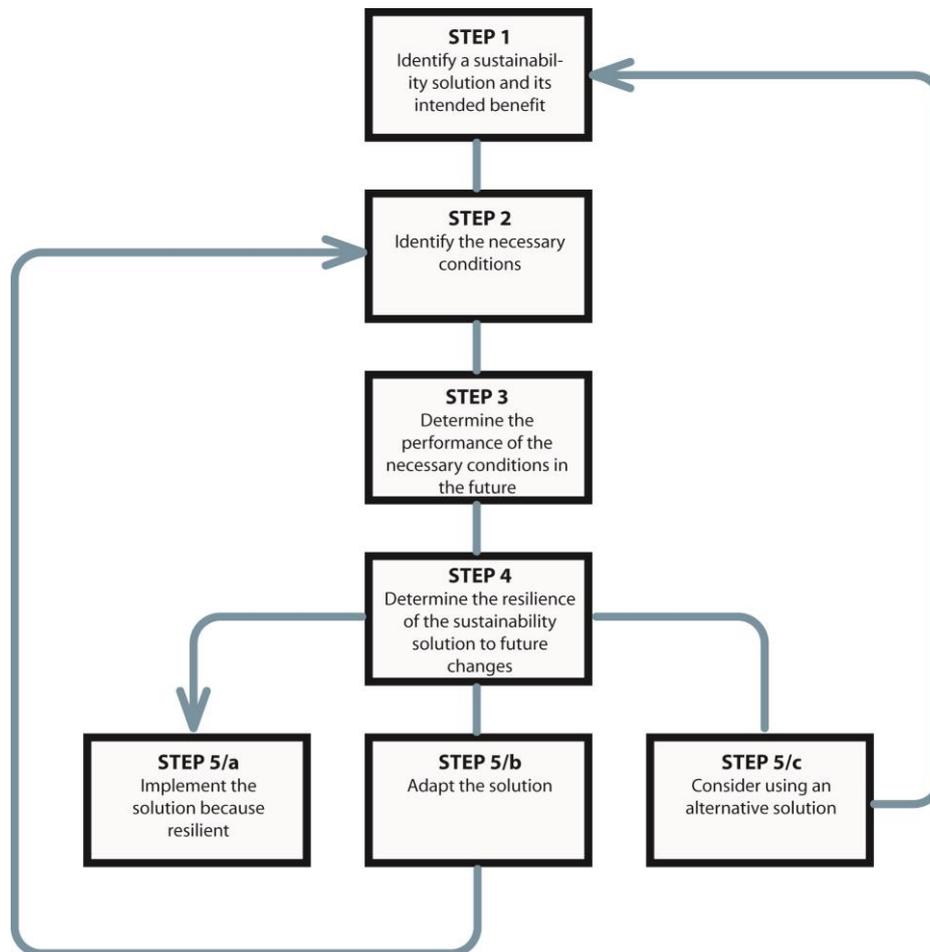


Figure 2- The five-step sequence of the methodology to appraise the long-term performance of urban development (adapted from [www.urban-futures-org.uk](http://www.urban-futures-org.uk))

### 3.1 - Coventry city centre

In the 1950s the city centre of Coventry went through a major regeneration process aimed at reconstructing a city destroyed by the war and modernising it according to rationalist principles. A new road networks for fast car circulation and the design of a new pedestrian retail precinct, in line with the latest American trends and other European example (e.g. Rotterdam's Lijnban), were among the highlights of the new plan. The ambitious scale and the architectural quality of the intervention contributed to build its reputation as one of the most successful examples of city centre regeneration of its time (see Hasegawa, 1992). Coventry's economic success was based on its car industries. Today, in this post-industrial age characterised by the decline of manufacturing in many developed countries, Coventry's economy is struggling. Ironically, like sixty years ago, the radical regeneration of the city centre is considered instrumental for the economic recovery. The new master plan that received initial planning consent proposes a major demolition and reconstruction of the 1950s shopping area in order to make space for new iconic buildings, larger retail units to attract world-leading retail brands, and new cinemas and restaurants.

Although design statements promise sustainability to be at the heart of the new regeneration, the evident ambition that drives design choices is the recovery of the local economic. Thus this is the main purpose identified in the first step of the analysis. Conditions for the local economy to prosper

over the following decades include: the architectural and urban quality of this new intervention must be perceived as attractive also by future generations; the urban typology of the Big shopping areas as urban typology must meet shopping habits of the future generations; the average size of the new retail units meets future market demands; and the economic benefits generated by the new regeneration fall on local communities with reasonable equity. The scenario analysis shows that a regeneration based on a radical new architectural identity can be prone to the whims of styles and market trends, thus becoming obsolete in the medium-term. A more resilient strategy would be to enhance the existing architectural legacy through sensitive renovation, since this is already perceived as a characterising feature of the city. Likewise, buildings and retail units designed to accommodate big global firms may be difficult to adapt to long-term market changes. The current and prolonged condition of financial instability, with its repercussions on household's expenditure, is already emptying high streets and modifying shopping habits. In the UK, some reports suggest that small, innovative and local enterprise must be encouraged through targeted policy, which can widen the offer, foster the local economy, and be more flexible to market shifts. Spatially, this entails for buildings to offer a wide range of spaces in terms of size and use.

### *3.2 - Bury St Edmunds*

Bury St Edmunds is an old market town with a well preserved architectural heritage attracting local and foreign visitors, and an affluent population. The town centre is visually pleasant, walkable, lively, and with a diverse mix of activities. Against this background, the vision for the future of the town outlined within the 2001 Development Framework is one of economic consolidation. Retail was identified as the principal activity providing economic opportunities, thus motivating the expansion of the retail space. However, new commercial development should be designed as a seamless extension of the city centre. To ensure this, the master plan that received preliminary planning consent took inspiration from the historical context in terms of buildings, urban typologies and urban grain. For example, the core of the new development is a square with spatial characteristics similar to those of the most popular square in the city centre. Building distances and architectural types and proportions are also inspired by existing historical buildings.

Similarly to the first case study, the main objective of this regeneration project too is to propel local economy, although in this case this objective is functional to the expansion of already thriving economic conditions. In addition, In the Development Framework, a strong emphasis is given to the environmental performance of buildings. The master plan that received planning consent responded to these objectives delivering a mixed-use development, entirely pedestrian, with low-rising buildings specified with local materials and designed to maximise natural light penetration. This new development hosts dwellings at the third floor and retail units at the first two floors. The formal language is subtly inspired to the historical residential buildings of the city centre, although a department store facing the main square is designed in a completely different style. Conditions enabling the stated objectives as they surface from the analysis include: the new development must be regarded by future generations as well integrated with the town centre; sufficient demand for retail space must continue over the lifetime of the development; and future regulatory framework must support current levels of energy efficiency of buildings.

The scenario analysis found that these conditions can only be partially met, and that the high concentration of retail space as proposed in the master plan makes the new development vulnerable to changes of the market and the attitude of consumers. Although this development scheme is based on a rigorous analysis of the contextual urban fabric, it ultimately proposes a high street extension rather than a place that can support a local community. As such, the public square may be populated predominantly by customers and be rather empty after working hours. Recommendations include the reduction of space for retail in favour of residential space, and a long-term programme for the delivery of commercial spaces over a longer period of time and across the entire areas surrounding the town centre. This would allow monitoring the demand for retail space and changing strategy in the event of adverse market conditions. Lower concentration of retail space would also result in a type of mixed-use closer to the real composition of the historical centre. Moreover, a sustainability strategy that

includes higher levels of building insulation would enable compliance with tighter future mandatory energy efficiency targets, which are regarded as likely in some scenarios.

### 3.3 - Luneside East, Lancaster

Luneside East is a previously developed, 6.6 hectare site in Lancaster earmarked for mixed-use waterfront regeneration. The triangular site is delimited by two embankments and the river Lune. In planning guidance, objectives for this development are: to connect the western area of the city (where some low-income communities are located) with the centre and to deliver a highly sustainable development, in which dwellings are designed to be energy efficient through natural lighting and orientation, efficient building envelopes and on-site renewable energy production. Energy targets are not given, although an alignment with other local energy policies for renewable energy generation is mentioned in the city's Development Framework (i.e. 10% on-site energy production).

Case study 1 -Precinct - Coventry		Case study 2 -Edmund St. Bury		Case study 3 - Luneside East	
<i>to support and re-launch local economy</i>		<b>to meet present and future demand for retail spaces – to plan new development as an extension of a preserved and valued city centre – to deliver environmentally efficient buildings</b>		<b>a mixed-use development with sustainability at its heart, spatially connected with neighbouring residential areas</b>	
<i>as planned</i>	<i>as recommended</i>	<i>as planned</i>	<i>as recommended</i>	<i>as planned</i>	<i>as recommended</i>
Demolition and reconstruction to re-launch local economy with a new iconic anchor buildings	Preservation of the existing heritage using architectural identity as a long-term strategy for place-making tradition	Shopping, pedestrian urban block designed and but with high construction and design standards in order to compare and extend the existing city centre	Alternative strategy with lower concentration of retail units and long-term program to distribute retail spaces on a wider urban area and as demand rises	Existing embankment modified in order to enhanced connectivity with neighbouring communities	Preservation of the existing embankments as a feature that can strengthen the identity of the place
	<b>Enhancing longevity of current resources</b>		<b>Multiple outcomes</b>		<b>Enhancing longevity</b>
New commercial buildings with large shopping units In order to attract high profile retailers	Mix of sizes to attract a range of retailers in order to attract customers from low to high purchasing power	New commercial buildings with large shopping units In order to attract high profile retailers	Design for flexibility in order to convert big units to small and medium units	On-site energy generation units	Facilitating the formation of a community organisation capable to define targets and forms of investments, and ensure long-term management
	<b>Redundancy</b>		<b>Adaptability</b>		<b>Alternative systems of governance</b>
Mixed use with commercial buildings for retail taking up most of the built area and limited square footage for residential and office buildings	A more balanced mix of uses Adaptability to future change of use	Central square designed as an attractive public space for the local community	Establish a network of organisations ensuring the square is fully utilised for the benefit of the community		
	<b>Adaptability</b>		<b>Redundancy</b>		
	Design and implement a cultural programme to promote and build on the architectural heritage of the city centre	Local materials as sustainability strategy Maximised natural light penetration	Ensure higher levels of thermal insulation for buildings in order to comply with possible future tighter standards		
	<b>Alternative systems of governance (Re-organisation)</b>		<b>Enhancing longevity</b>		

Table 2- Summary of the comparative analysis of the three case studies presented in section 3

Necessary conditions to deliver these objectives in the long-term include: features that can attract neighbouring communities to the new development, thus encouraging pedestrian and car flows through it; a form of management of the on-site generation system enabling its long-term functioning; and access to natural light over the entire lifetime of the development. The scenario analysis shows that the original intention of eliminating part of one embankment suggested in planning guidance as a way to increase connection with adjacent residential areas would be counterproductive over the long term for at least two reasons. Firstly, at present the embankment is an ‘unmanaged’ linear green area acting as a green corridor. Maintaining and enhancing this ‘green’ embankment would actually attract people rather than impede connection, thus preserving an urban feature that is embedded in the collective memory and strengthening the character of the new development. Secondly, it would create a buffer zone preventing eventual future development to limit access of natural light through high-rise buildings. A further recommendation from the analysis is for the local council to facilitate the start of a community group with which forms of management of the on-site generation units can be discussed. Scenario analysis suggests that technologies for this type of generation (requiring new components every 20-25 years) and frequent changes of house ownership (in case of micro-generation through PV panels) could undermine the initial expectations in terms of energy production.

Ecological resilience	SES (Folke et al., 2002)	Porter and Davouri (2012)	Ahern (2011)	Anderies (2014)	Principles for urban resilience
Stability landscape	Learning to live with change and uncertainty	Change and adaptation as a positive values	Adaptive planning and design		* Non-linearity * Multiple outcomes (scenarios)
Adaptation through change	Diversity	Non-linearity	(Bio and social) diversity Redundancy and modularization Multifunctionality	Redundancy Modularity	* Redundancy * Flexibility of buildings and open spaces * Experimenting and monitoring
Adaptation through change	Combining different types of knowledge for learning	Socio-ecological interplay Complex systems thinking	Multi-scale networks and connectivity	Diversity in agents (components) or connections	* Complex systems thinking * Enhancing longevity * Experimenting and monitoring
	Creating opportunity for self-organization		Adaptive planning and design		* Alternative systems of governance (Re-organisation)

Table 3 – Table comparing different interpretations of ecological resilience

#### 4 – Discussion

The case studies presented here show how the methodology for the long-term assessment can introduce concepts such as change, uncertainty and adaptation within the planning process. Recommendations aiming to build adaptive capacity (briefly outlined for each case study) bear resemblance to strategies to develop adaptive capacity within SES (see Table 3). Nevertheless, such recommendations also directly address and connect issues of governance, institutions, policy, and interplay between local and broader socio-economic context. The analysis developed through the methodology is therefore capable of integrating those issues highlighted in the introduction as critical for an ecological resilience model (i.e. intentionality, power and system boundaries) to become a useful theoretical model for the built environment. The remainder of this section elaborates on these three issues and shows how these were dealt with in the application of the methodology.

Within the methodology presented here, the definition of intentionality and systems boundaries is enabled by the analytical five-step sequence. The initial identification of the objectives of the master plans appraised and the conditions necessary for their attainment give intentionality as well as the spatial and socio-economic definition of a system. This is because such conditions can be only inferred by understanding the socio-economic local and national context, and by viewing these as nested systems. For example, one of the conditions outlined in the case study 1 and 2 was related to

national and global economy and how this can impact the local demand for retail, retail space typology and shopping habits at large. This also helped considering the real long-term benefits for the local economy of a classical model of growth based on an acceleration of cycles. In this model, obsolescence of style, use and values is instrumental to generate new demand. This process, however, can conflict with the process of place-making which builds on collective memory and incremental adaptation. In this complex systems view, different scales are connected and feedback loops are identified together with leverage points, which in turn can be used to modify possible and undesirable outcomes. Starting from the spatial configuration, the analysis touches on urban policy, and economic and social implications of design choices. Scenarios are a valuable tool because they capture values driving a particular evolution of society and their multiple impacts. Scenarios therefore become an effective heuristic device to explore future consequences of today's choices and reasons for failure to attain stated objectives. This is important, because plans for urban development are usually based on a static, crystallised desirable end-vision. By considering more than one plausible evolution of the present, the methodology prompts solutions that offer a high degree of adaptability within a stability landscape.

In his book outlining a scenario-based methodology aimed at integrating considerations about the future into design practices, Fry (2009) suggests that 'short-termism' is more than a culturally determined attitude. He maintains that 'while the inability to project our action in time seems to be a structural limitation of our mode of being, overcoming this condition and acquiring much greater futuring capability will become an increasingly vital factor for securing our ongoing being... Unless this is done, later events can make earlier decisions redundant, or expose them as inappropriate'. Whether the incapacity to scrutinise options we consider for the consequences they may yield in the future is a mental limitation of the human being rather than the result of socio-economic norms and constraints leading to prioritise immediate results to future benefits (for a discussion of the obduracy of frames and traditions limiting change in planning see Hommels, 2005), it seems undisputable that a radical change of perspective is needed. As Wilkinson suggests (2011; 2012), the exercise of reframing a particular situation is a practice that sometimes unearth aspects and ulterior reasons that can attract wider consent. By filtering elements that come into play within a mental process, frames are capable of emphasising selected aspects and fostering some set of values rather than others (Common Cause, 2011). The methodology presented here is an attempt to promote 'longevity' and 'change' as a value inherent to buildings and open spaces, which can be enabled only through enhanced adaptive capacity. This can be achieved through the long-term frame offered by the concept of resilience. The methodology facilitates to view practice through this frame by bringing to the fore risks encountered when designing and planning in the assumption that the future will be similar to the present. Longevity (and change) can be values shared by a variety of stakeholders: developers may be interested in retaining commercial value of assets over the long term, planning officers in developing a thorough risk analysis ensuring functionality of planned infrastructure, and local communities may be interested in ensuring that mechanisms for optimal management and maintenance are in place. In the process, however, all stakeholders acknowledge change as inevitable, perceive it as a design parameter, and are forced to view environmental, social and economic causes for accelerated obsolescence as a threat.

Power (the last issues highlighted by Porter and Devoudi) is perhaps the most problematic. Case studies developed through this methodology were able to elicit relationships of power and suggest, for example in the case study 3, more democratic ways of managing energy production and supply. This case study suggests that resilient energy systems are not a mere matter of technology and energy systems design but they are politically charged. A more resilient distributed energy network cannot simply be the result of sophisticated engineering; it requires difficult choices capable of questioning the power structure behind provision and supply, with its powerful market players. It also requires a role of policy makers as strategists capable of engaging community groups, transferring knowledge, and legitimising them for the management of new community assets and services. New tools for planning can facilitate critical analysis of the existing institutional arrangements and suggest approaches that by emphasising participation can make collective choices more resilient.

There is a correspondence that can be traced between principles for socio-ecological resilience and the strategies for resilience identified through case studies presented in the dedicated section of this article (see Table 3). For example, adaptability and redundancy are strategies for resilience that capture well the principle of diversity. In nature, diversity and redundancy provide systems of a safety net in the event that the extinction or temporary impairment of a species deprives the system of a critical function. By extension, in socio-ecological systems diversity and redundancy refer to a plurality of institutions guaranteeing the provision of vital services to society and the environment in the event of failure of one or more of such institutions. In planning, redundancy can be attained both in terms of space and governance. In order to foster a sense of place and facilitate the longevity of a local community, the square designed to be at the centre of the development in case study 2 must not be delivered as an empty space that can be filled in (or not) depending on the random flow of visitors to the shopping centre. Rather, it must be conceived as a multifunctional space (e.g. place for social encounters, place for customers of the shopping area, place for public events, etc.), and its use facilitating through an established network of groups that can use the space in flexible ways (e.g. farmers market, art performances, pop-up food stalls, etc). Ultimately, however, SES theories can help understand the practice of planning as one aimed at managing change and adaptation rather than merely delivering spatial development. Ultimately, there is an overall sense of purpose that permeates the theory for socio-ecological resilience. If applied to the built environment, this can move the accent from planning and delivery of the built asset to management through experimenting and ‘learn-by doing’ (Ahern, 2011).

#### **4 – Conclusions**

If urban planning is about the future, than planning practice needs to acknowledge the increasing complexity of society and unreliability of any medium-term forecast. Attempting to direct urban transformation and growth in a way that it accommodates current and future multiple and conflicting stakeholders’ agendas is no longer a matter of coordination and synthesis, rather navigation with a purpose. In this process, long-term foresight cannot be used as predictions enabling the formulation of plans to attain a determined desired future, rather as a tool to identify the forces that can drive change and the dynamics that can trigger undesirable conditions. Mapping these forces at play becomes the basis onto which targets, policies and systems of governance can be designed in order to enhance their adaptability to change. Future scenarios of society can be used to transcend a deterministic attitude to planning as well as a structural or culturally induced limitation of the human mind to act today with little consideration of the future consequences.

This paper has presented a scenario-based methodology enabling a structured approach to plan for uncertainty thus reinforcing the adaptive capacity of urban development. Its five-step analytical structure is designed to identify the precise purposes driving design choices. By putting purposes first and questioning design options for their capability to attain them against a number of possible futures, the methodology exposes the futility of short-term choices and the necessity of adaptable strategies as the only chance to attain the stated objectives over the long-term. Moreover, the methodology requires the identification of the conditions that can support such purposes. Inevitably, those conditions are connected to multiple factors, each one liable to change over time with consequences propagating to the entire system. In this exercise issues of power, governance and policy come to the fore and can be explored as elements facilitating or impeding adaptation. Tools can be useful only insofar as they simplify functions that are not easy to perform thus promoting new and more complex skills. In this perspective, the methodology presented here can promote a form of ‘adaptive’ planning based on the concept of ecological resilience which can facilitate an understanding of cities as dynamic entities.

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