Chapter 2
Resilience, Uncertainty, and Adaptive Planning

Simin Davoudi

Abstract We live in a complex and uncertain world which, among other things, is faced with climate breakdown with unknown and potentially catastrophic consequences. Governing uncertainties is particularly challenging for spatial planning which is primarily a future-oriented activity. In response to this challenge, the concept of resilience has attracted growing attention and become a keyword of our time. But, what does resilience actually mean, and how is it interpreted in policies and practices? This chapter unpacks two fundamentally different meanings of resilience (engineering and evolutionary) and discusses how they are aligned with two different understandings of space and place (absolute and relational) and two different approaches to spatial planning (blueprint and adaptive). The chapter argues that the engineering interpretation of resilience is underpinned by principles that are similar to those underlying the absolute understanding of space and blueprint approaches to planning, while the evolutionary interpretation of resilience is aligned with the relational understanding of space, and the adaptive approaches to planning.

Keywords Resilience · Planning · Uncertainty · Evolutionary resilience · Adaptive planning

2.1 Introduction

In October 2018, the world received another stark warning from the Inter-Governmental Panel on Climate Change whose latest report stated that we only have 12 years to keep the increase in the global mean temperature to 1.5 °C relative to pre-industrial levels; that every fraction of additional warming would worsen the impact of climate change on a whole host of natural and social processes. Alongside this apocalyptic future, the report also invokes a message of hope and suggests that if we take urgent and radical action in cutting greenhouse gas emissions, we can save the world from climate catastrophe.

S. Davoudi (✉)
Newcastle University, Newcastle upon Tyne, UK
e-mail: simin.davoudi@ncl.ac.uk

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It is widely acknowledged that spatial planning has a critical role to play in the transition away from fossil fuel economies by considering, for example, how land should be used to reduce urban sprawl, what kind of buildings should be designed to increase energy efficiency, and how renewable energy can be incorporated into new developments (Davoudi et al. 2009). However, even if the best mitigation measures are in place to keep global warming from breaching 1.5 °C, we will still be confronted with the consequences of past emissions. We will still experience sea-level rise, extreme weather events, water shortages, frequent flooding, heat waves, and wildfires. We do not know, however, the exact nature, severity, and implications of these events due to the complex feedbacks and radical uncertainties that are inherent in climate systems. Such uncertainties are not exclusive to climate change but are prevalent in all open systems.

When we look at events such as the 2008 banking crisis, periodic terrorist attacks, social upheavals, and even events in our own everyday life experiences, we realise how little we know, or indeed can know, about what happens next. Governing and managing such a state of flux is a great challenge for urban governance in general and planners in particular, whose job is to draw route maps into unknown futures.

2.2 The Growing Popularity of Resilience

In response to this challenge, one concept that has attracted everyone's attention more than any other is *resilience*. Many believe that building resilience will allow people and places to deal with the seemingly sudden shocks brought about by climate change. The attraction of this idea has been such that a growing number of think tanks, philanthropic organisations, governmental and non-governmental institutions, and corporate entities have made resilience their top priority. Examples include the United Nations' Sustainable Development Goal 11 which promotes "*inclusive, safe, resilient and sustainable cities and human settlements"*; the World Bank's *City Resilience Program*; Habitat III's *New Urban Agenda*; and the Rockefeller Foundation's *100 Resilient Cities*. Each of these organisations has developed a multitude of toolkits, guidelines, and indicators about how to make cities, citizens, and ecosystems more resilient. It is not surprising, then, that resilience has been heralded as "the buzzword of our time" (Zolli 2012), almost replacing the notion of sustainability.

2.3 Multiple Genealogies of Resilience

Resilience has a long and meandering genealogy with multiple roots in science, engineering, disaster studies, psychology, mechanics, and even anatomy. The term itself comes from the Latin *Resi-lire* meaning "spring back". According to Alexander (2013), resilience has been used historically in science by Francis Bacon in 1626; America's reaction to an earthquake in Japan in 1854; mechanics by William Rankine in 1858; psychology in 1950, then in the 1980s by Norman Garmezy; as well as in coronary surgery, anatomy, and watchmaking.

However, neither its long history nor its widespread appeal has led to a common understanding of what resilience actually means and how it is being interpreted in policies and practices. To shine a light on these questions and map out how they are linked to planning, this paper will unpack two fundamentally different meanings of resilience and discuss how they align with two different understandings of space and place and two different approaches to spatial planning. In doing so, I draw extensively on my previous work (without repeated self-citations) on resilience (Davoudi, 2012a, 2013, 2016, 2017, 2018), as well as relational space and interpretive planning (Davoudi and Strange 2009; Davoudi, 2012b, 2015). I start with the engineering interpretation of resilience and show how its assumptions are similar to the absolute and bounded understanding of space and blueprint approaches to planning. I will then talk about the evolutionary interpretation of resilience and show how it is aligned with the relational understanding of space and adaptive approaches to planning (Fig. 2.1).

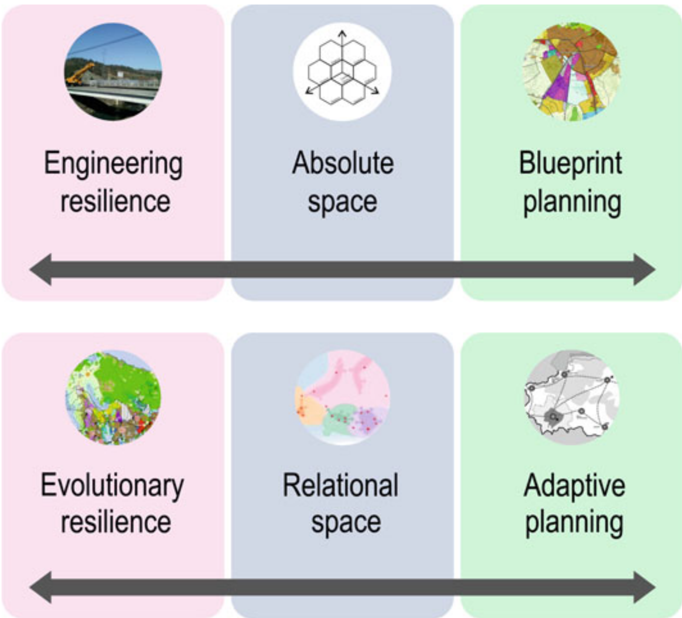

Fig. 2.1 Resilience, space and planning

2.3.1 Engineering Resilience: Absolute Space and Blueprint Planning

Physical scientists and engineers were among the first groups to use the term resilience to denote "the ability of a system to return to equilibrium after a disturbance" (Holling 1973, p. 17). This means that the *resistance* to disturbance and *the speed* at which the system returns to a state of equilibrium constitute the measures of the system's resilience. The faster the system *bounces back*, like a spring, the more resilient it is. Applying this idea to the socio-spatial contexts implies that a resilient city is a city that is able to recover and return to how it was before a crisis (such as a climate disaster, a terrorist attack, or political upheaval).

This engineering approach to resilience has influenced the debate in a wide array of disciplines. For example, economic geographers often draw on this definition to explain the trajectory of regional economic change as "a process of punctuated equilibrium" (Simmie and Martin 2010, p. 3). Similarly, in disaster studies, urban resilience is often defined as "the capacity of a city to rebound from destruction" (Vale and Campanella 2005), often putting an emphasis on quantitative measures of recovery. In psychology, where resilience thinking has a long history, the equilibrium model of resilience to trauma is defined as "the ability of adults [who have experienced a disruptive life event].to maintain a relatively stable level of psychological and physical functioning" (Bonanno 2004, p. 20). In public policy and everyday discourse, many of the references to resilience are implicitly or explicitly based on an engineering perspective, which places the emphasis on bouncing back to a previous, "normal" state, without questioning the desirability of the normal or seeking a new normal. This is problematic. For instance, for some of the survivors of Hurricane Katrina in 2005, resilience and return to "normal" would imply a return to poverty.

The equilibrium-based interpretation of resilience can be traced back to the Enlightenment, when the Scientific Revolution[1] stripped the universe from its divinity and symbolic value and conceived of it as an orderly, mechanical device—a giant clock in a state of equilibrium, governed by a set of mathematical rules. It was believed that the laws of nature could be unravelled through scientific discovery and that the behaviour of the clockwork universe could be predicted and controlled. While uncertainty was acknowledged, it was believed that the only limits to knowing the laws of nature were scientific or epistemic; that we could conquer uncertainty and predict future outcomes by having better science. Knowledge was seen as capable of knowing what is to be known (Chandler 2014). Our continued fascination with prediction and control has its roots in this way of thinking about urban futures and our aspiration to create, maintain, or return to an elusive and static equilibrium.

In planning, the quest for *spatial* equilibrium and the desire to impose order on the assumed disorder of cities has a long history and has been at the heart of modernist planning ideas in many western countries. A classic and highly influential example is the Charter of Athens (CIAM 1933), the brainchild of a group of avant-garde architects, planners, and urbanists who set up CIAM (*Congrès Internationaux d'Architecture Moderne*) in the 1930 s. For this modernist manifesto, a good city was a city in “a state of equilibrium among all its respective functions” (CIAM 1933, p. 3). The Charter described cities of the early twentieth century as being in a state of “chaos” because of “uncontrolled and disorderly development, leading to increasing congestion, overcrowding, disorderly use of land, chaotic functional relations and spreading blight” (ibid.).

Their observations of urban problems then can apply to many contemporary cities across the world today. Their solutions for tackling these problems, however, were limited. Such a functionalist reading of the city and their physically-deterministic approaches to planning were based on a conviction that by simply building better cities they could build better societies (Davoudi and Madanipour 2012). Le Corbusier, the renowned author of the Charter claimed that, “the city is dying because it is not constructed geometrically” (Le Corbusier 1933, p. 7). Doxiadis’s ambitious *Ekistics* theory was to develop a “science of human settlement” based on a series of “orderly classifications” of size, location, and function. His “ideal Dynapolis” which was supposed to be a dynamic city, was in fact rigidly pre-determined to be “uni-directional” and “built on the basis of a rectangular grid network of roads” (Doxiadis 1968, p. 365).

In many ways, their prescriptions suffered from the same misconceptions that underpin the engineering notion of resilience. They conceptualised space as an absolute, neutral container; a bounded entity in itself, independent of people, objects, and events. This static view of spatial relations led to the top-down and inflexible blueprint plans of the post-war era. The planning process was expert-driven and plans were presented to the public as *fait accompli*. Planners believed that a functional equilibrium and a steady state in the city could be achieved by the commanding power of the plan. Le Corbusier (1933, p. 7) wrote in capital letters that “the plan must rule”.

In the 1960s, the rise of systems theory (cybernetics) powered by computer modelling gave planners even more confidence about their ability to predict the behaviour of urban systems by unpacking the behaviour of their component parts. That, in turn, would enable them to control the future trajectory of the city through technical-rational planning procedures. These ideas have had a profound influence on the architecture and planning practices of post-war Europe and indeed elsewhere. They have left their mark on numerous cities and towns around the world. In the UK, they led to the planning disasters of the 1960s and 1970s. Although the technical-rational approach still dominates planning practices in many parts of the world, it has been significantly challenged by new developments in spatial theory, as well as evolutionary resilience thinking.

2.3.2 Evolutionary Resilience: Relational Space and Adaptive Planning

Evolutionary resilience is not about bouncing back to normality, but about the ability to change, adapt, and, crucially, transform in response to sudden shocks or cumulative pressures (Carpenter et al. 2005). It is about untried beginnings and about breaking away from an undesirable "normal." Here, resilience is not a fixed asset or a trait, but a continually changing process. It is not a *being* but a *becoming* that may emerge when systems are confronted with shocks. In the social context, this means that people may *become* resilient not in spite of adversities but because of them.

Evolutionary resilience recognises that the seemingly stable state that we see around us in nature or society can suddenly change and become something radically new, with characteristics that are profoundly different from those of the original. Faced with adversities, we hardly ever return to where we were. This in and of itself is not such a ground-breaking idea. What *is* new, however, is the acknowledgement that unpredictable shifts in a system can happen with or without external shocks and with or without proportional or linear cause and effects. This perspective sets the resilience of a system in the context of the evolution of the system itself.

This understanding of resilience is rooted in complexity theory, which has challenged the Newtonian view of the world and its mechanistic assertion of equilibrium. It considers the universe as complex and inherently unpredictable. It questions stasis and equilibrium, and defines open systems as non-linear, self-organising, and "permeated by uncertainty and discontinuities" (Berkes and Folke 1998, p. 12). Its take on uncertainty is radically different from engineering resilience. According to complexity theory, we don't know the unknown, not just because of our limited science, but also because of the logical impossibility of knowing it (Chandler 2014) since we are dealing with "unknown unknowns," a phrase popularised by Donald Rumsfeld, the former U.S. Secretary of Defence.

Complex systems such as cities can be approached heuristically as a non-linear iteration of an adaptive cycle with four distinct phases: exploitation or growth, conservation, collapse or creative destruction, and reorganisation. The first loop of the cycle relates to the emergence, development, and stabilisation of a particular pathway. The second loop relates to its rigidification and decline, while at the same time signalling the opening up of unpredictable possibilities or spontaneous reorganisation, which may lead to a new growth phase. So, as systems mature, their resilience reduces and they become "an accident waiting to happen." When systems collapse, a window of opportunity opens up for alternative pathways. This disruptive phase is, therefore, the time of greatest uncertainty yet high resilience, since it is the time of innovation and transformation. It is at this moment that a crisis can be turned into an opportunity.

In response to some of the paradoxes of the adaptive cycle (such as flexibility vs. redundancy), Buzz Holling, the Canadian theoretical ecologist, and his team have developed the Panarchy[2] model. This model suggests that systems function in a series of nested, adaptive cycles that interact at multiple scales (from small to large), multiple speeds (from slow to fast), and multiple timeframes (from short to long). Therefore, small changes can amplify and cascade into a regime shift, while large interventions may have little or no effect. This means that the past behaviour of a system is no longer a reliable predictor of its future behaviour, even when circumstances are the same (Folke et al. 2010).

What does all of this mean for planning? Does complexity mean the end of planning? If nothing is certain except uncertainty itself, would "planning be condemned to solve yesterday's problems" (Taylor 2005, p. 157)? The short answer is no. On the contrary, preparedness is at the heart of evolutionary resilience ranging from being prepared for short term emergency responses and immediate recovery to long term adaptive capacity building. The latter means developing "a qualitative capacity that can absorb and accommodate future events in whatever unexpected form they may take" (Holling 1973, p. 21).

Complexity and evolutionary resilience call for a different type of planning which is premised on a different understanding of space and place. Instead of thinking about space as a bounded physical container, we need to think about it as relational, fluid, and contingent; as being socially and culturally constructed through the interactions of people, objects and events. As David Harvey (1996, p. 53), following Henri Lefebvre, argued many years ago, our social interactions, "do not operate *in* space-and-time, but *actively construct"* them.

Our traditional approaches to the physical geography of proximity need to be complemented by the relational geography of connectivity, which is a key feature of a globalised world of material and virtual flows of people, goods, and ideas, as well as environmental resources and pollution. As planners, we need to constantly remind ourselves that people do not live in a framework of geometric relationships; they live in a world of meanings (Hubbard et al. 2004). They attach meanings and values to the places in which they live and work and, by doing so, shape cities through their social encounters, cultural exchanges, historical memories, and everyday life experiences.

Relational understandings of space highlight the contingency of our socio-spatial relations and resonate with the concept of evolutionary resilience, which considers cities to be in a constant process of becoming. To plan under the condition of fluidity and uncertainty, we need to move away from technical, rational, and blueprint planning and embrace what may be called adaptive planning. One of the first discussions about adaptive planning emerged in the 1900s when John Dewey (1927), a key advocate of American pragmatism, suggested that, "policies should be treated as experiments, with the aim of promoting continual learning and adaptation in response to experience over time". The concept of adaptive planning owes its resurgence to evolutionary resilience and its application in tackling the uncertainties of adaptation to climate change and the adaptive management of socioecological systems.

Adaptive spatial planning is driven not by the "will to order" space, such as imposing nested spatial hierarchies or geometrical grids, but by the "will to connect" multiple, overlapping relations between materials, people, resources, and knowledge. This requires combining "matters of facts" with "matters of concern", to use Bruno Latour's (1993) words. It requires paying attention to the objective and physical matters *of* spatial relations, as well as the subjective and social concerns *about* the place. As Henri Lefebvre (1991, p. 38) argued, there is a dialectical relationship between the "conceived spaces" of planners and systems analysts, the "perceived spaces" of imagination, and the "lived spaces" of everyday life.

Adaptive planning is not about predicting and controlling these relational complexities or eradicating uncertainty. It is about working with them, making adjustments along the way, and identifying transformative opportunities that may arise from them. Rather than a retreat to conformity and formulaic policies, adaptive planning focuses on the exploration of the unknown in search of *novel* practices. It is the rejection of fixity and rigidity—of blueprint plans and their rationalistic assumptions. It is about recognising the ubiquity of change and seizing the potential for disruptive innovation. Such a radically different approach to planning requires at least three conditions:

- agile institutional frameworks that can enable creativity and self-organisation;
- highly networked and reflexive planners capable of spontaneous and imaginative responses to changing circumstances; and
- inclusive processes that draw on diverse voices and values and multiple forms of knowledge from systematic and experimental knowledge to tacit and experiential knowing.

As mentioned earlier, the complexity theory suggests that small changes can amplify and lead to major shifts. Using this principle, the notion of *urban experimentation* has gained a growing following. Planners and other actors purposefully intervene in urban areas through small, yet disruptive experiments (such as the temporary greening of High Street in London) in order to innovate, learn, or experience how a small intervention may lead to a larger, transformative change.

Another growing phenomenon is the emergence of "Urban Labs" or "Living Labs". These initiatives often use the notion of experimentation in a scientific way and see the city not as a social construct but as a test bed for collecting data. They collect millions of mega-bites of sensor-driven data ranging from traffic flows to air pollution without always knowing what to do with them. The data is useful and makes some of the relational flows more visible, but urban labs suffer from the same problems that led to criticisms of the technical-rational planning traditions. Like them, urban labs are primarily preoccupied with collecting matters of facts through quantitative measurements, and not matters of concern. They, too, are based on expert-driven predictions and a control mentality that focuses on the physical attributes of the city and abstracts the social relations, the sense of place, and the multiple and diverse ways in which people experience and engage with places. Like their less sophisticated predecessors, their scientific, data-driven view of the city leads them to believe that better data creates better places or better policies for places.

2.4 Conclusion

We have come a long way in advancing our modelling techniques of forecasting and projecting in order to master uncertainties. These have been immensely helpful for dealing with probable futures and not so helpful for dealing with the unknown. This challenge, plus the entrenched technical-rational mindset and blueprint planning method, has led John Friedmann (1993, p. 482), one of the great planning theorists, to suggest that, "The conventional concept of planning is so deeply linked to the Euclidian mode that it is tempting to argue that if the traditional model has to go, then the very idea of planning must be abandoned". While acknowledging his insight, I beg to differ with this proposition and to suggest an alternative path forward for planning.

It is true that complexity and uncertainty are the defining features of our time, but this does not mean that we should abandon planning. It means that we need a different kind of planning; one that takes the fluidity and complexity of social, spatial, and ecological relations seriously. One that, more than anything else, mobilises the power of creativity and imagination and does not underestimate our ability to imagine how we might be otherwise.

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Davoudi S, Lawrence J, Bohland J (2018) The anatomy of resilience machine. In: Bohland J, Davoudi S, Lawrence JL (eds) The Resilience Machine. Routledge, London.

Davoudi S (2017) Self-reliant resiliency and neoliberal mentality: a critical reflection. In: Trell E, Restemeyer B, Bakema MM, van Hoven B (eds) Governing for resilience in vulnerable places. Routledge, London, pp 1–7.

Davoudi S (2016) Resilience and governmentality of unknown. In: Bevir M (ed) Governmentality after neoliberalism. Routledge, London, pp 152–171.

Davoudi S, Brooks E, Mehmood A (2013) Evolutionary resilience and strategies for climate adaptation. Planning Pract Res 28(3):307–322.

Davoudi S (2012) Resilience: a bridging concept or a dead end? Planning Theor Pract 13(2):299–307.

Porter L, Davoudi S (2012) The politics of resilience for planning: a cautionary note. Planning Theor Pract 13(2):329–333.

Davoudi S (2015) Planning as practice of knowing. Planning Theor 14:316–331.

Davoudi S (2012) The legacy of positivism and the emergence of interpretive tradition in spatial planning. Reg Stud 46(4):429–441.

Davoudi S, Strange I (eds) (2009) Conceptions of space and place in strategic spatial planning. Routledge, London.

Notes

1. Catalysed by scientists such as Nicolas Copernicus, Galileo, Francis Bacon, Rene Descartes, and Isaac Newton.
2. Panarchy from the Greek God of Pan (Ruler of Nature) refers to "how variables at different scales interact to control the dynamics and trajectories of change in ecological and socio-ecological systems" (Gunderson 2009, p. 4).

References

Alexander DE (2013) Resilience and disaster risk reduction: an etymological journey. Nat Hazards Earth Sys Sci 13:2707–2716

Berkes F, Folke C (1998) Linking social and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press, Cambridge
Bonanno GA (2004) Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events? Am Psychol 59:20–28
Carpenter SR, Westley F, Turner G (2005) Surrogates for resilience of social–ecological systems. Ecosystems 8(8):941–944
Chandler D (2014) Beyond neoliberalism: resilience, the new art of governing com-plexity. Resilience 2(1):47–63
CIAM (1933) The Athens Charter. Retrieved from http://modernistarchitecture.wordpress.com/2010/11/03/ciam%E2%80%99s-%E2%80%9Cthe-athens-charter%E2%80%9D-1933/
Davoudi S, Crawford J, Mehmood A (eds) (2009) Planning for climate change: strategies for mitigation and adaptation for spatial planners. Earthscan, London
Davoudi S, Madanipour A (2012) Two charters of Athens and two visions of utopia: functional and connected. Built Environ 38(4):459–468
Dewey J (1927) The public and its problems. Holt and Company, New York
Doxiadis C (1968) Ekistics. Hutchinson, London
Folke C, Carpenter S, Walker B, Scheffer M, Chapin T, Rockstrom J (2010) Resilience thinking: integrating resilience, adaptability and transformability. Ecol Soc 15(4):20–28
Friedmann J (1993) Toward a non-Euclidean mode of planning. J Am Planning Assoc 59(4):482–485
Gunderson (2009) Comparing ecological and human community resilience. CARRI Research Report 5. Emory University, Atlanta GA. Retreived from: http://www.resilientus.org/library/Final_Gunderson_1-12-09_1231774754.pdf
Gunderson LH, Holling CS (eds) (2002) Panarchy: understanding transformations in human and natural systems. Island Press, Washington, DC
Harvey D (1996) Justice, Nature and Geography of Difference. Blackwell, Oxford
Holling CS (1973) Resilience and stability of ecological systems. Annu Rev Ecol Syst 4:1–23
Hubbard P, Kitchin R, Valentine G (2004) Editors' introduction. In: Hubbard P, Kitchin R, Valentine G (eds) Key thinkers on space and place. Sage, London
Latour B (1993) We have never been modern. C. Porter (trans). Weatsheaf, USA
Le Corbusier (1929) The city of tomorrow and its planning. John Podher, London (Etchelle F (1924) Trans. from *L'Urbanisme*. Edition Cres, Paris)
Le Corbusier (1933) La Ville Radieuse. Freal et Cie, Paris (Knight P, Levieux E, Coltman D (1967) Trans. from *The Radiant City*. Faber & Faber, London)
Lefebvre H (1991) The production of space. Blackwell, Oxford (Donaldson-Smith N (1974) Trans. from the original edition)
Simmie J, Martin R (2010) The economic resilience of regions: towards an evolutionary approach. Cambridge J Reg Econ Soc 3(1):27–43
Taylor P (2005) Time: from hegemonic change to everyday life. In: Clifford N, Holloway SL, Rice S, Valentine G (eds) Key concepts in geography. Sage, London, pp 151–164
Vale LJ, Campanella TJ (eds) (2005) *The resilient city: how modern cities recover from disaster*. Oxford University Press, New York
Walker B, Holling CS, Carpenter S, Kinzig, A (2004) Resilience, adaptability and transformability in social-ecological systems. Ecol Soc 9(2):5. Retrieved from: http://www.ecologyandsociety.org/vol9/iss2/art5/
Zolli A. (2012) Learning to bounce back. The New York Times, November 2. Retrieved from: http://www.nytimes.com/2012/11/03/opinion/forget-sustainability-its-about-resilience.html

Simin Davoudi is Professor of Environment and Planning, Director of Global Urban Research Unit, and Co-Director of Newcastle University Centre for Researching Cities. She is past President of the Association of European Schools of Planning and Fellow of the: Royal Town Planning Institute, Academy of Social Sciences, and Royal Society of Arts. Simin has served as expert advisor for the UK government, European Commission and several research councils and held

visiting professorships in universities of, Amsterdam, Nijmegen, BTH (Sweden), Virginia Tech, RMIT and Tampere. Her research covers the socio-spatial and political aspects of urban planning, environmental governance, climate change, resilience, and imaginaries.