

University of Wollongong

**Research Online**

---

Faculty of Social Sciences - Papers (Archive)

Faculty of Arts, Social Sciences & Humanities

---

2016

## **Demonstrating retrofitting: perspectives from Australian local government**

Robyn Dowling  
*Macquarie University*

Pauline M. McGuirk  
*University of Wollongong, pmcguirk@uow.edu.au*

Harriet Bulkeley  
*Durham University*

Follow this and additional works at: <https://ro.uow.edu.au/sspapers>



Part of the [Education Commons](#), and the [Social and Behavioral Sciences Commons](#)

---

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: [research-pubs@uow.edu.au](mailto:research-pubs@uow.edu.au)

---

## Demonstrating retrofitting: perspectives from Australian local government

### Abstract

Cities are critical to transitions to low carbon futures, not only because of the large and growing global urban population but also because global resource consumption is concentrated in cities (Gossop, 2011:208; Hodson, Marvin, Robinson, & Swilling, 2012; Monstadt, 2007). Ensuring that new urban spaces, such as new housing or new city precincts, are low or zero carbon is central to these transitions (Hodson & Marvin, 2010). Yet, equally important to reducing urban carbon consumption is the retrofitting of existing urban planning frameworks and imaginaries, infrastructure, built form and patterns of daily life (Eames et.al., 2013; Pincetl, 2012). Retrofitting involves the modification of what already exists in cities: altering the ways in which existing buildings are heated and cooled, diverting households, businesses and organisations toward renewable sources of energy rather than fossil fuels, encouraging the take up of energy efficient appliances, altering urban infrastructures of energy and transport provision toward renewable sources.

Retrofitting is both a social and a technological challenge. Technologically, it involves the installation of a diverse range of new or upgraded zero or low carbon technologies in the existing urban fabric. These include, often in combination, new forms of building insulation to minimise heat transfer between the inside and outside of buildings, more efficient lighting and heating (e.g. heat pump rather than electric hot water systems) and micro-generation of energy supply. Retrofitting technologies can be applied at a number of scales. These include individual buildings, clusters of buildings, precincts, entire local authority areas, or supra-urban systems of energy infrastructure. In the Australian case, for example, where 60% of carbon emissions are generated by energy use and 75% of electricity generation is coal-fired (Australian Government, 2011), micro (ie individual building) installation of solar PV is the most common retrofitting technology. Retrofitting is also a social process in which technologies are adopted, accommodated and altered by urban actors. The behaviours and choices of individuals have a potentially profound impact on the effectiveness of technologies. For example, a recent Cambridge study suggested that attention to behaviour change can double the energy savings of retrofitting (Markusson, Ishii, & Stephens, 2011).

Surprisingly, given the importance of retrofitting to the achievement of low carbon cities, and the voluminous literature on urban carbon governance (Bulkeley & Castan Broto, 2013; Rice, 2010; While, Jonas, & Gibbs, 2010), explicit focus on enabling retrofitting through governance is rare. There is some analysis of programs that encourage retrofitting at household or building scales (see Deakin, Campbell, & Reid, 2012; Ghosh & Head, 2009; Kelly, 2009; Sunikka-Blank, Chen, Britnell, & Dantsiou, 2012; Willand et al 2012), but little consideration of what institutions and mechanisms might best enhance cities' capacities to adopt retrofitting technologies and behaviours. This chapter hence provides a theoretical framework for understanding the governance of urban retrofitting as well as empirical answers to the question of the character of retrofitting governance. Specifically, we develop and implement a framework for understanding the governance of urban retrofitting that considers the assemblage of institutions, materials, agencies and mechanisms that might enable the transformation of cities. This framework is outlined in the first section. The second section presents a more detailed examination of retrofit governance at the 'sub' urban scale, using an audit of local scale retrofitting initiatives in Australia's largest city – Sydney – to develop a typology of means or techniques through which retrofitting is governed. Developing our argument that an understanding of governing retrofit requires attention to the mechanisms and techniques through which conduct is 'conducted', in the final empirical section we outline two cases in which retrofitting is pursued through demonstration. We ask how and by whom they are enabled (and simultaneously, what are the constraints they negotiate), what are the mechanisms through which they become productive, and what is their relationship to the existing carbon governance regime. We also focus on the 'demonstration' or 'showcase' elements of these projects to critically

---

interrogate the multifaceted learning processes embedded within them. We conclude with an analysis of the limitations of retrofitting governance as currently practised and reflections on the purchase of demonstration as a governmental technique at citywide scales.

### **Keywords**

retrofitting, government, demonstrating, local, australian, perspectives

### **Disciplines**

Education | Social and Behavioral Sciences

### **Publication Details**

Dowling, R., McGuirk, P. & Bulkeley, H. (2016). Demonstrating retrofitting: perspectives from Australian local government. In M. Hodson & S. Marvin (Eds.), *Retrofitting Cities: Priorities, Governance and Experimentation* (pp. 212-231). Abingdon, United Kingdom: Routledge.

**Word count: 7243**

**Demonstrating Retrofitting: Perspectives from Australian Local Government**

Robyn Dowling

Pauline M<sup>c</sup>Guirk

Harriet Bulkeley

Chapter prepared for M Hodson and S Marvin (eds) *Retrofitting Cities: Priorities, Governance and Experimentation*, Taylor & Francis, London

Acknowledgments

Portions of this chapter have been published as Dowling, R., P. M<sup>c</sup>Guirk and H. Bulkeley (2014). "Retrofitting cities: Local governance in Sydney, Australia", *Cities* **38**: 18-24.

The research on which this chapter was based by funded by the Australian Research Council (DP110100081). We are grateful for research assistance provided by Nicola Vaughan.

## **Introduction**

Cities are critical to transitions to low carbon futures, not only because of the large and growing global urban population but also because global resource consumption is concentrated in cities (Gossop, 2011:208; Hodson, Marvin, Robinson, & Swilling, 2012; Monstadt, 2007). Ensuring that new urban spaces, such as new housing or new city precincts, are low or zero carbon is central to these transitions (Hodson & Marvin, 2010). Yet, equally important to reducing urban carbon consumption is the retrofitting of existing urban planning frameworks and imaginaries, infrastructure, built form and patterns of daily life (Eames et.al., 2013; Pincetl, 2012). Retrofitting involves the modification of what already exists in cities: altering the ways in which existing buildings are heated and cooled, diverting households, businesses and organisations toward renewable sources of energy rather than fossil fuels, encouraging the take up of energy efficient appliances, altering urban infrastructures of energy and transport provision toward renewable sources.

Retrofitting is both a social and a technological challenge. Technologically, it involves the installation of a diverse range of new or upgraded zero or low carbon technologies in the existing urban fabric. These include, often in combination, new forms of building insulation to minimise heat transfer between the inside and outside of buildings, more efficient lighting and heating (e.g. heat pump rather than electric hot water systems) and micro-generation of energy supply. Retrofitting technologies can be applied at a number of scales. These include individual buildings, clusters of buildings, precincts, entire local authority areas, or supra-urban systems of energy infrastructure. In the Australian case, for example, where 60% of carbon emissions are generated by energy use and 75% of electricity generation is coal-fired (Australian Government, 2011), micro (ie individual building) installation of solar PV is the most common retrofitting technology. Retrofitting is also a social process in which technologies are adopted, accommodated and altered by urban actors. The behaviours and choices of individuals have a potentially profound impact on the effectiveness of technologies. For example, a recent Cambridge study suggested that attention to behaviour change can double the energy savings of retrofitting (Markusson, Ishii, & Stephens, 2011).

Surprisingly, given the importance of retrofitting to the achievement of low carbon cities, and the voluminous literature on urban carbon governance (Bulkeley & Castan Broto, 2013; Rice, 2010; While, Jonas, & Gibbs, 2010), explicit focus on enabling retrofitting through governance is rare. There is some analysis of programs that encourage retrofitting at household or building scales (see Deakin, Campbell, & Reid, 2012; Ghosh & Head, 2009; Kelly, 2009; Sunikka-Blank, Chen, Britnell, & Dantsiou, 2012; Willand et al 2012), but little consideration of what institutions and mechanisms might best enhance cities' capacities to adopt retrofitting technologies and behaviours. This chapter hence provides a theoretical framework for understanding the governance of urban retrofitting as well as empirical answers to the question of the character of retrofitting governance. Specifically, we develop and implement a framework for understanding the governance of urban retrofitting that considers the assemblage of institutions, materials, agencies and mechanisms that might enable the transformation of cities. This framework is outlined in the first section. The second section presents a more detailed examination of retrofit governance at the 'sub' urban scale, using an audit of local scale retrofitting initiatives in Australia's largest city – Sydney – to develop a typology of means or techniques through which retrofitting is governed. Developing our argument that an understanding of governing retrofit requires attention to the mechanisms and techniques through which conduct is 'conducted', in the final empirical section we outline two cases in which retrofitting is pursued through demonstration. We ask how and by whom they are enabled (and simultaneously, what are the constraints they negotiate), what are the mechanisms through which they become productive, and what is their relationship to the existing carbon governance regime. We also focus on the 'demonstration' or 'showcase' elements of these projects to critically interrogate the multifaceted learning processes embedded within them. We conclude with an analysis of the limitations of retrofitting governance as currently practised and reflections on the purchase of demonstration as a governmental technique at citywide scales.

## **Governing Urban Retrofit**

Our purpose in this section is to provide the conceptual tools to understand how and by whom retrofitting is governed in the city. We start with the notion that retrofitting is a socio-technical process. By this we mean that retrofitting not only requires the application of technologies, but also the adoption and accommodation of these technologies across diverse sites and spheres. Conceived in this manner, retrofitting raises questions not only of technological performance and individual behaviour, but also of the means through which the co-production of socio-technical systems is fostered and directed. Coupled with the diversity of sites (e.g buildings, infrastructure systems) and actors (e.g. businesses, individuals, NGOs) through which retrofitting occurs, we hence turn to three dimensions of urban carbon governance to frame an understanding of retrofit.

First, we consider governance as multi-scalar: institutions governing carbon in the city encompass and exceed the urban scale, folding into and through each other in complex ways (Betsill & Bulkeley, 2006). There is therefore no one scalar centre of governance as such, but rather the governing of retrofit takes place through shifting scalar constellations. Actions of transnational networks have shaped urban responses to climate change, for example, as have national scale policies. The diverse initiatives of local authorities are also critical: urban authorities have driven emissions reduction and low carbon transitions through a diverse array of action (Betsill & Bulkeley, 2007; Hoffmann, 2011). Thus our analysis is alert to multi-scale responses to the retrofitting challenge.

Second, urban carbon governance is carried out by both state and non-state institutions. Divisions between public/private authority in urban governance are being reconfigured, as boundaries between public and private authority are reconfigured, including local forms of authority (M<sup>c</sup>Guirk & Dowling, 2009; Schroeder & Lovell, 2011). In other words, governing is a dispersed form of rule that cuts across conventional public/private spheres. Governing occurs through an assemblage or alignment of diverse actors, interests and institutions as well as materials and artifacts that enable programmatic aims to be achieved (Li, 2007). In the case of retrofitting, recent work has suggested that considerable effort is required to assemble institutions

capable and willing to implement retrofitting, and that the motivations of these institutions are often divergent (Deakin, et al., 2012; Schiellerup & Gwilliam, 2009). Extending this idea, we suggest that one task of retrofitting governance is to orchestrate a supportive policy framework and suite of related interventions through which builders, energy retailers, appliance and car manufacturers, infrastructure providers and householders may consider and embrace the possibilities for retrofitting. In simple terms this means that retrofitting technologies need to be taken up by, and are also mediated by, two central groups of stakeholders: those responsible for building the city (builders, developers, landlords, homeowners, governments) and also those that inhabit these spaces (residents, building tenants, workers, organisations, members of the public etc.). In our empirical analysis we are hence alert to this ‘dispersed nature of rule’ (Ekers and Loftus, 2008: 703) being enacted in the governance of retrofit.

Third, building upon insights that have been highly productive for understanding urban responses to climate change, governance is enacted through the ‘conduct of conduct’ (in relation to climate governance see Keskitalo, Juhola, & Westerhoff, 2012). By this is meant that shaping how an issue is framed, its objects or materials aligned and, crucially, its subjects and their practices enrolled are central to governing (Paterson & Stripple, 2010; Whitehead, 2009). In relation to retrofitting the two key targets of this ‘conduct of conduct’ are the stakeholder groups identified above: those shaping urban infrastructures and built environments and those who inhabit them. The first relates to the systems of provision that shape cities; entities responsible for generating the provision of retrofitting materials and technologies, supporting the development of markets, technologies, business models, skills, expertise and so on. Retrofitting, therefore, requires changes in conduct within the ‘systems of provision’ that shape urban sociotechnical systems. The second target relates to the adoption and accommodation of these new and upgraded technologies into the routines and cultures of daily life (Glad, 2012); the adoption of new behaviours and shifts in behavioural norms or hegemonies. This in turn means that the governing of behaviour change is critical in retrofitting just as it is in diverse other fields of low carbon transitions (Hargreaves, 2011). Here, the governance challenge for retrofitting is to encourage individual householders, workers and organisations not only to retrofit their respective



spaces materially (dwellings, commercial buildings, vehicles), but also to accommodate and embrace retrofitting technologies into daily practices and behaviour of residents, organisations, workers, and travellers.

Within the general context of scholarship that elaborates and questions behaviour change interventions across diverse policy realms (Jones, Pykett, & Whitehead, 2013), mechanisms to encourage the adoption of low carbon routines and habits generally are the subject of considerable research. Diverse techniques like social marketing, smart meters, public accountability measures like carbon diets, are instigated and monitored by diverse groups, including NGOs, governments and the private sector. Such mechanisms intersect with retrofitting directly and indirectly. Directly the challenge is to encourage individual householders, workers and organisation not only to retrofit their respective spaces materially (dwellings, commercial buildings, vehicles), but also to accommodate and embrace retrofitting technologies into the conduct of daily home and work lives. It is also the case, as suggested in the phrase ‘co-production of technology’, that technological objects (hybrid cars, smart meters) shape behaviour as well. The urban governance of retrofitting therefore requires attention to both structures of provision (builders, developers, landlords, homeowners, energy providers etc) and to practices of consumption (residents, organisations, workers, travellers etc), which takes us into the domain of behaviour change.

In contemporary analyses of behaviour change initiatives, attention has recently turned to mechanisms through which deeper engagement with subjects of governance may be facilitated, which is also our focus here. One strand of analysis emphasises various forms of deep learning processes that, it is argued, have greater potential to instigate change. These include: (i) ‘social learning’, a ‘combined act of discovery and analysis, of understanding and giving meaning, and of tinkering in the development of routines’ (Glad 2012: 280); (ii) higher order learning in which in which heterogeneous groups come together to exchange and perhaps transform framing of an issue (Vergragt and Brown 2007): and (iii) explicitly deliberative processes involving structured sharing of knowledge and practice (Hobson and

Niemeyer 2011). Across these diverse perspectives is a belief that the sharing of knowledge, information and experience can change individuals' perceptions and practices (Cheng et.al. 2011, p90). A second strand of analysis emphasises the materiality of engagement, in particular Marres' work (2009) on socio-material modes of involvement constituted through eco-homes and other forms of green living experiments. Materials, it is argued, play a critical role in transitions to a low carbon future and, more specifically we argue, in orchestrating retrofit.

Both material and pedagogic strands come together in the notion of demonstration. Initially connected to technology analysis in the sense of 'exhibiting a technological device in action' (Rosenthal 2005, p.346) or promoting or selling a technology (Markusson et.al. 2011 p. 294), demonstration embeds an impetus for learning through a material mode. Through demonstrations, an artefact is shown to multiple audiences. Demonstration's reliance on techniques of exhibition highlights its materiality. Exhibitions, according to Whitehead (2009), can be seen as 'demonstrating perfection' (p.74) representing in a holistic way how things could and should work. As part of a broader set of pedagogies, exhibits use moral and economic persuasion in conjunction with new forms of knowledge. Thus, in Whitehead's case study of the governance of atmospheric pollution in Victorian Britain, exhibitions materially recreated the smoke-free home and, in so doing, built new knowledge and social networks around a technology (see also Markusson et.al. 2011). Socio-material engagements as facilitated through demonstration are governmental in that they bring both practical technologies to a wider audience and in the process 'allow the people to know and thence to regulate themselves' (p.72), through facilitating an experience of a different reality. As a pedagogy of climate governance, demonstration hence provides a revealing window on the techniques of governing urban retrofitting that we pursue in this chapter.

In what follows we use the framework developed above to capture the multi-scalar, multi institutional and multi-mechanism dimensions of governing retrofit. Whilst principally interested in local-scale governance, we see this as constituted by actors at local and non-local scales. We are also alert to the importance of context in shaping

governance limits and possibilities, and attend specifically the broader Australian context in the next section. We conceive of governance as occurring through both state and non-state actors, as well as partnerships. And finally, we are interested in the mechanisms and techniques of governance as a means through which conduct is 'conducted', with a particular focus on demonstration. These conceptual tools, as the analysis will show, bring to the fore both the potentials and pitfalls of governing retrofit.

## **Governing Retrofit at the Local Scale in the Australian City: The Case of Sydney**

As we have discussed elsewhere (Dowling, M<sup>c</sup>Guirk, & Bulkeley, 2014), retrofit is governed at multiple scales in Australia, principally state, national and local. State and national government involvement in governing retrofit has two key characteristics. First, and specifically in relation to the socio-technical nature of retrofit, is the relative lack of engagement with the social practices of energy consumption. By far the majority of policies are targeted at the installation of more energy efficient technologies and renewable energy sources: for example, providing rebates to install solar PV, grants to retrofit buildings, information programs to promote purchase of environmental offsets for fleet vehicles. With rare exceptions, such as mandatory environmental standards for residential renovations, engagement with the use and integration of retrofitted technologies into patterns and practices of daily life is not constructed as being within the remit of state or federal government. Second is the indirect nature of much of this involvement: with few exceptions outside the regulation of the energy sector and government itself, policies engage soft measures to enable or encourage retrofitting rather than hard measures to mandate it. Moreover, these are overwhelmingly policies that require multi-institutional cooperation across states or partnerships with local governments and community organisations. The state and federal approach to retrofitting Australian cities can be succinctly summarised as ‘governing at a distance’.

Local scale retrofitting governance in Australia is certainly imagined within and conditioned by these federal and state scales, as suggested by the plethora of grants available. Yet local governance with some independence from state and federal parameters is also feasible and, indeed, is evident within Australian cities. Thus in 2011/2012 we carried out a survey of carbon abatement initiatives across the domains of energy infrastructure, buildings and transport being undertaken at the local scale across all eight of Australia’s state and territory capital cities (Sydney, Brisbane, Canberra, Darwin, Adelaide, Melbourne, Hobart and Perth). Importantly, this survey encompassed not just explicit carbon abatement strategies, but also interventions and initiatives that indirectly targeted carbon abatement – such as environmental education programs that incorporate reductions in energy use. Given our resources, it was not possible to survey each local jurisdiction in the capital cities. Instead, a

sample of approximately a third of local government areas in these cities was surveyed, encompassing a theoretically informed selection of small and large, CBD, inner and mid city, and outer suburban jurisdictions. The audit started with websites of local governments, known not-for-private and community organisations, and documented private sector interventions, and then snowballed out from these to identify less visible interventions. This approach resulted in the identification of 896 initiatives related to buildings, transport and energy infrastructure, of which one-third had a retrofitting component. Then, using a framework developed by Castan Broto and Bulkeley (2013), we classified these according to who initiated/participated, the focus of the initiative, the mechanisms through which it was undertaken, its target audiences and its funding. We draw from the Sydney initiatives documented in the audit to capture and characterise retrofitting governance at the local scale.

< Table 1 here >

Of the 278 initiatives identified in Sydney, 103 had a retrofitting component (see Table 2). Mirroring the state and national policy context, these initiatives can generally be described as intentional but small-scale retrofitting interventions, with an absence of holistic visions for retrofitting the city. Turning first to the institutions of retrofitting governance, we found that most were initiated by local government (79%), principally acting alone (44%), though occasionally using funding from other sources. The rest were initiated by a diverse group, of which the private and non-government sectors were the most active, with minimal direct federal and state government involvement as instigators of initiatives. The retrofitting of transport (e.g. the conversion of existing vehicles to alternative fuels) is marked by its relative absence (just two initiatives); with most local retrofitting governance instead focusing on residential, commercial or public buildings. Thus most prevalent in terms of a material focus was retrofitting energy provision at the building scale, typified by installing devices that enable individual buildings to be powered from renewables or low carbon sources. Technologically, there was an overwhelming focus on micro-generation in the form of the installation of solar PV, and on energy efficiency through the conversion of lighting, heating and cooling to more energy efficient forms (LED, gas, solar). Compared to state and federal policies, these initiatives have an equal focus on the initiating organisation and residential buildings/households (43 and 44% respectively) and are less likely to address retrofitting by

businesses or of business premises. Initiatives were much more likely to use enabling mechanisms such as the provision of advice, audits and information, suggesting again the predominance of governing at a distance.

The techniques through which governing retrofit is pursued are the focus of the rest of this chapter. For these purposes, we classify each Sydney-based retrofitting initiative captured in our audit in terms of a four-fold typology (Table 3). The categories of the typology are not mutually exclusive: though all initiatives fall into one of these categories; some fit into two or more. We describe and analyse these techniques in what follows.

<Table 2 here >

*Holistic* retrofitting is a technique that tackles retrofitting in a coordinated and multidimensional manner. It pertains to large-scale programs to retrofit the energy infrastructure, travel patterns and building fabric of a particular geographical area (e.g. a local government area), most often as part of a clearly articulated retrofitting vision. These are rare in urban Australia, and are thus far confined to the well-resourced CBDs of Sydney, or federally-funded programs like *Solar Cities* or *Smart Grid, Smart City*.<sup>1</sup> Unlike the more narrowly-focused initiatives in the other elements of the typology, these initiatives focus on retrofitting the wider energy infrastructure in combination with retrofitting individual buildings. They do so through facilitation, direct intervention, as well as through widespread education and demonstration. Interestingly, the use of strong regulatory measures is rare even across these schemes with wide ambition. Australian cities have not, for example, restricted cars from their city centres nor have they mandated building energy performance for existing buildings.

The City of Sydney's Sydney 2030 program is illustrative here (see: <http://www.sydney2030.com.au/>). Following a comprehensive visioning and strategic planning process, the City (an area encompassing the CBD and immediate surrounds)

developed a strategic plan that prioritised sustainability, in which initiatives targeting the retrofitting of diverse sectors (transport, energy, buildings) were introduced across the city. As befits the term holistic, the City of Sydney example involves a broad spectrum of governance mechanisms, as well as a multi-dimensional focus across residents, businesses, transport and infrastructure. These include a business-coordinated retrofitting of commercial buildings, a plan to move city buildings off the coal-fired state-wide electricity grid and onto a city-scale trigeneration system, the conversion of road space to cycling paths, as well as the conversion of council vehicle fleets, lighting and buildings to low or zero carbon energy sources. Such holistic governance, though politically and popularly contested, is underpinned by a strongly articulated vision matched by political and economic resources to bring the vision to fruition. It is also connected to the City of Sydney's economic strategy to be identified as 'green and global' (Acuto, 2012).

Retrofitting through *self-governance* in the form of retrofitting an organisation's own assets is our second mode of governance. This includes the retrofitting of public buildings like council offices, local-government-owned swimming pools, libraries, or the headquarters of non-government organisations. About 40% of retrofitting interventions were of this type, suggesting that local authorities in Australia have a most pronounced capacity to act with respect to their own organisation. Self governance sees various adaptations to buildings made to reduce carbon footprints, including installation of insulation, or solar PV and changes in lighting. Beyond individual buildings this also includes the conversion of systems of street lighting to LED and the conversion of council car fleets to non-gasoline fuels. Specific examples are numerous and are found extensively within and beyond Sydney; buildings retrofitted in this way can be found in almost every Australian local government area. Funding via the federal and state grant programs outlined in the previous section is critical to self-governance. A number of inner city councils, for example, use various grant schemes to retrofit the lighting, heating and cooling systems of their swimming pools, parks and community centres. In this mode, local institutions are principally enacting an authority and capacity to govern the consumption of energy in their own buildings, though primarily through application of energy efficient or renewable technologies rather than a concerted focus on behaviour. Self-governance can, nonetheless, have an educative component, in that many of these buildings are also used to demonstrate low carbon living to a broader audience.

Closely related though different is retrofitting through facilitative techniques, in which local governments *facilitate* or *broker* the retrofitting activities of local businesses, organisations (e.g. schools) and households through a combination of education, provision and access to funding. Local governments (and sometimes non-government or private sector actors) facilitate access to grants, audits and bulk purchase schemes to enable households etc to decarbonise their buildings through retrofitting measures. Here, local agencies (government, non-government and commercial) use publicity and access to knowledge, programmes and other schemes to attempt to shape conduct so as to initiate retrofitting, primarily at the building scale. Local agencies connect businesses and households with the practicalities and materials of retrofitting. An example here is Auburn and Parramatta's *Streamline Your Business* program in which the local authority provides a business with access to an on-site energy assessment and a tailored Energy Action Plan detailing how they can save energy, including through retrofitting technologies. A program with wider geographical reach is *CitySwitch*, a national local government-commercial tenant partnership that includes four local authorities in Sydney. The program explicitly works with commercial tenants in the geographical areas to provide information, tailored advice and implementation plans on reducing their carbon footprint, including a strong emphasis on retrofit. Local government involvement is essential: facilitating access to organisations, assisting in the hosting of events and administering associated grant programs.

Governing retrofit in an *educative* mode is by far the most common strategy both across our sample nationally and in Sydney. This emphasis no doubt stems from local governments' long term environmental education focus as well as the assumption that correcting the 'information deficit' is key to changing energy-related behaviour (Shove, 2010). Thus our audit captured myriad initiatives that aimed to inspire, inform and educate households and businesses about retrofitting their premises and to integrate retrofit technologies into their daily lives. A wide range of educative strategies is evident, with information provision through leaflets, websites and newsletters most prevalent. A number of organisations, for instance, use a commercially produced 'Sustainable Living Guide' in which households are informed about the carbon-reduction benefits of installing newer energy efficient appliances as well as insulation. Local governments also run workshops for residents to see retrofitting



technologies in practice. For example, the *Treading Lightly* initiative, which operates collectively across several Sydney local governments, consists of 6-monthly blocks of weekly workshops primarily targeting local householders and focusing on domestic and household activities. The focus is on encouraging the update of technologies rather than their use. Information provision, toolkits, and workshops all facilitate, encourage, and inform rather than mandate. Thus governing retrofit in an educative mode shapes conduct indirectly and in this respect shares the focus of facilitating retrofit.

In sum, the retrofitting challenge is certainly being addressed at the local scale in Sydney, through a proliferation of initiatives and by a variety of actors. Governing retrofit in educative, holistic, facilitative and self-governing ways, these initiatives largely eschew direct intervention in favour of ‘at-a-distance’ techniques that render the issue and its solutions visible to a broad audience. Thus the potential of local scale retrofitting governance in Australia is yet to be fully realised. This is partly because of poor alignment between the technological and social dimensions of retrofitting. In short, where the system of provision is being directed towards retrofitting, the intended subjectivities and practices are scarcely taken into account and hence are likely to fail to materialise or at least to under perform. Likewise, interventions to create new subjects and practices (e.g. through education) are not supported by systems of provision in which these subjects could act. Demonstration, as we flagged earlier in this chapter, can potentially bring together technologies and materials, a claim that we investigate further in the next section.

### **Demonstrating Retrofit**

In terms of the above typology, demonstration is a subset of educative mechanisms. However, unlike the largely at-a-distance techniques that dominate educating for retrofit in our sample, demonstration has the capacity to act more directly, and with a simultaneous focus on social and technical aspects. Across the sample of Sydney interventions we charted, the demonstration of low carbon retrofitting technologies, creating life-like contexts and connecting technologies to their daily use, was spasmodic. These largely focused on the domestic sphere, such as the home of a sustainability pioneer regularly open to the public, purpose-built show homes for low carbon living, or ‘demonstration homes’ established in

council-owned premises, demonstrating retrofitting *in situ*. There were also a number of demonstrations of retrofitting corporate and public spaces (i.e. demonstration connected to self governance) that take us beyond the increasingly well documented domestic-focused demonstrations. We briefly present two such cases here as a means of excavating the different means and purposes of demonstrating retrofit.

Our first example– Greening the Wharf (GTW) – entailed retrofitting one of Sydney’s heritage-protected former wharves, which is the current home of the Sydney Theatre Company. After being used as a theatre for more than 20 years, in 2007 a comprehensive retrofitting program was initiated following an environmental audit and the appointment of high profile celebrity husband and wife climate activists Cate Blanchett and Andrew Upton as artistic directors. By the end of 2010 the wharf had been retrofitted with Australia’s second largest rooftop solar array; a rainwater harvesting system; solar hot water and the installation of energy efficient appliances through the theatre, focusing on lighting and the public bathrooms; and integrated, interactive public displays detailing the retrofit, its effect and the possibility for wider adoption of its approach (see Figures 1 and 2). GTW is deliberately ambitious, encompassing ‘infrastructure projects, company-wide behavioural change, environmentally responsible theatre production, community engagement and education’ with the quantified goal being to reduce annual carbon emissions by 550 tonnes (greeningthewharf.com).

< INSERT FIGURE 1 HERE >

< INSERT FIGURE 2 HERE >

A distinctive, corporate-focused and multiscalar set of institutions were assembled in GTW, with minimal local government involvement. Primary funding of \$1.2 million was provided as part of the Federal Government’s Green Precincts Program and the NSW Government, as owner of the wharf and landlord, carried out the retrofitting. Further philanthropic funding of more than \$2million was received from a small number of wealthy individuals and family

foundations. This amalgam of public private partnerships, with philanthropy and celebrity, underpin the distinctive form that demonstration has taken here.

A second distinctive element of GTW is its positioning as demonstrating cutting edge technologies. The solar array, for example, is noted as the first commercial installation of this new type of PV cell. Likewise, the rainwater harvesting system is one of only a handful in the world. For GTW, an important goal was to ‘demonstrate that complex infrastructural projects – such as the solar array and the rainwater harvesting system – can succeed at high profile heritage sites’ ([greeningthewharf.com](http://greeningthewharf.com)). GTW encourages learning, though in a scientific register. Scientific knowledge is valorised, whether that be through hosting special talks of the Wentworth Group of Concerned Scientists,<sup>2</sup> telling the retrofit story through the evidence of numbers, and engaging audiences through data (Figure 2). Through smart metering, toolkits and guides, it involves data gathering and monitoring as part of the daily practice of running a theatre: checking production sourcing against sustainability criteria, being aware of and adjusting energy use in response to data gathered. The principal audience for the demonstration was professionals in the arts and heritage sectors. Nonetheless, theatre audiences are also engaged digitally through ‘Green Screen’ information kiosks that highlight energy efficiency information and through touch screens invite theatre patrons to understand the technologies used in retrofitting the wharf and consider undertaking them in their own homes.

Our second example is also an iconic site in Sydney. Located approximately 100 kilometres west of the CBD, the Blue Mountains town of Katoomba is the geographical heart of a World Heritage site that attracts millions of tourists each year, as well as a burgeoning resident population, many of whom articulate a very strong ‘green ethos’. Our retrofitting example is the Blue Mountains Sustainable Precinct, which consists of three non-contiguous buildings – the Echo Point Visitor Information Centre, Katoomba Civic Centre and Blue Mountains Cultural Centre – with the first two being retrofitted and the last being a redevelopment of an old site. Together, the buildings serve both resident and tourist populations, and are owned and managed by the local authority – Blue Mountains City Council. In 2010 the Civic Centre was upgraded with rainwater tanks, new windows and solar photovoltaic panels, and in 2012 the Echo Point Visitor Centre was retrofitted with a stormwater harvesting system and solar

PV (see Figure 3 and photos at: <http://www.environment.gov.au/topics/water/water-cities-and-towns/green-precincts-fund/blue-mountains-city-council/gallery-blue>). Both projects were completed through part funding from the Federal Government's Green Precincts fund, and as such had a critical demonstration element, in particular to showcase working examples of innovative design in an environmentally sensitive context.

The Blue Mountains Sustainable Precinct was enacted by a set of state-based actors. Significant financial support was provided by the Federal Government. The Blue Mountains City Council initiated and delivered the project, and part-funded it through the use of local environmental levies. This amalgam of interests flowed through to the means through which demonstration occurred. With the exception of the solar PV on the Visitor Information Centre, the retrofitted technologies were largely invisible. Visitors to the Cultural Centre, for example, are reminded that many of the green features of the building (like the solar panels or the unique insulating wall cavities) would be invisible to them. The pedagogic elements of the project were confined to signage across the precinct, and can hence be described as having a light touch, being attuned to context, and decidedly non digital. Signage around Echo Point asks tourist to look differently at the buildings they may have just visited and suggests ways visitors could incorporate similar changes in their own spaces (Figure 4). Discussions of the project emphasise the capability of the Blue Mountains City Council to implement green strategies, suggesting that the project is demonstrating the capacity and authority of local government to act as much as the efficacy of retrofitting.

These examples highlight the multiscalar, multi-actor constitution and the at-a distance nature of governance that is broadly characteristic of the way urban retrofit in being governed in Australia's largest city. Governance interventions that pursue retrofitting through demonstration have the potential to bridge this constructed dualism of social and technical elements by exhibiting retrofitting technologies in a specific context for a specific audience. In so doing, they bring technologies into context, and with the assistance of pedagogical strategies like information provision, may induce retrofitting. The examples discussed here, however, illustrate the complex and fragile connections between a demonstrational intent and deeper learning as theoretically envisaged. In both cases, multiple registers and audiences of demonstrations were in evidence as the projects sought to address actors concerned with

structures of provision and wider audiences as inhabitants and users of various spaces with retrofitting potential (heritage sites, residential spaces etc.). However, the ambitious reach of these projects diluted their outcomes as retrofitting demonstrations. Both the Sydney Theatre Company and Blue Mountains Council can be interpreted as attempting to demonstrate institutional authority and capacity to instigate change, with the consequence that direct educational engagement was a weaker element. Both projects were trying to reach domestic audiences through a commercial context. While this allowed an extended reach for the demonstration in terms of the considerable number of annual visitors to each site, it also necessitated a less direct engagement with various publics. In both sites visitors were not able to materially engage with retrofitting technologies in their habitual context. In this sense the technique of demonstration, as practiced in the cases examined here, struggles to overcome the distance between technology and practice, to engage with the socio-technical nature of retrofitting and to promote related learning across its diverse target audiences. In sum, these examples necessarily force us to develop a more complex understanding of demonstration as a governance technique, acknowledging the role that context plays in shaping audiences, purposes and mechanisms used.

## **Conclusion**

In this chapter we have illustrated how the governance challenge of transitioning cities to low carbon futures through retrofitting is being addressed by multiple state and non-state institutions, and through diverse mechanisms. Focusing on just one Australian city, we have found a proliferation of initiatives, principally at the local scale, that aim to directly or indirectly (through incentives, education, etc.) retrofit diverse elements of cities. Beyond this proliferation, the landscape of governing urban retrofitting in Sydney is an uneven one. There is no citywide vision or program of retrofitting in Sydney, and the local initiatives we have documented here are piecemeal across multiple dimensions – geographical focus, technical focus, materiality of engagement.

Nonetheless these initiatives – in their educative, facilitative, self-governing and holistic forms – provide insights for thinking about retrofitting at the citywide scale. Initiatives that work through the self-governing, facilitative and educative modes of governance are likely to

be incremental in their effect, through an accretion of multiple actions by multiple actors from individual households to place-based organisations, to organisations involved in the structures of provision operating citywide. They constitute an ecology of initiatives that collectively can contribute substantially to city-wide retrofitting (McGuirk, Bulkeley & Dowling 2014), notwithstanding the tendency to date for them to focus on a technical rather than a socio-technical conception of retrofitting. Holistic retrofitting, in addressing infrastructure and behaviour simultaneously, escapes this limitation. Such initiatives tend to arise through multi-level partnerships, and encouraging wide-reaching local government involvement in such partnerships may be a productive option for enhancing city-wide retrofitting that engages technological and social practice dimensions. The challenge of the diversity of means and modes through which retrofitting is being governed is one of coordination. The diverse modes of retrofitting governance identified here may reach their limits however when they encounter urban systems—notably infrastructural systems—that are integral to the capacity to retrofit, yet require coordinated, citywide action. The multiple purposes and practices of retrofitting governance revealed in this chapter, therefore, highlight its existing limitations as well as its potentials to be explored in further policy and theoretical work.

## References

- Australian Government (2011). *Securing a Green Energy Future: The Australian Government's Climate Change Plan*. Canberra: Commonwealth of Australia.
- Acuto, M. (2012). Ain't about politics? The wicked power-geometry of Sydney's greening governance. *International Journal of Urban and Regional Research*, 36, 381-399.
- Betsill, M., & Bulkeley, H. (2006). Cities and the multilevel governance of global climate change. *Global Governance*, 12, 141-159.
- Betsill, M., & Bulkeley, H. (2007). Looking back and thinking ahead: a decade of cities and climate change research. *Local Environment*, 12, 447-456.
- Bulkeley, H., & Castan Broto, V. (2013). Government by experiment? Global cities and the governing of climate change. *Transactions of the Institute of British Geographers*, 38, 361-375.
- Castan Broto, V., & Bulkeley, H. (2013). A survey of urban climate change experiments in 100 cities. *Global Environmental Change*, 23, 92-102.
- Deakin, M., Campbell, F., & Reid, A. (2012). The mass-retrofitting of an energy efficient-low carbon zone: Baselineing the urban regeneration strategy, vision, masterplan and redevelopment scheme. *Energy Policy*, 45, 187-200.
- Dowling, R., McGuirk, P., & Bulkeley, H. (2014). Retrofitting cities: Local governance in Sydney, Australia. *Cities*, 38, 18-24.
- Eames, M., Hunt, M., Dixon, T. & Britnell, J. (2013) Retrofit city futures: visions for urban sustainability. Report. University of Cardiff, Cardiff.
- Ghosh, S., & Head, L. (2009). Retrofitting the Suburban Garden: morphologies and some elements of sustainability potential of two Australian residential suburbs compared. *Australian Geographer*, 40, 319-346.

- Glad, W. (2012). Housing renovation and energy systems: the need for social learning. *Building Research & Information*, 40, 274-289.
- Gossop, C. (2011). Low carbon cities: An introduction to the special issue. *Cities*, 28, 495-497.
- Hargreaves, T. (2011). Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change. *Journal of Consumer Culture*, 11, 79-99.
- Hodson, M., & Marvin, S. (2010). Can cities shape socio-technical transitions and how would we know if they were? *Research Policy*, 39.
- Hodson, M., Marvin, S., Robinson, B., & Swilling, M. (2012). Reshaping Urban Infrastructure. *Journal of Industrial Ecology*, 16, 789-800.
- Hoffmann, M. J. (2011). *Climate governance at the crossroads : experimenting with a global response after Kyoto*. Oxford; New York: Oxford University Press.
- Jones, R., Pykett, J., & Whitehead, M. (2013). Behaviour Change policies in the UK: An anthropological perspective. *Geoforum*, 48, 33-41.
- Kelly, M. J. (2009). Retrofitting the existing UK building stock. *Building Research and Information*, 37, 196-200.
- Keskitalo, E. C. H., Juhola, S., & Westerhoff, L. (2012). Climate change as governmentality: technologies of government for adaptation in three European countries. *Journal of Environmental Planning and Management*, 55, 435-452.
- Li, T. (2007). *The Will to Improve: Governmentality, Development, and the Practice of Politics*. London: Duke University Press.
- Markusson, N., Ishii, A., & Stephens, J. C. (2011). The social and political complexities of learning in carbon capture and storage demonstration projects. *Global Environmental Change*, 21, 293-302.
- M<sup>c</sup>Guirk, P., & Dowling, R. (2009). Neoliberal privatisation? Remapping the public and the private in Sydney's masterplanned residential estates. *Political Geography*, 28, 170-185.
- M<sup>c</sup>Guirk, P., Bulkeley, H. and Dowling, R. (2014). Practices, programs and projects of urban carbon governance: perspectives from the Australian city. *Geoforum* 52, 137-47, 10.1016/j.geoforum.2014.01.007.
- Monstadt, J. (2007). Urban governance and the transition of energy systems: Institutional change and shifting energy and climate policies in Berlin. *International Journal of Urban and Regional Research*, 31, 326-343.
- Paterson, M., & Strippel, J. (2010). My Space: governing individual's carbon emissions. *Environment and Planning D: Society and Space*, 28, 341-362.
- Pincetl, S. (2012). Nature, urban development and sustainability – What new elements are needed for a more comprehensive understanding? *Cities*, 29, Supplement 2, S32-S37.
- Rice, J. L. (2010). Climate, carbon, and territory: greenhouse gas mitigation in Seattle, Washington. *Annals of the Association of American Geographers*, 100, 929-937.
- Schiellerup, P., & Gwilliam, J. (2009). Social production of desirable space: an exploration of the practice and role of property agents in the UK commercial property market. *Environment and Planning C: Government and Policy*, 27, 801-814.
- Schroeder, H., & Lovell, H. (2011). The role of non-nation-state actors and side events in the international climate negotiations. *Climate Policy*, 1-15.
- Shove, E. (2010). Beyond the ABC: climate change policy and theories of social change. *Environment and Planning A*, 42, 1273-1285.
- Sunikka-Blank, M., Chen, J., Britnell, J., & Dantsiou, D. (2012). Improving Energy Efficiency of Social Housing Areas: A Case Study of a Retrofit Achieving an 'A' Energy Performance Rating in the UK. *European Planning Studies*, 20, 131-145.
- While, A., Jonas, A., & Gibbs, D. (2010). From sustainable development to carbon control: eco-state restructuring and the politics of urban and regional development. *Transactions of the Institute of British Geographers*, 35, 76-93.
- Whitehead, M. (2009). *State, science and the skies: Governmentalities of the British atmosphere*. Chichester: Wiley-Blackwell.
- Willand, N., Moore, T., Hunter, S., Stanley, H. and Horne, R. (2012). *Drivers of Demand for Zero and Towards Zero Emissions Residential Retrofits*, Report for the Australian Sustainable

Built Environment Council. Viewed 13 March 2014 and available at  
[http://asbec.asn.au/files/120913%20Drivers%20of%20Demand%20for%20Zero%20and%20Towards%20Zero%20Emissions%20-%20Final%20Draft\\_0.pdf](http://asbec.asn.au/files/120913%20Drivers%20of%20Demand%20for%20Zero%20and%20Towards%20Zero%20Emissions%20-%20Final%20Draft_0.pdf)

---

<sup>1</sup>Federally-funded cross-sectoral programs that fund and instigate alterations to energy supply, building design and household/business interactions with energy (e.g. through smart metering or solar PV installations).

<sup>2</sup> The Wentworth Group is an independent group of leading Australian scientists concerned with intervening in debates and policy setting to secure the sustainability of Australia's land water and biosecurity.