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New lamps for old: financialised governance of cities and clean energy

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ABSTRACT

Using a six-year case study of Glasgow's Sustainable City business model, this paper examines interactions between financialised governance of cities and clean energy strategies. Research on the role of cities in developing clean energy has paid limited attention to the interaction with financialised governance of infrastructure, which makes the implementation of plans largely dependent on private investment. A conceptual approach combining economic sociology of actor networks and urban political economy is used to analyse the career of the business model designed to transform old infrastructures into new clean energy assets. The analysis focuses on interactions between city council, public bodies and electricity distribution network business. Climate policies are creating uncertainties for energy businesses over revenues from ageing networks, suggesting scope for alliance with local governments. Making new liquid assets for clean energy from old infrastructure is however shown to be a process marked by instability and reversals. In conclusion, it is argued that concepts from actor-network theory and urban political economy used together reveal the hidden contingencies of financialisation in particular socio-technical interactions, and their materiality in the context of climate change.

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Urban energy; climate change; financialised governance; business models; actor-network theory

Introduction

Dating back to at least the UN Rio Earth Summit 1992, city governments have been envisaged as significant institutional and political actors in mitigating climate change and developing low carbon and renewable energy. Many cities have devised ambitious strategies, but material progress remains largely piecemeal, reinforcing uncertainties over urban governance capacities for climate protection (Hodson and Marvin 2014, Bulkeley *et al.* 2015, Rutherford and Jaglin 2015, Webb *et al.* 2017). Research on British cities has examined the struggle to build intermediary capacity and mobilise resources, but little attention has been paid to the implications of financialised governance. Conversely, the political economy of financialisation has paid little attention to implications for sustainable city developments.

The first contribution of the paper is to address this gap by examining urban sustainable energy planning in and through the financialised governance arrangements of UK neo-liberal political economy (Du Gay *et al.* 2012, O'Brien *et al.* 2019). A case study of the trajectory of Glasgow's Sustainable City business model over six years contributes practice-based evidence to necessary public debate about the fitness of our contemporary government institutions for urgent action to mitigate climate disruption (IPCC 2018). At one level, the case study is a micro-scale account of the efforts of a small

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group of people over a few years to mould mainstream business and finance models to low carbon energy investments in one city. From an economic sociology perspective, however, the macrostructures of economic and political institutions and the microstructures of negotiation and exchange are inextricably implicated in each other. The argument is that case study methods contribute to knowledge about the inter-connected workings of macro and micro, and implications for societal change. In this instance, the research problem concerns the malleability of financialised governance to urban clean energy investments. Glasgow was historically integral to the macro-structuring of industrial capitalism and its economics of wealth creation from fossil fuels. By the early twentieth century, it was a leading European city with a population of 1.1 million. Its socially progressive municipal corporation owned and developed public infrastructures, housing and energy networks. It has however become one among many meso-scale post-industrial cities working to engage the contemporary macrostructures of finance capitalism in urban renewal. With a population reduced to around half its former size, it has an uneven legacy of old infrastructures, derelict land and social problems, as well as major new investments in culture, commerce, research and innovation. The Sustainable City model was one of a number of strategies to transform old infrastructures into new assets.

The second contribution of the paper is conceptual. Building on the economic sociology perspective on the interlocking of macro and micro, two strands of theory are brought together to analyse the encounter between local clean energy plans and UK financialised governance. The more structural framework of urban political economy is combined with the more interpretative economic sociology of actor networks to examine interactions of financialised governance with local sustainable energy strategies. These two fields of knowledge are usually considered disconnected, with political economy dealing with macrostructures of institutions, and sociology with microstructures of transactions. This divide is bridged by blending the sociological focus on the nexus of people, organisations and technical devices which assemble economic agency, with the political economy of infrastructure financialisation. The processes of making financialised governance locally material can then be examined. Technical devices implicated in financialised decision-making, including business models, metrics and contracts, are interpreted not as neutral decision support tools, but as constitutive elements of a programme of financialised governance, shaping the legitimacy and feasibility of particular actions (Du Gay *et al.* 2012). Such programmes of governing are not however impermeable to local political contest and improvisation, resulting in continuing partial failure (Lapsley *et al.* 2010). Particular attention is paid to the business models which mediate between UK financialised governance institutions and local strategies to invest in clean energy. The economic sociology perspective suggests that the 'micro history' of Glasgow's sustainable city model, as a form of technical device, casts light on the tangible social, political and technical struggles implicated in producing financialised governance, and its material consequences.

Urban infrastructure, particularly since the financial crisis, has become a focus of financialised governance. Not only is it regarded as critical to economic renewal and productivity, but in the context of UK austerity policies, it is also seen as amenable to financialisation, because of modelled attractive and secure returns, relatively insulated from market volatilities (McKinsey and Co 2013). In the UK, radical reductions in local authority funding, consequent on priorities of fiscal consolidation (Audit Scotland 2018, National Audit Office (NAO) 2018), have obliged local governments to search for new investment and revenues. Reconfiguring local infrastructure into an asset class tradable on global markets is one option (O'Neill 2018). Implications for local governance are beginning to emerge, including concerns about inappropriate displacement of risk and debt from UK Treasury to local governments with inadequate powers and resources (NAO 2019).

Throughout this period, evidence about major climate disruption has gained increasing prominence, and UK and Scottish governments have made legislative commitments to climate protection and clean energy. Progress in low carbon urban infrastructure has however been limited, and UK and Scottish policy aim to mobilise local governments through their capacities as major estate owners, and their powers over land use planning and development (Scottish Government 2017, UK Government 2017). Some cities regard clean energy infrastructure as an opportunity to attract private

investment and gain new revenues (UK100 [www.uk100.org]), but implications for carbon budgets are largely unexamined. This paper brings these major areas of public policy together to examine the implications of financialised governance for urban development of low carbon infrastructure.

The paper is organised as follows. First, the conceptual framework combining urban political economy and sociology of actor networks is discussed. Second, the case study and methodology are described. Third, the case study analysis is presented. Lastly, the discussion and conclusions examine what has been learned about interactions between financialised governance of cities and clean energy infrastructure. The extent to which generalisations can be drawn across British cities, and conceptual contribution are outlined.

Financialised governance of infrastructure and urban clean energy

Urban infrastructures are both material and relational: critical to the organisation of societies, political economy and democracy. They constitute a trace of past political priorities and power relations: sewers and energy supplies are ‘essential aspects of distributional justice and planning power’ (Star 1999, p. 379). They are by extension critical to political and economic struggle over the future sustainability of cities. The funding, financing and governing of infrastructures is a central concern of states, from international to local scales. Economic sociology of actor networks has not however focused directly on questions of political economy and state institutions, as opposed to the formatting of markets. Analysis of infrastructure governance, and financialisation, has advanced mainly through political economy and economic geography. Its insights are critical to understanding the UK governance arrangements which inform Glasgow’s sustainable city strategy, but an economic sociology of actor networks is valuable in casting light on the particular socio-technical nexus implicated in assembling finance for low carbon infrastructures. The aim is to retain a balance between the macro-structuring of financialisation, exemplified in translation of urban infrastructures into globally tradable assets, and micro inter-mediation and contestation at urban scale.

The development of finance capitalism, and complex corporate and governmental networks of institutional investment, rating agencies, trading platforms and business restructuring have been a particular focus in political and cultural economy (Pryke and Du Gay 2007, Streeck 2016, Bayliss *et al.* 2017). Infrastructure has increasingly been configured as a globally tradable asset class, with investment banks, pension, private equity and sovereign wealth funds adding urban infrastructure to investment portfolios (O’Brien *et al.* 2019). In at least some cities, structured finance instruments have been applied to extraction of value from infrastructures, reconfiguring these as liquid asset classes yielding ‘predictable and secure income streams’ (Leyshon and Thrift 2007, p. 101) in global markets. Critical scholarship has highlighted the risks of subordination of public purposes to private profit, and narrowing the features of public utilities down to financial metrics of rate of return, risk and debt ratios (O’Brien *et al.* 2019).

Current work however challenges any suggestion that this is an impermeable, singular, accelerating and universal process governed by abstract laws of financial markets. The heterogeneity and varying trajectories of financialisation, and its disparate and unpredictable consequences for infrastructure provisions, are evident (Weber 2010, Ashton *et al.* 2012, 2016). Financialisation emerges as a project negotiated, orchestrated and managed as much by multi-level state institutions, as by financial market actors. Through capital structures, organisational reforms and regulatory frameworks, local, central and devolved governments may take an active part in structuring financial markets, using political power to legitimise strategy (O’Neill 2018). They have multiple roles as planners, commissioning and contracting bodies, financial guarantors, (co-)owners and customers (O’Brien *et al.* 2019), but uneven capacity to effect innovation (Weber 2010).

Institutional structures and processes of government do not remain unchanged by such transactions, but are reoriented to assembling private and public finance, enmeshing city governments, investors and counter-parties in a long term process of economic value creation and maintenance (O’Neill 2018). Analyses of specific devices, such as concession contracts or leases, which mediate the transformation of urban infrastructures into commodities backed by global investment

consortia, show that financialised governance is not a single event marked by signing a contract. It is a process managed over long periods by all parties – financial intermediaries, city governments and investors – entangled in the engineering of value through techniques geared to reducing risk, adjusting discount rates and refinancing to maximise returns to private investors (Ashton *et al.* 2016). When the public sector lacks expertise in the financial techniques used to engineer higher returns to investors than those produced by rents from asset use, there are significant challenges to fairness in public shares of returns from contracts (Ashton *et al.* 2012). Cities such as Chicago, which have led the way in financialising urban infrastructures as a means to solve fiscal crises, have sought to manage risks by incorporating financial intermediaries into state institutions, developing new forms of agency (Ashton *et al.* 2016). Strategic functions such as planning for example may become increasingly oriented to prioritising private investment over provision of collective services, with implications for local populations facing differential services and costs (O'Brien *et al.* 2019). Creating material ties between global financial markets and local infrastructures is hence an irreducibly political and cultural as well as technical process.

Political economy analyses make clear that forms of infrastructure financialisation are contingent on the institutional, and multi-level, arrangements of states. Despite global financial market liberalisation, UK state institutions and financialised governance differ from other European or North American countries. Since the 1980s, the UK government has led European innovations to extend the sphere of markets, embedding financialised measures of value in policy and regulation across scales (Davis and Walsh 2016). Private finance has been drawn into public services through deregulation, privatisation of public infrastructures including energy generation, transmission and distribution, and use of private finance instruments for renewal of ageing infrastructures. In addition, the autonomy of local governments over finance and investment is circumscribed by the centralised powers of UK political institutions over taxation, monetary and fiscal policies, even after devolution (Eckersley 2017). A centrally governed framework of statutory duties disciplines local strategy; energy and climate policy are not statutory, but discretionary, activities, and these have been eroded by the financial crisis. In the search for new sources of finance for regeneration, including local energy infrastructure, local authorities have turned to commercial business models (Hyndman and Lapsley 2016), but local variants have depended significantly on central government political patronage, access to business networks, and enterprising assembly of resources (O'Brien and Pike 2018).

These more actor-oriented analyses of financialisation processes in urban political economy are opening up questions about the rationales, techniques and shifting political positions adopted in local infrastructure investment strategies, and material consequences of the struggle for control over shares and forms of value. They suggest the need to trace the cross sector and cross scale transactions between local and cosmopolitan actors in order to understand the trajectories of financialised governance and responsiveness to low carbon infrastructure. These questions resonate with the more interpretative economic sociology of actor networks. By foregrounding the analysis of situated practices, actor-network theory lends itself to investigating the dynamics and improvisational qualities of financialised governance and its likely uneven material results. The economic capacities and powers of any particular actor network are interpreted not as pre-given, but as conditioned by its particular constituents. These comprise human knowledge and sociality as well as technical devices, digital, contractual and physical entities which variously extend and modify human cognitive capacities (Latour 2005, Caliskan and Callon 2010). Applied to the analysis of local government strategies for assembling infrastructure investment, the actor-network perspective draws particular attention to the potentially performative role of technical devices in mediating economic agency (Doganova and Eyquem-Renault 2009, Weber 2016). As outlined above, in the UK's centralised and financialised governance institutions, and with limited local powers over taxation, city governments increasingly emulate commercial strategies, devising business models to promote the city to global investors (Lapsley *et al.* 2010). In actor-network theory, business models are key technical devices implicated in building and translating shared financial facts across parties, in order to enrol them in a common

investment strategy. Such models typically combine a narrative, seeking to convey a compelling vision of a prosperous future, with financial calculations which project attractive returns on investment. This ‘macro investor’ perspective is constituted through standard financial formulae, used to calculate expected rate of return on investment and hence demonstrate value (Chiapello 2015, Doganova and Muniesa 2015). Its metrics are intended to make different options appear comparable on a single numerical scale, notionally enabling investors to select projects with highest anticipated returns. Perceived credibility and robustness of the business model is essential to assembling the requisite economic agency. Belief in facticity of the calculations is however dependent not just on metrics, but also on perceived legitimacy of the underlying finance techniques, including their sponsorship by financial or political elites (Mackenzie 2009).

Glasgow’s sustainable city business model sought to reconfigure legacy infrastructures and land into financial value for new clean energy investment, framing the attributes of existing infrastructure as profitable sources of future income. The business model has to circulate among, and translate between, disparate networks of commercial, public, and civil society actors to build alliances around shared facts about the investment value of the future city. It interacts with established, and potentially conflicting, interests and understandings of the value of the city’s assets whether as commercial or public goods. Hence such models are likely to be entangled in political struggle and critique. Any particular infrastructure proposition may or may not proceed, and may evolve into something not entirely foreseeable from its starting point, contingent on the particular assemblage of people, resources and artefacts emerging over time. Ultimately the propositions remain unrealised if successive iterations of the business model prove ineffectual in assembling economic agency for material investment.

The case study

Characterising the Glasgow case study

The critical case study approach (Flyvbjerg 2011) is a means to analyse the work of assembling economic agency over urban infrastructure in a specific setting through processes in situ, with insights potentially relevant to other cases. This case study traces the career of Glasgow’s sustainable city business model, which anticipated major private investment in urban energy systems for economic and social regeneration, and climate protection.

In the early twentieth century, the Glasgow Corporation owned the city’s energy networks as well as major civic facilities, housing and transport systems. Following the second world war, however, UK government macro-economic policies favoured economic rationalisation through increasingly centralised state control. The transfer of the city’s municipal energy to UK state ownership was considered by some to be a form of expropriation, undermining local capacities for self-determination and civic welfare. Neither did macro-economic policy avert decline in Glasgow, or other industrial cities. The municipal corporation was finally dismantled during the 1970s local government reorganisation, with the council facing a legacy of housing debt and an impoverished population. Glasgow council is now structured around a core and periphery model, aligned with UK financialised governance and outsourcing (Froud *et al.*, 2017). The core structures are chief executive, corporate and financial services; development and regeneration services; land and environmental services; social work and education. Most local services, facilities management and regeneration are handled via ten arms length management organisations (ALMOs), characterised by a local politician as ‘wider members of the family, a very modern political euphemism’ (City Councillor, Chair of Sustainability Policy Committee).

Privatisation of energy and liberalisation of energy markets has also been central to UK financialised governance. Commencing in the late 1980s, an already centralised energy system was disaggregated into generation, transmission, distribution and retail before sale. The Office for Gas and Electricity Markets (OFGEM) was created to regulate the market. Gas and electricity networks

were defined as monopoly assets to be regulated through price control formulae designed to guarantee a fair return on capital assets, indexed for inflation, less a fixed percentage per annum to incentivise productivity. Unlike in the USA, there is no cap on returns to network businesses. The duty both to protect customers and to ensure that companies can invest and innovate has been the centre of dispute, with claims that energy network businesses are able to make unearned profits to the disadvantage of customers (Ford and Plimmer 2018).

Local governments hence do not own or control any significant energy assets, and energy distribution network owner-operators (DNOs) have no obligation to interact with local councils to plan investment. DNOs do however own land and infrastructures whose value is physically embedded in local social, political and economic life, and hence share with local councils an interest in local prosperity. Both encounter the problem of assembling new revenues from old infrastructures, but their objectives are only partly compatible. The city government has responsibility for local public services, welfare and civic amenities, while most DNOs, including the Glasgow DNO, are part of transnational corporations whose primary legal responsibility is to secure profitable returns to shareholders. In this case, the question around which Glasgow council and the DNO manoeuvre is whether there is potential for a mutually beneficial alliance to unlock new revenues from integrated energy and joint investment planning.

Methodology and data

As a component of research commencing in 2010, the author interacted with, and interviewed, fifty-six city politicians and officials, consulting engineers, electricity distribution network managers, technological university representatives, and officials from central government, health services, and investment agencies. Interview transcripts were analysed using themes concerning sustainable urban energy, energy planning, carbon management, 'smart grids', technical-economic and financial feasibility of projects, business models, city governance, finance and regeneration strategies. The analysis also draws on notes from the following meetings: sustainable city project board; energy project planning; the DNO 'Smart Cities and Energy' forum; City Council low carbon working groups and committees. Lastly, the following documents have been reviewed: Sustainable City report; city energy and carbon plans; energy services company (ESCo) plans; technical-economic feasibility studies for urban energy projects and media reports.

Case study analysis

Sustainable City 2010: origins and propositions

Origins and initial development of Glasgow's Sustainable City concept exemplify Granovetter's (1973) analysis of the strength of weak ties in economic transactions. Cross sector economic strategies to improve the city's tax base provided the network of engineering, banking, infrastructure and commercial businesses, and public sector leaders. Not only were there personal connections, through 'going to the football' (Project Director), but a cross sector city Economic Commission was developing proposals to mitigate the major damage of the financial crisis, and low carbon industries were identified as central. Timing was conducive, with European funding for sustainable cities, and public investment in a major regeneration programme incorporating energy from waste facilities, a hospital, a Commonwealth Games village and a further education campus. The city's regeneration agency was also accustomed to structured finance instruments using public land and property assets as stimulants to private investment.

These loose ties, centring on the city's technological university and local politicians, and linking energy companies, equipment manufacturers, business services, waste contractors and a global investment bank, were instrumental in assembling data for outline financial modelling for a future city business model with investment propositions built on clean energy, light rail and a 'smart grid'.

The Sustainable City Report, drafted by a Scottish government official on secondment to the university, translated greenhouse gas and energy metrics into technically and financially integrated clean energy investment opportunities, with local socio-economic benefits. The narrative articulated the ambition to make the city one of the most sustainable in Europe by 2020, invoking tropes of world-leading transformation within a decade.

The business model mapped opportunities against the city's estate and facilities. New investment of up to £1.5 billion was envisaged, based on modelled financial returns sufficiently attractive to secure most investment from the private sector. Investment propositions constituted old infrastructures as the basis for new liquid assets. First underground waterways, mine workings and tunnels were referenced as low carbon heat sources and conduits for heat networks, alongside industrial heat recovery. Second municipal sewage and waste would become biogas and electricity assets. Third vacant and derelict sites would become resources for biomass energy. Fourth energy demand management and flexibility services, using public buildings as assets for energy performance contracting, would be a foundation for a new 'smart grid'. The two major projected areas of investment, comprising £1400 million of the £1.5 billion, are, for reasons of space, the specific examples discussed: first decentralised energy zones for district heating and local electricity generation, and second a 'smart grid' for management of critical infrastructures, including street lighting, buildings, waste water treatment and water supply. Different options for raising and managing required capital were noted, although the central proposal was a public-private investment trust, operating on commercial terms, to raise capital and allocate finance against projects to develop or repurpose infrastructure and land.

Translation and enrolment: the 'sustainable city' model as a device to build financial facts and mobilise capital

The 2010 launch tested initial enrolment of commercial investors in the model's outline financial facts to secure the £1.5 billion investment. Representatives of the global investment bank, two energy utilities, a global municipal services contractor, IT and telecommunications businesses, as well as politicians, officials and public investment agencies turned out to welcome the sustainable city strategy, but proving the business proposition required investment grade proposals. This relied on commercial experts working with a council project manager, governed by a public sector project board and cross sector steering group. The steering group was the critical coupling between public and commercial knowledge, with representatives of energy, water and telecoms utilities, as well as IT and control systems' businesses. Financial intermediaries were not prominent in this grouping. Nevertheless, city political leadership, with long-term financial commitment evidenced by major public investment in regeneration, supportive planning policies and vocational training, were framed as creating a stable, low-risk environment for private investment.

In practice, the work of assembling financial metrics was halting. Budget reductions and continuing restructuring put in doubt the council's capacity to enrol these diverse interests in financing clean energy in Glasgow. The council leader, regarded as a highly effective politician committed to the enterprise, had to resign amidst allegations of criminal activity; his successor was cautious. Appointment of a project manager was delayed, and redundancies and early retirements among officials diluted the available expertise: 'a huge lump of knowledge just disappeared' (project director), with what the first project manager described as having 'a devastating effect'. In addition, commercial sector secondments were scarce in the absence of guaranteed contracts. In 2012 the first project manager was succeeded by a second who aimed to re-invigorate the business model using explicitly commercial terms, foregrounding financial, rather than 'academic' greenhouse gas, metrics. Perceiving a short-term opportunity to secure affordable capital, following the collapse of commercial property markets, and unallocated capital on corporate balance sheets, the Sustainable City Board was restructured with business and public sectors 'around the same table' in discussion over a public/private commissioning and contracting body.

Assembling business models for clean energy infrastructure

A sense of hiatus was however emerging: ‘we can talk a good game, but we can’t actually do it ... the problem is that things unravel’ (Senior Environment Officer 2012). In the absence of significant commercial leverage, attention turned to public commissioning of technical-economic appraisal of proposed decentralised energy zones. These were expected to produce more compelling facts about financial returns by integrating clean energy infrastructure with major capital investment programmes in regeneration areas and using similar structured finance devices. A significant area on the north side of the city combined assets managed by the city’s regeneration, and community facilities ALMOs, as well as housing associations, a university, hospital, brewery, Scottish canals, and a civil engineering contractor. A detailed study of the economics projected significant financial benefits of low carbon district energy infrastructures, including micro-renewables, heat networks and heat recovery from water-courses, waste water and mine waters. The model proposed initial integrated heat supply via three energy centres, based on gas combined heat and power (CHP) and district heating, encompassing public estates, social housing, and the brewery; this would be future proofed for expansion and conversion from gas CHP to heat recovery from water and industrial sources. Compared with equivalent smaller scale isolated developments, such as those already planned by the hospital and university, the analysis projected ‘up to £8.5 million combined operating benefits (savings on energy costs) per annum’ shared between participants, with annual operating cost savings of up to 40%, and an annual operating profit of £2.7 million. Options for private, as well as municipal, ownership were outlined, but in both models the political and financial commitment of the city council would be critical.

Council divisions over the business model

The apparently attractive financial proposition however demanded considerable innovations in governance, because both business models required creation of new long term inter-dependencies across public sector bodies, and a commercial stake from the brewery. The key parties would need to negotiate agreed financial, environmental and social objectives, and to develop a robust technical and commercial structure, including principles for long term allocation of financial risks and rewards. The sustainable city board should have provided the vehicle, but was perceived by council officials as having too many ‘free riders’ and lacked political and economic leverage. Neither was there a critical mass of support for a commercial business model, which was a source of enduring tension in the council, especially when the business members of the board were slow to contribute resources. The private commissioning model was publicly espoused, given local austerity budgets, and shrinking technical, financial and legal resources. This would however require the council, perhaps in collaboration with housing associations, to tender a long term (20–30 year) concession contract for private investment in an Energy Services Company (ESCo) to design, build, finance, operate and maintain local energy infrastructures, including new heat networks. Bidders would want long term guaranteed revenues from heat (and possibly power) sales to large scale public estates to anchor the financial model, with component grant funding to connect social housing at a subsidised rate.

In principle, this allowed the council to ‘use its assets and skills married together with the strengths of the partner: commercial return, structuring of deals, finance, service delivery’ (Sustainable City Manager, 2012–2014). The contractor would ‘put their infrastructure in, fund it themselves, but we will make it a better overall deal for the city’ (Director of Sustainability). It would in itself however require major ‘statecraft’ by the council to organise consent among all of the parties who would need to sign heat (and possibly power) agreements with the ESCo over a 20–30-year period. This could in itself be a lengthy process pre-tender, followed by further lengthy negotiation with bidders over allocation of risks relating to customer contracts and bad debt, operation and maintenance, fuel supply and tariffs. In addition, as discussed earlier, such negotiations do not end with signing a contract. Lengthy concession contract negotiations for a waste recycling and energy facility in the

south of the city provided immediate experience of the complex commercial, financial, operational and legal issues and transaction costs. Economic modelling had also already projected higher costs of this concession structure than direct public ownership, because of required higher financial returns (typically a minimum of 14% in comparison with 4–6% for public sector schemes).

Local politicians and officials were also divided over the merits of the financialisation model. A prominent politician argued that vulnerable households could be disadvantaged. Members of urban planning, design and architecture services regarded it as an abdication of responsibility for civic leadership, and likely to marginalise more radical elements of the sustainable city vision for greener, safe and sociable places. Concession contractors would be ‘as far removed from integrated urban design principles as you could possibly be, because they’re not interested, they’ve not got the expertise to do it’ (Council Architect). Civic priorities were expected to be subordinated to those of commerce: contractors may ‘come to the table and say ... “we know this, we know that,” but realistically ... they just want quick ... commercial fixes’ (Council Urban Design Manager). In the energy and sustainability team, even the officials espousing the commercial model were uncertain about securing the anticipated benefits:

Trying to work with [the two energy businesses], people would cry foul; while they may say they’re doing it to benefit the city, structurally they work to the benefit of their shareholders. (Sustainable City Project Manager 2012–2014)

You know, it’s all about pounds sterling and pence to them. And if they don’t see a kind of a quick pay back ... they’re not so interested. (Director of Sustainability)

Among dissenting voices, the city’s influence as a minority shareholder in any ESCo enterprise was regarded as tenuous and unlikely to secure a fair share of socio-economic benefits.

Electricity distribution network operator (DNO) translation and enrolment strategy: profit, altruism and assets through integrated energy planning

The DNO was a prominent sustainable city board actor and a potential bidder for an ESCo concession contract. Council divisions over financialisation were however amplified by the council’s distrust of energy companies, which DNO managers commented, were perceived by public sector bodies as ‘commercial animals who are going to rip us off’ (DNO City Energy Team Director). The DNO public stance was that of responsible partner in any local system, committed to beneficial returns to the city through jobs, incomes and revenues:

We are effectively just a responsible energy partner seeking to do the best by the council ... It might sound really altruistic, but it really is true. (DNO City Energy Team Manager 1)

Its position was however structurally difficult. Financial advantage from decentralised infrastructures, local tariffs and trading is difficult to assemble when regulatory frameworks are geared to centralised generation and wholesale markets: ‘There is no incentive to create a shared system’ (DNO City Energy Team Market Development Manager). Local generation connected to the distribution network also creates operational and technical risks, potentially reducing profitability:

The more the network is fragmented, the less chance you have of creating that automation [for a smart grid]. Weird things have happened, understandable for monetary reasons, but when you get down to the technical reasons, decisions do not appear as sensible. (DNO city energy team manager 2)

A DNO would ideally want a stake in planning and controlling any such investments, in order to manage interactions between local generation and network capacity to its financial advantage. A competitor energy business however already held local contracts, including Commonwealth Games Village energy infrastructure. As a subsidiary of a transnational business, the DNO also needed to prove financial returns from local investment superior to those from global market comparators. They set up a city energy team as intermediary between parent company and city,

legitimising ‘involvement in things that are seemingly unrelated to the DNO’ (City Energy Team Director). The team devised a strategy to build financial facts about local infrastructure through integrated energy planning from a database on energy use in all buildings. This was regarded as a platform to convert old ‘wires and substations’ into a future ‘smart grid’, which would be a powerful business resource and foundation for capital investment, energy performance contracting, heat supply contracts and tariffs to incentivise demand shifting. Decentralised energy developments, such as on the north side of the city, would add value through new heat revenues, and insider insight into planning applications and property developments would enable city-wide investment planning in full knowledge of energy demand.

Such a plan required integration of electricity network, heating and planning and development data, which neither council nor DNO could assemble independently. The DNO controls the network, energy data and systems expertise, and access to corporate finance. The council controls significant land and buildings, and exercises statutory powers over land use and development planning:

We know where things are going to be built; we know where some of the difficulties are, and being able to bring that together at the city level is a pretty powerful tool. (Sustainable City Project Manager 2012–2014)

Political power and civic legitimacy also mattered: ‘you’re not going to get anywhere unless you have the city council on board’ (Director of Sustainability). The city council was wary of allowing the DNO some commercial advantage, but nevertheless perceived an integrated plan as another potential key to ‘sweating the city’s assets’ (Sustainable City Project Manager 2012–2014), and EU funding ultimately enabled the council to commission the DNO to proceed.

Reviewing the viability of new assets from old

Previously regarded as key to turning old assets into new income, the 2014 published integrated energy plan had no financial metrics, replacing these with a reference to the need for innovative financial solutions. There was growing recognition that successive iterations of the business model were unable to secure the projected £1.5 billion private investment in clean energy by 2020 on publicly acceptable terms: ‘plenty of investors out there with money, but that money’s expensive and the payback ... is usually too short’ (Council Energy and Carbon Manager). The city and technological university continued to find short term innovative solutions in public funding competitions, with a 2013 award of £23 million for a ‘smart city’ business model, which was invested in an operations centre and data observatory, low energy street lighting, and street and building level digital sensor networks for demand management. Even this did not however enable the DNO to devise an investable model to generate business revenues from smart local energy systems, combined with solutions to the city’s social and economic problems. Relative to global investment comparators, the financial value of decentralised energy proved unattractive to the transnational company and the City Energy Team was dissolved.

Council evaluations of results were mixed. Planning officers regarded the new projects as standing ‘in splendid isolation’ rather than being integrated into the envisaged strategic transformation. The ‘smart city’ device was regarded by some as another chip in the ‘incredible game of poker [over] just how much we can get for those assets’ (Council Planning Officer), without providing the key to a politically credible financial model. There had been: ‘too much talking, not enough action; too much policy, we’re drowning in policy’ (Council Architect). Energy officers were more inclined to regard the projects as capacity building for future energy investment. The historical tradition of public works was referenced: ‘people do remember the old Corporation when we provided everything ... We used to run energy networks’ (Council Director of Sustainability), and a council ESCo was created in 2015 to manage the Commonwealth Games Village energy network. This supplies 700 houses, care and leisure facilities and will notionally ‘deliver the kind of social and economic benefits we spoke about ... The ESCo can then start to develop into something maybe a bit more commercial’ (Director of Sustainability). No joint agreements have as yet been secured with other public bodies to

interconnect their new stand-alone energy infrastructure. Ultimately the municipal model is limited by lack of financial powers: ‘we don’t have the tools, because we don’t have any independent revenue raising powers’ (Councillor Chair of Sustainability Policy Development). New financialisation plans were emerging instead:

Nothing is off the table ... We’re going to have to look at more enterprise zones ... accelerated planning zones ... pension funds ... I think the major problem is to keep that Sustainable Glasgow partnership going, but also to look at ‘where’s the money coming from guys?’ Is there a way we can look at Europe? ... Is there a way we can look at investment from other countries? Are there ways that we can connect much more with Westminster? ... There’s got to be innovative ideas ... When push comes to shove, I’m not joking about having to sing in the street. (City Councillor, Chair of Economic Development Committee)

Without obvious political or financial capital for sustainable energy however, infrastructure business models turned increasingly to more tractable questions of economic regeneration.

Discussion and conclusion: sustainable city visions and material Realities of financialised governance

One of the biggest challenges ... is because of the economic and social history of the city. But it’s also one of the fantastic opportunities ... Glasgow wanted to cause mayhem politically, but still wanted to hold your hand at the same time. It was a very Glasgow way of doing things, you know? (Councillor, Chair of Sustainability Policy Committee)

In Glasgow, the sustainable city vision was entangled in the city’s political, economic and social history. As a political entity, the council had a strong sense of the politics of financialisation and sought a Glasgow way of accessing its benefits. Financialising old public infrastructures and legacies as a route to new clean energy assets and socio-economic benefits was however elusive. The disciplinary power of UK financialised governance, centralised budgetary control, lack of a local statutory mandate over energy, and privatised, centralised energy markets presented local politicians and officials with significant uncertainties. Over six years, multiple variants of the sustainable city business model, detailed technical-economic analyses, integrated investment and energy plans, public funds and the old infrastructures of public estates and energy networks were insufficient to assemble an economic actor for clean energy. Improvisation around narrative and finances interacted with private sector risk aversion, declining public expertise, political ambivalence, instability and reversibility of commitments. Successive attempts to build facts about the compatibility of advantageous returns to capital with local affordability and new public revenues dissipated. Global investment options available to businesses such as the transnational owner of the local electricity distribution network proved more compelling, and terms on offer from financial intermediaries were politically unpalatable. Authoritative structured finance devices for low carbon and energy saving urban infrastructures were also lacking, and political capital from applying greenhouse gas metrics to challenging the economics of business as usual was limited. Pilot energy projects stand as examples of good practice by a small group of determined officials and politicians, but routes to systematic transformation did not emerge, and investment relied on traditional public funding from competitions, grants and loans.

As early as 2014, political attention had shifted from the sustainable city proposition to the more familiar terrain of infrastructure financialisation through growth-oriented commercial property, housing and transport, where established instruments of structured finance operate. The particular financial opportunity was the UK government city deals programme. In an artful political manoeuvre, during the 2014 Scottish independence referendum campaign led by the governing Scottish National Party, the Labour-controlled city council opened negotiations directly with UK government over a city-region infrastructure deal. The eventual Glasgow Clyde Valley Deal was structured around £1 billion capital funding from UK and Scottish governments, plus £130 million in public borrowing from the combined local authorities, for investment in housing, transport and technological innovation. Public finance is again expected to leverage a much larger sum (projected £3.3 billion) of private finance. Unlike the Sustainable City 2010 proposition, which contained 440 references to energy,

the City Deal has no references to energy or low carbon infrastructure, and only one passing reference to 'sustainable'. Its objectives are economic growth, with forty-four references to growth in its twenty-four pages. Earlier ambitions for integrated clean energy and property investment planning are marginalised, with the risk that regeneration for short-term gain has a high societal price from exacerbating climate disruption.

To what extent can findings from the Glasgow case study be generalised to other British cities? While the conjuncture of local politics, economics, social history and current resources suggests that the trajectory of energy initiatives in every city will differ somewhat, UK financialised government institutions and the centralised powers of UK Treasury make radical innovation unlikely anywhere. This would require more substantive decentralisation of fiscal policy and investment strategies, as well as a restructuring of energy market regulations to prioritise local and regional energy planning and investment, and empower local governments. The city deals programme, as a major indicator of current infrastructure investment models, suggests the improbability of such change. Despite policy gestures, and domestic, as well as global, responsibilities of climate governance, city deals have not foregrounded clean energy, providing only limited grant funding for 'low carbon pioneers'. There are ambitious clean energy propositions in major city regions, including Birmingham, Cardiff, Edinburgh, Leeds, London and Manchester. Implementation however remains largely reliant on improvised solutions, including access to informal networks of political power and patronage, which lack transparency and public accountability.

Beyond the Glasgow case study, using an interpretative conceptual framework to demonstrate a 'causal' relationship between financialised governance of urban infrastructures, and limited material responses to climate change is challenging. The value of the conceptual framework is its demonstration of the indivisibility of macro- and micro-scales and their potential instability. The case study method grounds the politics and economics of financialisation in specific practices of governing, highlighting the political strains inside, as well as between, institutions of the UK neo-liberal state. The transaction costs, counter-efficiencies and ultimately limited results of Glasgow's sustainable city model reveal the conditionality, rather than fixity, of financialised governance and its imperfectability. Such governance is not a matter of automatic operation of higher order technical-economic laws, but contingent on partially improvised political judgements, corresponding technical devices and re-arrangements of existing resources. Financialisation works not according to a singular logic, but through a multitude of decisions each of which could be made differently, including deciding to act with necessary urgency on climate change. Developing sustainable cities will require direct planning and investment with clear objectives and timetables; financial valuation devices and price mechanisms are not enough, putting climate and energy policy back in the realm of politics rather than technicalities.

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