

Rigour and rigour mortis? Planning, calculative rationality, and forces of stability and change

Iain White 

University of Waikato, New Zealand

Urban Studies

1–16

© Urban Studies Journal Limited 2019



Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/0042098019886764

journals.sagepub.com/home/usj



Abstract

A defining feature of planning is that it is informed by sound evidence. An ever more diverse range of decision support tools is available to help achieve this, a trend that is set to accelerate along with the rise of Big Data and Smart Cities. At the same time, planning is frequently requested to improve the urban and environmental outcomes it helps deliver. This research draws upon intellectual resources from Science and Technology Studies, and empirical data from actors across the science–policy–practice interface, to analyse critically issues connected to the design, application and wider effects of calculative practices within planning. It finds that these practices selectively open up or foreclose discourses and play important political roles relating to ordering complexity and mitigating professional risk. They are also revealed as underpinning a stability and certainty within decision making that not only maintains the power of established calculative agencies but also serves to replicate an ideology of urban form that is in tension with more normative calls for change. More broadly, the findings help unsettle the planner and planning policy as the key agent able to change planning outcomes, which is instead revealed as more contingent on the political, institutional and professional culture, and the ways human and non-human objects align and combine to create internal stability when there are external calls for change.

Keywords

calculative rationality, critique, decision making, decision support tools, planning

Corresponding author:

Iain White, University of Waikato, Geography, Tourism and Environmental Planning, University of Waikato, Private Bag 3105, Hamilton 3240, New Zealand.

Email: iainw@waikato.ac.nz

摘要

规划的一个决定性特征是它应当是依据可靠的证据进行的。有越来越多样的决策支持工具可以帮助实现这一目标，这一趋势将随着大数据和智慧城市的崛起而加速。与此同时，人们经常要求规划改善城市和环境成果。本项研究利用了来自科学技术研究 (Science and Technology Studies) 领域的智力资源，以及来自科学-政策-做法界面的参与者的经验数据，以批判性地分析与规划中计算实践的设计、应用和更广泛影响相关的问题。研究发现，这些做法有选择地打开或取消话语，并在整理复杂性和降低专业风险方面发挥重要的政策作用。它们还被揭示为决策过程中的稳定性和确定性的基础，这不仅保持了既定计算机构的力量，而且还复制了一种城市形态的意识形态，这种意识形态与更规范性的变革要求相矛盾。更广泛地说，这些发现挑战了规划者和规划政策作为能够改变规划结果的关键因素的地位，并揭示了规划结果更依赖于政治、制度和专业文化，以及当有外部变革呼声时，人和非人的目标如何协调和结合以创造内部稳定。

关键词

计算理性、批判、决策、决策支持工具、规划

Received January 2019; accepted October 2019

Planning and calculative rationality

the intellectual puzzle of some future time will be to account for the failure rather than the success of the period in which we have lived ... the prestige accorded to mathematics in economics has given it rigor, but, alas, also mortis. (Heilbroner, 1979: 193–198)

The famous quip from a US economist concerning the adverse effects of the rise in prestige of mathematics in economic thought provides both an initial scene-setting provocation and a need to justify its selection. To adapt the quote, this paper investigates the extent to which the rise in prestige of similar calculative practices in planning has not only given it rigour, but other side effects, which, in part, help explain critique of planning outcomes and the profession more generally.

A defining feature of contemporary public policy is that it is informed by rigorous evidence (Cairney, 2016; Parkhurst, 2017). This trend has been particularly noticeable within planning, where long-held Geddesian

practices of ‘survey before plan’ are now supplemented by a growing focus on gathering data to inform decisions (Faludi and Waterhout, 2006). Associated with this rise in scientific knowledge, planners have drawn upon an ever more diverse range of decision support systems (DSSs) or decision support tools (DSTs) to help achieve this goal, from population projections, to cost-benefit analyses, to complex traffic models and beyond. This is set to intensify, as the emergence of ‘Smart Cities’ not only promises that more data can be captured than before but, if assimilated effectively, new opportunities will emerge to enhance evidence-based approaches (e.g. Batty, 2013; Marvin et al., 2016). We are also witnessing an explosion in the institutional capacity to count and correlate, which is generating ‘new hypotheses about the way the world works and prescriptions for how to act on that knowledge’ (Jasanoff, 2017: 2). There is an implicit positivism underlying much discourse connected to this ‘evidentialist’ turn, where better evidence should lead to better policies and plans, and from there to better outcomes (Davoudi, 2015).

However, DSTs do not just bring knowledge to decision makers. A key aspect supporting their wider political value is they turn subjective or uncertain data into actual dollar values, specific numbers or precise lines. These ‘calculative practices’ are associated with the need to make complex systems, such as those associated with urban areas, governable (Miller, 2001, 2008); they provide a simplified representation of reality and reveal ‘stories that matter in a field of infinite happenings’ (Jasanoff, 2017: 2). Consequently, they play a deeper role underpinning decision making by rationally identifying, delineating and comparing options. In doing so, they help defend decisions and play an important role in maintaining trust in expert decision making (Giddens, 1990). However, while decision makers have never had so much scientific knowledge at their disposal, as the opening quote indicates there is a widespread dissatisfaction with outcomes and claims of crises (Florida, 2017; IPCC, 2014).

As a key agency associated with this agenda, planning frequently receives political and public calls for change, notably with regard to its ‘red-tape’, zoning practices, or inefficiencies in processing consents (e.g. Cheshire et al., 2012; HM Treasury, 2015). In this context, DSTs are seen as a means to improve rigour, efficiency or outcomes, yet research emerging from the field of Science and Technology Studies (STS) is recasting these objects from an uncritically accepted part of the solution – a ‘tool’ for users or ‘information deficit’ to be filled – to potentially being a co-constituted part of the problem. This goes beyond debates concerning the political or value-laden nature of evidence-based planning (e.g. Davoudi, 2006; Krizek et al., 2009) to its performative and constitutive power (Callon, 2007).

For example, research in planning reveals how specific calculative practices, such as development viability modelling or housing

affordability metrics, do not merely describe or explain but also *shape* cognitive structures and help frame decisions from public and private actors (David and Halbert, 2014; McAllister et al., 2013, 2016; Murphy, 2014). Consequently, DSTs are an intrinsic part of the assemblage of laws, regulations, culture, policy and logics that serve to create and stabilise *markets* (Callon and Muniesa, 2005).

This perspective repositions power and agency in planning decisions and outcomes from the usual suspects of policy, planners or even politicians, to also be *epistemological* and *relational*, to better capture the interplay between non-human objects and decision makers. As Callon (1998: 16) argued: ‘if calculations are to be performed and completed, the agents and goods involved in these calculations must be disentangled and framed’. Given the rise of the evidential turn within planning, this research seeks to take a critical perspective concerning the selection, application and wider effects of calculative practices within planning, including the kinds of issues they open up or foreclose and the ways that provide stabilising forces that are in tension with more normative calls for change. While the methodology uses a case study of New Zealand planning to interrogate the use of DSTs within a professional setting and culture, it is anticipated that the findings will be of interest to others analysing the epistemic turn in urban planning or the wider critique of the profession.

DSTs are defined as a method or framework that can be used to assist with the analysis of information required for decision making or to assist with the decision-making process itself. The empirical aspects comprise 28 semi-structured interviews, each of which lasted an average of an hour, and a 3-hour workshop, all conducted in 2018. The interviewees were identified via a heterogeneous sampling strategy designed to capture issues emerging across the science–policy–practice interface. Three broad areas were identified:

those who design or develop DSTs (7), such as modellers or consultants, those who consider the weighting and effects (14), such as infrastructure experts, planners and Independent Hearing Commissioners, and those who consider the outcomes (7), such as academics, advocates and developers. In practice, however, a number of participants had knowledge in multiple areas. The workshop was conducted with a local council and an international consultancy firm who typically provide data for clients. Attendees included consultants and council staff specialised in planning, infrastructure and urban design who commission, interpret and weight evidence, and the Chief Executive Officer. Together, this approach enabled insights into a wide range of DSTs, as well as the interplay between technical and legal issues, and professional and political aspects. The nature of the New Zealand planning context and system is also worthy of note. The Resource Management Act 1991 (RMA) provides the key regulatory framework. In common with many planning systems, it shares a commitment to evidence-based policy and decisions, which can be challenged by opposing parties, contrasted with other evidence, and subject to expert and legal scrutiny (Özkundakci et al., 2018). As will be explained later, another characteristic it shares with other national planning systems is significant governmental critique and wider calls for reform.

An engine not a camera

Planners are expected to commission, compile, integrate and interpret a variety of evidence, whether relating to economic futures, impact assessments or transport models, and use this to inform plans and decisions. Furthermore, other actors concerned with planning rely upon DSTs, from financial viability assessments for developers, to environmental agencies who map flooding.

There is an air of instrumental rationality associated with the profession rooted in an enlightenment perspective of gathering, considering, deciding and monitoring. The aim here is not to question the simplicity of this notional model against the messy political reality of practice, rather it is to emphasise the growth of an ‘epistemic culture’ within planning that warrants critical attention.

There is a burgeoning social science scholarship exploring the influence and effects of science and technology that open up valuable spaces of critique for urban planning scholars and practitioners. One key aspect is the political utility of data. In a world that is perceived as fluid, connected and complex, processes of calculation, classification and standardisation provide valuable stability for decision making (Rydin, 2013). Numbers provide a ‘technology of trust’ and a rational ‘common language’ to justify decisions (Porter, 1995); responding to the preference of policy makers for ‘law-like regularities’ (O’Neill, 2001: 487) that help defend potential legal challenges (Kuhlicke and Demeritt, 2016; Lane, 2014; Özkundakci et al., 2018). The ability of DSTs to insure against professional, reputational or institutional risk has been notably discussed with regard to planning and natural hazards, where the threat of future liability is particularly stark (Haughton and White, 2017; Porter and Demeritt, 2012). In this regard, Jasanoff (2012: 3–4) deftly describes calculative rubrics, such as risk assessment, as ‘exonerating discourses’, where the supposedly apolitical realm of rational assessment and prediction can provide a degree of political refuge for decision makers.

A second strand of critique of interest emphasises that these ‘authorised acts of seeing’ (Jasanoff, 2017) are inevitably selective. Regardless of good practice in model development, the development or design of any information claim involves political choices (Jasanoff, 2004; Latour, 1999). There are

hidden logics that influence which public facts are produced and where reality is bounded by realities of measurement (Denis et al., 2006; Jasanoff and Simmet, 2017). As such, they provide a scientific basis for ordering types of knowledge. Gieryn (1983) used the term 'boundary work' to describe ideological attempts to contrast science as a preferred truth over non-science, or to adopt the language of science to legitimate ideological positions. This issue includes the selectivities of when, where and which DSTs to use, and for what purpose; all of which can privilege certain framings and outcomes (Bell, 1994; Kitchin et al., 2009). There is also the politics of non-knowledge, as scientific practices of ordering and hierarchy mean decision makers can over-rely on what science knows and disregard what science does not yet know (Jasanoff, 2017).

The ability to recognise and mitigate these issues can be affected by 'black boxing', which describes how the inner workings of objects or processes can be rendered opaque, or too complex to easily understand. This has implications for scrutiny, as the high level of expertise required to analyse evidence and adapt to new knowledge objects, means that non-technical actors may be excluded. Jasanoff (2017) links the growth in appeals to science for legitimacy to a culture requiring high investment in knowledge to participate. Beyond the more traditional demarcation between expert and lay knowledge, this issue touches upon capacity, skills, and the knowledge and resource demands the epistemic culture places upon local planning actors (e.g. Ferrari et al., 2011; Rydin, 2007). In these circumstances, information can acquire a degree of anonymity, yet at the same time become authoritative and have a taken-for-grantedness that provides valuable stability for decision making (Jacobs et al., 2007). Research also highlights the costs of 'opening up' these black boxes, such as the instability it can create, or the resource

demands in generating technical counter-claims as a prerequisite of creating new spaces for negotiation (Rydin, 2013). This emphasises that as calculative agency is uneven, so is power. Therefore, those disciplines, agencies or issues that have more knowledge resources, calculative competencies or stable roles within decision making may wield greater influence.

What this discussion highlights is how the generation, weighting or application of science raises intriguing issues of non-human agency. STS scholarship usefully adopts the term 'actants' to describe how both human and non-human entities form associations, operate in relation to each other and potentially modify the actions of others (Latour, 2004). From a planning perspective, the notion shifts perspectives away from views of technology as a 'resource' or 'tool', or the power relations of, or between, *actors*, to also consider the relations actors have with *objects*, such as a DST or plan, and how these collective relations create outcomes that may not have otherwise happened (Callon, 2009). The terminology enables us to add to the body of knowledge that focuses on the use of tools or their implicit biases, to emphasise that they can be bestowed with power that is useful for decision-making processes, as well as practical outcomes. In short, an STS standpoint argues that non-human entities can frame problems, modify behaviour or be enrolled to support agendas. They co-constitute, align and provide collective stability. They make a *difference*.

This is connected to the idea of performative power, a term that highlights how calculations do more than record phenomena, they provoke reactions or change goals (Callon, 1998). MacKenzie (2006: 16–20) identifies three increasing levels of performativity: generic (whether it is used), effective (whether it has an effect) or Barnesian (whether its use makes reality more like its depiction). This third element has a self-

fulfilling aspect that can make calculations appear ‘more true’ – they are ‘an engine, not a camera’. Research focusing on institutional dimensions provides additional nuance. This emphasises that while all DSTs have the *potential* to be performative, their power is influenced by the culture of decision making; for example, by the culture of professions or the institutional and policy settings, both of which influence the appropriate weight and acceptability (Mikes, 2009; Svetlova, 2012). Similarly, a history of application means their ‘world-making ability’ matures and crystallises over time (Christophers, 2014).

Overall, this discussion highlights the flaws in considering planning decisions as akin to a ‘rational actor’ model where objective information from objective tools is weighted by objective actors. There is no doubt that incorporating data and information within planning decisions is a positive force to improve the quality of evidence. Yet, as STS scholarship emphasises, we can also appreciate that alongside the accepted benefits of this more epistemic culture there is a parallel need to apply critical attention to the sophisticated social relations that occur between actants. In particular, the wider political agency that calculations provide, the selectivities at play, the capacity of planners to effectively scrutinise information, and of real note concerning the inexorable rise of data within planning, the potential performative power over outcomes. We now explore these key issues in more depth.

Calculative rationality within an epistemic culture

‘Popping heads above parapets’: The political utility of DSTs

The data revealed recurring themes connected to the political value of DSTs centred

on their ability to mitigate professional and institutional risk, and provide stability and trust. While the quote below introduces a culture most planners would find familiar, it also provides readers with an insight into the specific epistemic culture of planning within New Zealand, where, for example, calculations hold value in producing quick, justifiable, and defensible decisions.

[planners are] under the pump, they’ve got statutory time limits, you don’t want to put your head above the parapet because it’s going to take more time and because there’s somewhat of a litigious nature; property values are high, neighbours can get upset, it’s better to be more conservative and less innovative ... the whole issue of judicial review hangs over you because your whole career can be trashed by one decision ... I think a number of planners that I come across interpret things very strictly. (Independent Hearing Commissioner 1)

Of particular note is the central positioning planners and Independent Hearing Commissioners placed upon defendability, in particular the way DSTs provide a ‘track record’ of ‘testable’ evidence, and the perception of professional risk that emergent or less stable forms of knowledge can bring.

The cautious approach reigns generally ... people don’t want to be ending up in front of the Environment Court trying to defend something ... you put a lot of emphasis on if it’s [the model] been tried and tested. (Planner 2)

I think there is inherent conservatism because there’s a concern, ‘well, if we get cross-examined or have to give evidence we don’t want to be too far out there popping our head above the parapet in terms of what the modelling is telling us’. (Independent Hearing Commissioner 3)

The utility of defendability and the perceived cost of counterclaims also came through strongly when speaking to developers who highlighted the extra risks associated with non-standard development, which they

argue has helped foster a conservative, stable culture within the private sector. For example, Developers 1 and 2 both saw the social, environmental and place-making benefits of building at a higher density but argued that it was more difficult to get planning consent for these developments as they were atypical. Emergent ideas and the associated resource demands to justify and defend were seen to carry a degree of avoidable risk for many private-sector actors, which, while providing stability, helps to crystallise behaviour over time.

Do you want to get your consent in this at the time, or do you want to open up to a bit more risk where we don't get consent, or it's contested? (Workshop Participant)

The development sector, and particularly the construction sector, is very risk averse. (Academic 1)

Industry loves to claim that it's innovative but it's never true. They all want to do tomorrow what they're doing today. They know how to do it ... They'll fight against a change in policy first rather than change their business ... We forget sometimes, we use these models as tools to prevent change from happening. (Advocate 2)

By reflecting upon the recurrence of the phrase 'popping heads above parapets' we gain insights into the epistemic culture and the relations between human and non-human actants. Stakeholders from across the science-policy-practice interface recognised the wider political utility of DSTs, in particular relating to two aspects: their ability to defend decisions from counterclaims and the stability they create for decision making. While innovation in ideas, processes and practice was widely valued, it was clear that there was a perception of risk, whether concerning the resource demands of developing new knowledge, time delays or even the risk of incorporating evidence with a less demonstrable track record. For example,

workshop participants discussed how councils need to invest in data to justify and defend new policy initiatives or disrupt existing ways of doing and knowing, but that the costs, lack of capacity and uncertain value propositions inhibit this.

'We are in a world of proof and proof is numbers': Selecting, reducing and integrating

Issues of selectivity bring into focus the types of knowledge generated, relative value between competing knowledge claims, and the relations between those who produce the data and those who consider it. In this regard, interviewees identified a clear preference for generating and considering quantitative knowledge within planning decisions that, while providing stability and standardisation, may exclude aspects of planning that either have a less long-standing calculative tradition or are connected to more qualitative approaches. For example:

It's partly how we measured things in the past, and it's easy to count things and harder to make qualitative assessments. We are in a world of proof and proof is numbers ... there will be this reliance on what appears to be a numerically extreme prediction 30 years into the future of what will happen in a network, which just looks accurate and gains a plausibility which you just can't justify. (Local Government 1)

Similarly, Modeller 3 identified the power of traditional institutional and policy settings when he recalled asking traffic engineers whether they included cycle use and was told that they did not as 'We're not Amsterdam'. A recurring theme linked the generation of knowledge with agency, specifically that if data are not collected then certain outcomes are less likely. An example of an attempt to form a new association between actants to mitigate this was research aiming to quantify

the value of walking in order to enable a more pedestrian-focused public realm. The authors get to the heart of the perceived bias in rigour towards quantification and auto-oriented transport in their subtitle: ‘You have to count walkability to make walking count’ (Davis and Golly, 2017). A number of other interviews mentioned how more subjective aspects such as design, place or even indigenous knowledge are captured less often and are more silent in comparison. As Modeller 1 put it:

[we know] Māori information is lacking, and we always push it aside, and just note that this is lacking ... Quite often we focus on the easiest because we have the data, not actually what is most important, or what matters most to people or communities.

Moreover, it was demonstrated how the careful caveats and probability ranges of modellers become selectively reduced as they transition to the Mayor’s desk. While DSTs are commonly seen as a valuable simplification of reality, the realities of politics push this into more problematic territory that prizes reductionism and certainty, and may put DSTs under pressure to evidence a claim or issue that they were not designed to.

if I present a range of outcomes, decision makers don’t like it. They want to see a single outcome that is predicted. (Modeller 2)

There’s always the expectation amongst decision makers, be they elected members or senior management or whoever, who don’t understand the limitations of the model and think that ... you can ask the model 12 questions when it’s only been designed to answer three. (Modeller 3)

Models built for one purpose will be picked up ... then all of a sudden it’s being used to look at [something else]. That never was the intended purpose and if you went back and asked the model builder whether that should happen or not they’re probably in tears and

reading all of their contracts to make sure they’re not legally liable for any of these kind of things. (Modeller 5)

A further aspect that develops the discussion of selectivity and relations between actants is the integration *between* models. Taking the example of population projections and infrastructure it would be expected that these should relate closely to each other, but in two major cities the data revealed this was not the case, leading to a shortfall in infrastructure investment. In Hamilton, infrastructure projections were set to ‘low’ while population models indicated ‘high’ was the most likely scenario, which was later proved accurate. This selective political decision meant household rates were set lower but under a new administration the infrastructure deficit became apparent, which contributed to a sharp 9.7% rise to help pay for growth and manage emerging unaffordability concerns (Modeller 1). Similarly, the Auckland Plan (Operative 2012) had its population projections set to ‘high’ but infrastructure projections were set lower to prevent infrastructure surpluses. The 2017 plan refresh, combined with growth that exceeded even the high projections, brought the effects of this policy to light and now they are closely aligned (Advocate 1). This emphasises how selectivities occur between, as well as within models, and highlights the importance of transparency, an issue we now turn to.

Opening up the black box: Complexity, scrutiny and democracy

The research revealed that the rise in data volume and complexity, the huge profits made from development and the rise of a more epistemic culture all contribute to a black box effect. The quotes below highlight a consistent view that – particularly for

significant planning issues – the financial costs of participation combined with the expertise needed to understand data or produce counterclaims in an evidential system have implications for professional scrutiny and the ability to transition to alternative ways of knowing and doing.

The volume [of evidence] has gone up, the complexity has certainly gone up, the whole legal and evidential base has ramped up hugely in the last decade ... there is such a power imbalance because an applicant clearly wants an outcome of a decision and is prepared to pay for that, submitters, neighbours or community groups who are not well funded simply cannot afford to contest it in the way it needs to be contested in an evidential system. (Independent Hearing Commissioner 1)

17 years ago you'd go through a big development application, the hearing would be done in a day, the applicant would spend 2 or 3 hours putting their case forward. Not a lot of evidence. Submitters would come along speak for 10 minutes, leave. Now our submitters have lawyers, our submitters have planners. It becomes a paper war ... If you're an average mum and dad, you are completely bamboozled by the whole process. (Local Government 2)

The following quotes also reveal how data resist peer review and possible counterclaims as their complexity increases and, as a consequence, scrutiny becomes increasingly delivered by experts in hearings rather than by planners in local authorities who may not have the capacity to interrogate the terminology, methods and assumptions. In a number of cases it took moments of legal disagreement or public controversy from expert counterclaims to render these issues visible.

It certainly left me with a real concern that we were placing a large reliance on the outputs from these models and making huge decisions

long term around network changes and expenditure. I think the decision makers just assume there's a high level of rigour going on behind the scenes ... if it's not your thing, it's pretty easy to leave it to the experts to get on with it. (Planner 1)

[during the hearing] it became evident that the model that the council was using and what opponents and others were using, was the same [but] they all had different understandings of the terminology and assumptions ... so they were all coming up with different outcomes. (Independent Hearing Commissioner 1)

There is much research on the characteristics of good decision making, where issues such as transparency or independent peer review are mentioned. The data show this is difficult to achieve in some cases because of how data are owned. Modellers and planners both observed a rising commercialisation of DSTs within the consultancy sector, outlining how hard it is to get access to the data and assumptions and open up the black box or compile counterclaims. For instance, Modeller 4 states:

It can't happen, because commercial models will never open their black box ... You can have peer review with non-disclosure agreements, but at the same time that's not the level of transparency I would be looking for.

Additionally, Modeller 1 argued that the relatively small size of New Zealand and the evidential nature of its planning system lends itself vulnerable to 'expert capture', where one side secures the services of experts to both defend their position and help close the black box by preventing their expertise being available for counterclaims. Interviewees pointed out the need for open access protocols that enable more scrutiny and peer review, as well as a better understanding of the caveats and weight to be assigned. As Independent Hearing Commissioner 3 argued:

I don't think there is enough investigation of models, whether it's traffic modelling, employment or whatever, in getting under the bonnet and understanding what assumptions have been made that have fed into the model, because unless you fully understand and appreciate those you run the risk of rubbish going in the model and rubbish coming out.

This discussion not only has consequences for practitioners, it also has implications for the ability to transition to other planning goals. To challenge in this epistemic culture you need to understand evidence, analyse and produce your own interpretation, and possibly even procure your own science and experts. Yet, the central importance of DSTs for evidence-based decision making, combined with the rise in data complexity and the difficulty for non-experts to open up the 'black box' for scrutiny favours those with the existing calculative agency or the resources to obtain it. It is worth noting that checks and balances were conducted, but the ability to scrutinise is uneven and requires investment or existing expertise.

Human and non-human agency: Making a stable world

The discussion helps foreground how non-human entities, such as DSTs, form associations with actors to modify decisions in ways that may not otherwise have happened. There was a widespread perception amongst participants of a degree of Barnesian performativity, where actants collectively usher into being the future that is predicted. First, the history and power of traffic modelling was repeatedly cited as a constitutive force on urban environments, creating auto dependency, homogeneity and over-engineered road widths resulting from a strong calculative tradition associated with travel time savings for automobile travel. Interviewees did flag an attempt to shift the institutional

settings since the change in Government in 2017 to include other modes of travel, such as cycling, but also emphasised the power of the status quo, the stable decision-making environment, and the path dependencies already created. This is not the fault of modellers or DSTs, it appears to be more a function of the institutional settings that generate stability and the 'world-making' power afforded to calculative rationality.

if you talk about tools that we tend to be using currently, firstly they're largely predicated by an almost concealed assumption that traffic flow and the speed of traffic flow takes precedence over any other consideration ... and that has significant implications for both place quality and the functioning of places. (Local Government 1)

If you only measure transport in cars, travel counts, and journeys with cars, then that's what you get and that's what you design for. Therefore, your cars go into those designed roads, because that's what you did. (Modeller 1)

The thing that we do classically wrong with models, is predict and provide. We look at what the black box tells us and then we provide it, and that induces the future that it predicts. (Local Government 3)

A further insight into how institutional and policy settings, rather than the DSTs, may have performative power is revealed when considering the incremental effects of siloed decisions. For example, a number of interviewees mentioned that development proposals may require minimum car parking provisions, which is logical when considering individual planning applications, but from a cumulative perspective has a negative effect on the public realm, such as for building design or the viability of shifts to other modes of transport.

I've worked with architects for decades and they will all say, 'the first thing that has to happen is we've got to accommodate 300 cars on

the site, we have to go to a traffic engineer and they have to approve this traffic plan'. And that has a direct influence on the form of the building. (Advocate 2)

between your churches, your pubs, and your supermarkets, they all require a level of car parking. But, if you add all of those assumptions together you end up with the whole CBD as a parking lot and you've really got no ability to develop the CBD. (Workshop Participant)

The next performative power highlighted was that, generally speaking, infill or CBD development was perceived to be more difficult to gain planning consent for than greenfield development, in part because of calculative traditions concerning what costs are included. The wider implications of these tendencies are well known, encompassing issues as wide ranging as poor travel options, obesity, CO₂ emissions, fuel poverty, high costs for new infrastructure and the need to regenerate 'hollowed out' CBDs.

the rule book is predisposed to greenfield development ... It doesn't see land as the problem on the outskirts. It's just the way it is. (Planner 2)

[Take the example of] greenfield development in a developing area, where the background traffic was very light, but it generated a lot of trips ... [this] requires very little mitigation. The contrary case is a brownfield development in an urban core area where there's quite a high level of background traffic already, you may get this cumulative effect where development, even though it generates fewer trips per capita, will put the background network to a level of performance that's considered unacceptable, therefore this development will be required to mitigate all of the impacts. (Local Government 1)

You build first where it's cheapest, and that's usually in the greenfield. If you don't internalise the social costs, the costs of infrastructure, of water, of waste, of energy. (Modeller 1)

An important final issue is the political power of ideological spatial imaginaries, which have become standardised within institutional and policy settings. For instance, the number of DSTs discussed in the brief quote below reveals how, over time, actants align and stabilise a particular conception of urban form.

Over the last decade, having cities connected by large state highways or motorways has been a desire irrespective of the evidence base to support those outcomes. So, you can ask questions of transport models with regards to travel time benefits, vehicle operating costs, emission safety. You can do the calculations ... and follow the economic evaluation manual through the investment assessment framework and get answers which give you good benefit cost ratios, etc. You can get strategic alignment if your strategy is to build motorways. (Modeller 5)

This section links the critique of planning, such as with regard to the type of places created and the ability to change in response, with epistemological, ideological and relational concerns. Within the calculative culture of New Zealand planning the examples appear to highlight the power of DSTs, particularly concerning the location and type of development, or the ways citizens travel. Readers can better understand, for instance, why New Zealand has one of the highest rates of light vehicle ownership (cars, vans, SUVs and utility vehicles) in the world, with 792 per 1000 of population, a growth of 23% over the last decade (Ministry of Transport, 2018). We should, however, exercise caution in assigning causality. For example, do models respond to the demands of existing spatial patterns, or indeed the aspirations of politicians and public concerning their preferred mode of transport, rather than the other way around?

Discussion and conclusion: Reflections on DSTs, stability and change

Planning researchers and practitioners are all too familiar with the critiques of the profession and the perennial pressure to produce better outcomes in more efficient ways. It should be noted that the stakes are high and there was widespread dissatisfaction with the practices and outcomes of planning. Within New Zealand, the governmental and public critique has been concerned with poorly functioning cities (e.g. congestion), a lack of integration (e.g. more spatial strategies) and the high cost of housing, which is amongst the least affordable in the world (Edmunds, 2019; New Zealand Productivity Commission, 2017). The urgency of debate is encapsulated by a new Ministry of Housing and Urban Development created in late 2018 to help make 'housing more affordable and our cities more liveable' (New Zealand Government, 2018: 1) and the recently announced intention to 'comprehensively overhaul the RMA' (New Zealand Government, 2019).

One value of an STS perspective is that it helps shift critical attention away from policy or the balance between public and private actors, to instead rest upon wider issues connected to the epistemic culture and the relations between human and non-human actors. Although discussion of this relational-actants approach may make it more difficult to provide policy 'fixes', by extension it also brings to light the danger in oversimplifying causality or seeing DSTs as only having non-human power when they are constructed by layers of social processes. For example, this research emphasises how actants combine to produce stability and, by extension, facilitates a different view of the difficulties associated with systemic change. This relates to the production of knowledge, the selective way knowledge claims are

assigned value and voice, and how their world-making ability crystallises over time. Put differently, the empirical sections reveal a tension between intrinsic human ambitions to achieve settled and objective states of the world, such as with regard to the development process, and the changing and subjective expectations people have of the places they live. It is a given that there is value in repetition, not least for efficiency and certainty, but where there are significant calls for planning reform the wider epistemic culture and the ways actants align to provide stability should be recast as aspects of critical attention.

This perspective helps us appreciate not just why change is hard, but also the kinds of culture and practices that need to be fostered in response. It was clear that the long-standing practices of planning fostered established relations between human and non-human actants, which served to open up and stabilise particular kinds of planning discourses, close other arguments and assign value selectively. Insights into the epistemic culture also provided insights into why quasi-scientific technical terms such as rigour, testability or 'track records' are deemed important and why DSTs provide valuable roles relating to inuring to professional and institutional risk. The high profile of concerns relating to counterclaims and liability served to create a degree of self-regulation where decision makers sought to balance the protection of their reputational capital with more emergent but risky ideas.

The empirical sections discussed how DSTs did not just help order development options, they also provided a hierarchy between actors and agencies. For example, institutions with a longer history of calculative competency and access to technical resources had a powerful position stabilised by established actant relations in comparison with more qualitative, normative and emergent agendas, such as relating to

quality, indigenous knowledge or walkability. While these issues did have voice, it was acknowledged that the epistemic culture helped foster an uneven playing field where norms of public judgements and institutional practice categorised knowledge into differing spaces of calculative competence. We can now better appreciate how rigour can stray into rigour mortis, how stability can be both positive and negative, and the challenges in normative shifts from a calculative rationality to more ambiguous and disordered matters such as justice, quality or liveability.

The political dimensions of DSTs stretched beyond their value to order complexity, to reveal a bias towards a preferred truth that has its roots in an ideological vision of urban form. This is less about the influence of models as such, but more about the way that long-held scientific ways of seeing align to provide a stable set of relations that legitimises and mainstreams an imaginary that some interviewees argued runs counter to aspects such as liveability or sustainability. Their attempts to develop counterclaims were affected by a black box effect and the costs associated in championing knowledge deemed emergent, less rigorous or lacking a calculative tradition and track record. As a consequence of the increase in complexity, advocates in particular claimed the balance has subtly shifted towards technocratic elites with the requisite resources, as has been observed elsewhere (e.g. Rydin, 2007). Even relatively well-resourced local authority actors complained of the costs and uncertain investment propositions of compiling evidence to justify shifts in practice.

More fundamentally, an application of an STS lens to planning leads us to some interesting discussions regarding performativity. It should be recognised that DSTs in planning are designed to be performative; data should modify behaviour, that is the point. Within planning, non-human actants, such as policies or DSTs have agency and always

will. If a plan is enacted it is self-fulfilling and deemed a success, but in contrast to economic models, it is designed for that purpose. As such, planning may not be prone to the level of performativity that some interviewees suggest, but rather, inherently prone to accusations of it. Long-held professional terminology such as 'decisions should be made in accordance with the plan' promotes a culture where non-human objects are given agency to modify human behaviour, but this also presents a potential risk of abdicating professional judgement and planning by technical proxy. From a planning perspective, the question is not just whether it is performative or not. It is rather about first, examining their normative underlying pre-suppositions that seek to categorise the world. Second, considering whether the epistemic culture affords differing forms of rationality the correct agency. And third, analysing how easy it is for more emergent agendas to advance counterclaims, open up alternative discourses, and facilitate systemic changes if desired.

While all models are wrong there is no doubt they are incredibly useful. All interviewees acknowledged that data and rigour are staples of good decisions, without which we would struggle to make sense of phenomena, understand options and communicate information. Further, the research also showed that in many cases the process *is* working well; DSTs were tested and calibrated, scrutiny and weight assigned, and planning delivered outcomes that many were happy with. It was, however, apparent that the relatively litigious and epistemic planning regime in place, combined with the high financial stakes of development, fosters a decision-making culture that is data hungry, prizes stability and certainty, and suggests a need to more easily open up black boxes or create safer spaces for innovation.

If urban aspirations and preferences are subject to a growing degree of technological

mediation we can say that planners need to understand that calculations matter, not because of their accuracy or objectivity, but because of how they represent forces of stability that may run counter to more dynamic and diverse societal expectations. As such, the data help unsettle the planner and planning policy as the key agent determining planning outcomes, which is instead revealed as more contingent on the political, institutional and professional culture and the diverse array of technical tools that combine to create stable frameworks for decision making. It also helps provide a fuller understanding of the perennial criticism of planning as a system and why, without a stronger critical focus on the relationship between science, policy and practice, more data will not necessarily equate to better outcomes.

Calculations will always be of central value for planning, but with rigour comes the risk of rigour mortis; a stability and certainty that maintains the power of established calculative agencies and replicates similar outcomes. Theories of, and in, planning often refer to noticeable shifts in rationality, such as towards communicative planning or the current movement in many countries to be more market-enabling. Yet, associated with this trend has been the widespread adoption and integration of rational-calculative devices that are a staple of economic agency and behaviour. Their wider influence, however, suggests that planning and urban researchers should reflect upon the role of DSTs not just as ‘truth-seeking’ but as potentially ‘place-making’ forces that provide internal stability when there are external calls for change. Indeed, the relative neglect of planning scholars to consider the ways by which the calculative practices shape decisions and outcomes is striking when considered in the context of the shift to evidence-based planning that runs analogous to much critique. Moreover, the range of issues identified provides an indication of

the richness of epistemic cultures and calculative rationalities as core objects of planning enquiry. A key recurring question for planning research is how do we enable a culture that is more facilitative to innovation and emergent knowledge, while retaining the evidence-based system that will always be a part of planning?

Acknowledgements

I would like to thank the hard work and insights of the anonymous reviewers who played a key role in elevating the paper.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The author would like to acknowledge funding from the National Science Challenge: Building Better Homes, Towns and Cities, based in New Zealand.

ORCID iD

Iain White  <https://orcid.org/0000-0003-4277-5042>

References

- Batty M (2013) Big data, smart cities and city planning. *Dialogues in Human Geography* 3(3): 274–279.
- Bell S (1994) Methods and mindsets: Towards an understanding of the tyranny of methodology. *Public Administration and Development* 14(4): 323–338.
- Cairney P (2016) *The Politics of Evidence-Based Policy Making*. London: Palgrave Macmillan.
- Callon M (1998) Introduction: The embeddedness of economic markets in economics. In: Callon M (ed.) *The Laws of the Markets*. Oxford: Blackwell, pp. 1–57.
- Callon M (2007) What does it mean to say economics is performative? In: MacKenzie D,

- Muniesa F and Siu L (eds) *Do Economists Make Markets? On the Performativity of Economics*. Princeton, NJ: Princeton University Press, pp. 311–357.
- Callon M (2009) Elaborating the notion of performativity. *Le Libellio d'AEGIS* 5(1): 18–29.
- Callon M and Muniesa F (2005) Peripheral vision: Economic markets as calculative collective devices. *Organization Studies* 2(8): 1229–1250.
- Cheshire P, Leunig T, Nathan M, et al. (2012) *Links between Planning and Economic Performance: Evidence Note for the LSE Growth Commission*. London: London School of Economics.
- Christophers B (2014) Wild dragons in the city: Urban political economy, affordable housing development and the performative world-making of economic models. *International Journal of Urban and Regional Research* 38(1): 79–97.
- David L and Halbert L (2014) Finance capital, actor-network theory and the struggle over calculative agencies in the business property markets of Mexico city metropolitan region. *Regional Studies* 48(3): 516–529.
- Davis D and Golly T (2017) The business case for walking – Counting walking to make walking count in Auckland, New Zealand. *Journal of Transport and Health* 7: S53–S54.
- Davoudi S (2006) Evidence-based planning: Rhetoric and reality. *disP – The Planning Review* 165(2): 14–24.
- Davoudi S (2015) Planning as practice of knowing. *Planning Theory* 14(3): 316–331.
- Denis JL, Langley A and Rouleau L (2006) The power of numbers in strategizing. *Strategic Organization* 4(4): 349–377.
- Edmunds S (2019) NZ house prices are amongst the most unaffordable in the world: Survey, STUFF, 21 January. Available at: <https://www.stuff.co.nz/business/110049950/auckland-ranked-among-worlds-least-affordable-cities-in-housing-report> (accessed 26 July 2019).
- Faludi A and Waterhout B (2006) Introducing evidence-based planning. *disP – The Planning Review* 165: 4–13.
- Ferrari ET, Leahy Laughlin D and Watkins CA (2011) Planning and the housing market: Reflections on strategic housing market assessment in England. *Town Planning Review* 82(4): 393–424.
- Florida R (2017) *The New Urban Crisis*. Philadelphia, PA: Basic Books.
- Giddens A (1990) *The Consequences of Modernity*. Cambridge: Polity Press.
- Gieryn TF (1983) Boundary-work and the demarcation of science from non-science: Strains and interests in professional ideologies of scientists. *American Sociological Review* 48(6): 781–795.
- Haughton G and White I (2017) Risky spaces: Creating, contesting and communicating lines on environmental hazard maps. *Transactions of the Institute of British Geographers* 43(3): 435–448.
- Heilbroner RL (1979) Modern economics as a chapter in the history of economic thought. *History of Political Thought* 11(2): 192–198.
- HM Treasury (2015) *Fixing the Foundations: Creating a More Prosperous Nation*. CM 9098. London: HM Treasury.
- Intergovernmental Panel on Climate Change (2014) *Climate Change 2014: Synthesis Report*. Geneva, Switzerland: IPCC, 151 pp.
- Jacobs JM, Cairns S and Strelbel I (2007) 'A tall storey ... but, a fact just the same': The red road high-rise as a black box. *Urban Studies* 44(3): 609–629.
- Jasanoff S (2004) *States of Knowledge: The Co-Production of Science and Social Order*. London: Routledge.
- Jasanoff S (2012) *Science and Public Reason*. London: Routledge.
- Jasanoff S (2017) Virtual, visible, and actionable: Data assemblages and the sightlines of justice. *Big Data and Society* 4(2): 1–15.
- Jasanoff S and Simmet HR (2017) No funeral bells: Public reason in a 'post-truth' age. *Social Studies of Science* 47(5): 751–770.
- Kitchin R, Perkins C and Dodge M (2009) Thinking about maps. In: Perkins C, Dodge M and Kitchin R (eds) *Rethinking Maps: New Frontiers of Cartographic Theory*. London, UK: Routledge, pp. 1–25.
- Krizek K, Forsyth A and Schively Slotterback C (2009) Is there a role for evidence-based practice in urban planning and policy? *Planning Theory & Practice* 10(4): 459–478.
- Kuhlicke C and Demeritt D (2016) Adaptive and risk-based approaches to climate change and the management of uncertainty and institutional risk: The case of future flooding in England. *Global Environmental Change* 37: 56–68.

- Lane SN (2014) Acting, predicting and intervening in a socio-hydrological world. *Hydrology and Earth System Sciences* 18(3): 927–952.
- Latour B (1999) *Pandora's Hope: Essays on the Reality of Science Studies*. Cambridge, MA: Harvard University Press.
- Latour B (2004) *The Politics of Nature*. Cambridge, MA: Harvard University Press.
- McAllister P, Street E and Wyatt P (2016) Governing calculative practices: An investigation of development viability modelling in the English Planning System. *Urban Studies* 53(11): 2363–2379.
- McAllister P, Wyatt P and Coleman C (2013) Fit for policy? Some evidence on the application of development viability models in the United Kingdom planning system. *Town Planning Review* 84(4): 495–521.
- MacKenzie D (2006) *An Engine not a Camera: How Financial Models Shape Markets*. Cambridge, MA: MIT Press.
- Marvin S, Luque-Ayala A and McFarlane C (eds) (2016) *Smart Urbanism: Utopian Vision or False Dawn?* London: Routledge.
- Mikes A (2009) Risk management and calculative cultures. *Management Accounting Research* 20: 18–40.
- Miller P (2001) Governing by numbers: Why calculative practices matter. *Social Research* 68(2): 379–396.
- Miller P (2008) Calculating Economic Life. *Journal of Cultural Economy* 1(1): 51–64.
- Ministry of Transport (2018) Annual fleet statistics, ministry of transport: Wellington. Available at: <https://www.transport.govt.nz/assets/Uploads/Research/Documents/Fleet-reports/1b33252a3d/The-NZ-Vehicle-Fleet-2017-Web.pdf> (accessed 26 July 2019).
- Murphy L (2014) 'Houston, we've got a problem': The political construction of a housing affordability metric in New Zealand. *Housing Studies* 29(7): 893–909.
- New Zealand Government (2018) Press release: New housing and urban development ministry. Available at: <https://www.beehive.govt.nz/release/new-housing-and-urban-development-ministry> (accessed 26 July 2019).
- New Zealand Government (2019) Comprehensive overhaul of the RMA. Available at: <https://www.beehive.govt.nz/release/comprehensive-overhaul-rma> (accessed 26 July 2019).
- New Zealand Productivity Commission (2017) Better urban planning: Final report, February. Available at: <https://www.productivity.govt.nz/inquiry-content/2682?stage=4> (accessed 15 November 2018).
- O'Neill J (2001) Representing people, representing nature, representing the world. *Environment and Planning C: Government and Policy* 19: 483–500.
- Özkundakci D, Wallace P, Jones HFE, et al. (2018) Building a reliable evidence base: Legal challenges in environmental decision-making call for a more rigorous adoption of best practices in environmental modelling. *Environmental Science & Policy* 88: 52–62.
- Parkhurst J (2017) *The Politics of Evidence*. London: Routledge.
- Porter J and Demeritt D (2012) Flood risk management, mapping, and planning: The institutional politics of decision support in England. *Environment and Planning A: Economy and Space* 44: 2539–2578.
- Porter TM (1995) *Trust in Numbers, the Pursuit of Objectivity in Science and Public Life*. Princeton, NJ: Princeton University Press.
- Rydin Y (2007) Indicators as a governmental technology? The lessons of community-based sustainability indicator projects. *Environment and Planning D: Society and Space* 25(4): 610–624.
- Rydin Y (2013) Using actor-network theory to understand planning practice: Exploring relationships between actants in regulation low-carbon commercial development. *Planning Theory* 12(1): 23–45.
- Svetlova E (2012) On the performative power of financial models. *Economy and Society* 41(3): 418–434.