

The wicked city: Genealogies of interdisciplinary hubris in urban thought

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Abstract: Across multiple academic disciplines and fields of policy, cities are now ascribed wide-ranging task responsibility for addressing a wide range of global issues. This paper elaborates a genealogical mode of analysis for understanding the ascription of causal and practical responsibility to urban processes. This analysis is developed through a case study of the revival of interest in the concept of wicked problems. The paper pinpoints aspects of the original account of wicked problems that are crucial to appreciating the significance now played by this concept in discourses of metrophilia. The focus is on the specific sense of 'wickedness' outlined in this original account. The career of the wicked problems idea is reconstructed, with an emphasis on different views of expertise and how these are related to the changing status of the city in recent accounts of wicked problems. The paper identifies differences and similarities between the two

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prevalent ways in which the invocation of the concept of wicked problems is used to ascribe responsibility for shaping urban futures – a ‘taming’ perspective and a ‘sharing’ perspective. In concluding, it is argued that the career of the idea of wicked problems brings into view the constitutive link between generalised ascriptions of task responsibility to urban processes and a set of chronic concerns about the ambivalence of urban expertise.

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1 URBAN THOUGHT IN AN AGE OF METROPHILIA

Encapsulated in declarations of The Urban Age, The Urban Century, and The Urban Revolution, the first two decades of the twenty-first century saw the consolidation in policy circles and public debate of what Waite and Morgan (2019) have called “metrophilia.” Marked by a distinctive emphasis not just on challenges and problems but also on the opportunities and potentials of urbanization, a “new conventional wisdom” identifies cities as empowered to respond creatively to a range of intersecting issues whose causes are not necessarily attributed to urbanization at all (see Gordon and Buck 2005). An assertive view of the multi-faceted potential of urban life has become a core element in the problematization of various ‘global challenges’ as objects of expert management. Cities are now seen as essential platforms for responding to the ‘polycentric crisis’ facing to twenty-first century global governance, one that encompasses issues ranging across eco-system degradation, global warming, food insecurity, energy transitions, and persistent poverty (e.g. Swilling and Annecke 2012, Swilling and Hajer 2017).

The break-out of metrophilia is shaped by a series of overlapping shifts in knowledge production about urban processes. First, it is indicative of a widely shared conceptual move towards thinking of global processes as necessarily working through places, localities, and regions (Barnett and Parnell 2016). This move is related to the expansion of the intellectual sources of expert knowledge about urban processes. Urban thought, once the preserve of a relatively small number of academic disciplines and sub-disciplines, is now generated by diffuse fields of knowledge production that span the natural and environmental sciences,

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engineering and design, arts and humanities, medical sciences, and a wide range of associated fields of public policy and corporate innovation (see Iossifova *et al* 2018). Second, metrophilia is associated with newly assertive modes of solution-oriented interdisciplinary inquiry that promise to address multiple global challenges through various experimental interventions (e.g. Brown *et al* 2010, Donaldson *et al* 2010, Keith *et al* 2020, Watts 2017). And, third, the optimism associated with these expanded fields of urban thought is related to a transformation in the temporal imaginations through which expert knowledge is linked to action (see Abram 2014, Guyer 2007).

The temporal imagination of contemporary metrophilia is marked by a double reorientation of the relation of urban space to future possibilities. First, urban space is reimagined in terms of bolstering the capacity of urban environments and their inhabitants to withstand change – where change is understood by reference to various shocks, whether global financial instability, terrorist attack, catastrophic physical disaster, or impending transitions generated by climate change or peak oil. In turn, and second, the purpose of managing urban change has been reconfigured towards enhancing the potential of cities and other places to generate as yet unimagined future pathways of innovation. This twin reorientation is most often articulated through the temporal registers of resilience and sustainability, with the emphasis on institutionalising capacities, dispositions and virtues such as agility, anticipation, adaptability and mitigation (see Bear 2016). And it is also conveyed in the widespread adoption of the rhetoric of urban experimentation (see Caprotti and Cowley 2016).

It might appear self-evident that the proliferation of concern with managing urban futures is a natural response to the demographic transition to a majority urban population in the first decade of the twenty-first century (cf. McGranahan and Satterthwaite 2014). Critical urban studies, by contrast, tends to interpret claims about the Urban Age and associated ideas as ideological formations, beset by a reliance on chaotic concepts and lacking epistemological rigour (e.g. Angelo and Waschmuth 2015, Brenner and Schmid 2015, Slater 2021). My analysis here follows a different path, developing a form of genealogical inquiry into the problematizations that shape varied forms of urban knowledge in the twenty-first century (e.g. Barnett 2015, Barnett and Bridge 2017, Lawton 2020, Parnell 2016, Uhrqvist and Lovbrand 2014). This form of inquiry focuses analytical attention on how constructions of what is ‘true’ in urban thought are integrally related to ways of finding out how to change urban processes and practice (cf. Hacking 2012). ‘Urban thought’, from this perspective, is

not restricted to specialised fields of academic research. It refers to the diverse institutionalised fields through which the problem of understanding how cities change in order to change them is made into an explicit object of attention (see Barnett 2012).

I elaborate on this form of genealogical analysis here by tracing the widespread revival of interest in the idea of wicked problems. Originally developed in debates in planning and design studies in the 1960s and 1970s, the wicked problems idea is now routinely invoked as a conceptual tool to justify applying forms of complexity science and resilience thinking to various global challenges (see Zellner and Campbell 2016, Forrester *et al* 2019). And wicked problems are often now presented as having a set of characteristics that lend themselves particularly well to distinctively urban interventions to address global challenges (e.g. Xiang 2013). The intersection of complex systems thinking and the revival of the wicked problems idea has been central to the reorientation of concepts of the urban in novel scientific fields (e.g. Gaston 2012) as well as to the promotion of the ‘science of cities’ in policy debates (e.g. Government Office for Science 2016). The discussion of the renewal of interest in wicked problems serves here as an empirical case of analysing ascriptions of responsibility to urban processes – a case that might well be exemplary of the dynamics animating the breakout of metrophilia.

My discussion proceeds through four steps. Section 2 outlines the genealogical analysis of ascriptions of responsibility to urban processes that will be further developed through the case of the career of the wicked problems idea. Section 3 then pinpoints aspects of the original account of wicked problems that are crucial to appreciating the significance now played by this concept in discourses of metrophilia. The focus is on the specific sense of ‘wickedness’ outlined in this original account. Section 4 considers the revival of the wicked problems idea, with an emphasis on different views of expertise and how these are related to the changing status of the city in recent accounts of wicked problems. Section 5 then considers in more detail the differences and similarities between the two prevalent ways in which the invocation of the concept of wicked problems is used to ascribe responsibility for shaping urban futures – a ‘taming’ perspective and a ‘sharing’ perspective. In concluding, it is argued that the career of the idea of wicked problems brings into view the constitutive link between generalised ascriptions of task responsibility to cities and a set of chronic concerns about the ambivalence of urban expertise.

2 ANALYSING THE URBANIZATION OF RESPONSIBILITY

The emphasis in contemporary urban thought, in the expanded sense I am using that term here, on identifying actionable solutions is disclosed by the widely shared claim that cities have a double responsibility. Urban processes and practices are sometimes identified as causally responsible for generating or exacerbating myriad contemporary problems. At the same time, cities and urban practices are increasingly championed as the sites which provide opportunities to address varied global issues, often far beyond the traditional scope of urban analysis. It is in this double sense that I refer here to ‘the urbanization of responsibility’ as the defining feature of twenty-first century metrophilia. The clearest expression of the public consolidation of the urbanization of responsibility was marked in 2014, when the International Panel on Climate Change (IPCC) first acknowledged the potentially pro-active role of cities as platforms for climate-change mitigation and adaptation (IPCC 2014). The IPCC position illustrates a fundamental feature of the contemporary urban thought: a shift from focussing on remedying existing urban-sourced problems, towards the anticipation of future challenges and the attribution of agency for altering the course of future patterns and processes (e.g. IRP 2018, Romero-Lankao 2018).

The premise of a genealogical inquiry into the urbanization of responsibility is that accounts of urban processes are not merely factual or explanatory but can be thought of as *ascriptive* (see also Barnett, Robinson and Rose 2008, Barnett and Scott 2007, Barnett *et al* 2011). As understood here, the ascription of responsibility is not a retrospective assignment of blame or liability, but a prospective positing of capacities to act in the future (see Young 2013). Accordingly, my analysis of this process conceptualises responsibility as having both an explanatory dimension and a practical dimension (see Baier 1991). Ascriptions of responsibility are therefore not the same as straightforward explanatory causal claims. Whereas causal statements are backward looking, ascriptions of responsibility are both backwards and forward looking, combining a sense of what brought about a course of events with what might be done to prevent, mitigate, anticipate, or shape future events. On this view, descriptive or explanatory accounts of urban processes are overdetermined by an imperative to identify actions that could be subjected to control in order to bring about or prevent particular outcomes – they are a prelude to identifying plausible pathways to “task responsibility” (ibid.).

In using the phrase ‘the urbanization of responsibility’ to characterise the defining features of contemporary urban thought, I am therefore referring to the processes by which the causal and practical aspects of responsibility are variously combined and ascribed to different ‘urban’ actors, infrastructures and processes. In some fields, cities are identified as causing certain problems to which they are, by extension, also identified as providing potential solutions. But the ascription of task responsibility to urban processes in the twenty-first century extends far beyond the scope of strictly ‘urban’ problems, however variously defined those have been (see Cochrane 2007).

To elaborate on the analysis of ascriptions of responsibility to urban processes, this paper reconstructs the web of meanings associated with a key concept in current debates about the potentials of knowledge-based policy interventions - the idea of wicked problems. A concept concerned with relations between complexity, uncertainty, and conflict, the idea of wicked problems has its origins in debates in planning studies and design theory in the 1960s and 1970s. But it has received increasing attention across varied fields of policy-facing research and scholarship in the last two decades (see Lönngren and van Poeck 2020; Head and Alford 2019).

At its core, the concept of wicked problems has always been addressed to questions of responsibility. It was originally presented as a kind of moral challenge to emergent professional fields of operations science, management studies, planning studies and other fields in which versions of systems theory had become central (Churchman 1967; see also Pesch and Vermaas 2020). But from its very inception, there has been an ambivalence inscribed into the idea of wicked problems. While intended as a warning against professional hubris, it was also acknowledged that there can be rewards in being able to frame a professional field as beset by the dilemmas associated with wicked problems (Churchman 1967; see also Wexler 2009). The deployment of this concept therefore always involves assertions of how capacities to exercise agency and bring about change are distributed. Tracing the career of the wicked problems idea helps us see that the expansive ascription of task responsibility to urban processes is a function of the search for ways to finesse this ambivalence about expertise that aims to link knowledge to action.

In using the career of wicked problems as the entry-point to analyse how urban issues have come to be ascribed task responsibility for a wide range of global challenges, my focus is on the convergence between two distinct aspects of the revival of this idea. First, as already

indicated, the concept of wicked problems was originally associated with a call for professional modesty amongst experts. By contrast, it is now common to find new forms of data-led science championed as having the potential to solve what are initially presented as wicked problems, by breaking down and modelling their complexity in order to deliver clear solutions to decision-makers. Second, the status of the city in accounts of wicked problems has been transformed. Both data-led forms of urban science as well as theories of collaborative decision-making accord significant agency to cities. Whereas urban issues were originally the exemplars of wicked problems, the renewed interest in this concept is associated with the claim that cities are privileged sites for addressing any number of pressing complex issues. The analysis below traces the variable relationships between these two aspects of the renewal of interest in the wicked problems ideas – assertions of expertise and the enhanced agency ascribed to urban processes.

3 WICKEDNESS AND ITS RESPONSIBILITIES

The wicked problems idea has become an influential figure for justifying claims of expertise that are equal to new forms of complexity and uncertainty. It is an idea that stands within a broader tradition of critical thinking about the limits of rational models of decision-making in post-WW2 policy and planning programmes (see Abbott 2005, Bevir 2017). One strand of this critique took a classically ‘neoliberal’ form, in which the posited complexity of self-regulating systems was seen as a once-and-for-all knock down argument against government planning and regulation. However, the wicked problems idea belongs to an alternative tradition in which the analysis of complexity was mobilised to re-imagine the relationships between bureaucratic organisation, collective action, and democracy (Collier 2017).

The origins of the wicked problems concept lie in a set of broader debates rooted at the University of California, Berkeley, in the 1960s, extending through wider networks in design theory and design methods, as well as planning theory (see Buchanan 1992; Churchman *et al* 2006; Rith and Dubberley 2006; and Skaburskis 2008). The concept of wicked problems was originally developed by Horst Rittel in relation to debates about the application of systems thinking to design problems (Rittel 1972; see Lange 2016). It was elaborated most fully by Rittel and the planning theorist, Melvin Webber (Rittel and Webber 1973). Rittel and Webber referred to urban issues such as transport planning, urban renewal, and spatial concentrations of crime to exemplify the limitations of models of rational decision-making that arise from combinations of complexity, pluralism and conflict. Inherently non-divisible conflicts

generated around spatially embedded objects of contention therefore served as illustrations of the irreducibly normative dilemmas of decision-making involved in so-called “planning-type” problems (see Barnett 2017, pp. 161-166).

The definitive statement on the idea of wicked problems synthesized the respective interests of both its authors as well as the broader intellectual milieu of which they were a part. The explicit target of Rittel and Webber’s jointly authored paper, ‘Dilemmas in a General Theory of Planning’, was an ideal of professional expertise capable “solving an assortment of problems that appeared to be definable, understandable and consensual” (Rittel and Webber 1973, p. 156). The wicked problems idea was, in short, developed as part of a critique of the overly optimistic promises of technocratic social analysis to solve complex issues through the application of data-led predictive theories. Condensed into a now famous list of ten characteristics (ibid. pp. 161-167), the idea of wicked problems referred to a set of attributes such as the indeterminacy in problem formulation, the non-definitiveness in problem solution, the irreversibility of the consequences of interventions, the individual uniqueness of issues, and conflicts over interests and values. These characteristics defined a particular class of issues as ‘wicked’ as distinct from ‘tame’ problems.

The idea of wicked problems is often associated with similar sounding ideas inflected by systems theory, including those of Jane Jacobs (see Laurence 1996), the distinctions between convergent and divergent problems (Schumacher 1977) and between ill structured and well structured problems (Simon 1974), and accounts of ‘mess’ (Ackoff 1974). All of these ideas recognise either that processes of problem definition already entrain preferred solutions, or that available solutions tend to dictate the definition of problems. The same propositions are staple assumptions of fields of critical policy analysis across disciplines, in which the focus is upon the historically and geographically contingent formations of social problems (e.g. Blumer 1971, Peters 2005, Savransky 2020, Turnbull and Hoppe 2018). Across these different fields, the predominant view, either positively or critically, is that what is at stake in addressing problems is an epistemological challenge: either clarifying what type of problem is at stake; clearing up the definition of poorly structured problems; or in more critical variants, exposing the interests and exclusions which shape the construction of certain issues as actionable problems in the first place.

In important respects, the concept of wicked problems differs from the prevalent epistemological imagination of indeterminacy and uncertainty found in these broader

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traditions of thinking about problems. To understand how, it is necessary to specify the precise sense of ‘wickedness’ invoked by Rittel and Webber. In his earliest formulations of the idea of wicked problems, Rittel (1972) explicitly affirmed that wickedness was not simply an epistemological characteristic associated with complex systems. If wickedness does not refer to an epistemological puzzle waiting to be tamed, then nor is wickedness best thought of as a kind of ontological feature of specific types of system (e.g. Andersson and Tornberg 2018). It is more appropriately conceptualised in pragmatist terms, as an attribute of a situation that comes into view in the course of action and inquiry (see Barnett and Bridge 2017). Rittel and Webber (1973, p. 160) argued that planning-type problems “are inherently wicked” because wickedness is, for them, an irreducible attribute of a certain class of problems. The relationship between tameness and wickedness is a contrast between different *types* of problems. Wickedness is not a temporary feature of problems waiting to be tamed through the application of appropriate knowledge.

To be more exact, the sense of the wickedness ascribed to wicked problems is derived from a contrast between two images of professional expertise. Rittel and Webber proposed that scientific and engineering knowledge focussed on “benign” problems which had a clear sense of a goal and clear criteria for whether a problem has been solved. The successes of twentieth century planning, they asserted, had been in addressing “relatively easy problems” (Rittel and Webber 1973, p. 156). They argued that neither of those “clarifying traits” – clear mission and criteria of success - applied to planning-type problems. What defined planning and design issues of the sort defined as wicked problems was a temporal relationship between systematic attempts to accomplish “explicit purposes” and the unpredictability of outcomes.

Rittel and Webber were drawing into view a set of questions about the politics of expertise at stake in fields of planning and design. There are two related senses in which Rittel and Webber saw wicked problems as inherently political. First, planning-type problems are riven by value pluralism and conflicts of interest.. Wickedness is a function of the pluralism of modern societies, characterised by increasing differentiation, a diversity of goals, and an end to consensus (Rittel and Webber 1973, pp. 167-169). In essence, wicked problems are symptomatic of situations in which the equity, fairness and justice of the procedures and outcomes of expertise-led interventions become explicitly contentious issues. Second, and an issue that often slides from view even when the first aspect is recognised, the wicked problems idea was developed as part of a wider critique of the types of power – even

“tyranny” - exercised by fields of technical and professional expertise (see Webber 1969). The intersection of these two aspects of the political unconscious of the concept of wicked problems is crucial to identifying different strands of the renewal of interest in this idea in the first two decades of the twenty-first century.

In the next section, the recent career of the concept of wicked problems is discussed, with an emphasis on how urban spaces are refigured in the revival of this idea. Then in Section 5, the focus is on different interpretations of the wickedness now attributed to wicked problems. What comes into view, in tracing these differences, is the degree to which the capacity ascribed to the city as a medium for governing global challenges is a contingent effect of the dilemmas characteristic of assertive fields of professional expertise.

4 THE CAREER OF A CONCEPT

Urban issues were, in Rittel and Webber’s original account of the pretensions of systems-theoretic models of decision-making, accorded a significant status as exemplars of planning-type problems. In these cases, where clear and predictable causal chains are difficult to establish and predict, the application of scientific knowledge to produce predictable outcomes was likely counterproductive, if not outright dangerous. Rittel and Webber’s critique belongs to a broader moment in which community and participatory planning theories flourished. There is, in turn, a lineage of using the wicked problems idea to analyse urban policy initiatives (e.g. Harrison 2000, Davison *et al* 2015). However, we will see below that in the revival of the wicked problems idea in the twenty-first century, the status of urban processes has moved from providing a set of exemplars, towards being the privileged mediums ascribed task responsibility for addressing a wide range of challenges.

The concept of wicked problems is now routinely deployed in relation to any set of issues capable of being re-described in terms derived from new forms of complexity science and theories of resilience (Head and Alford 2013, Crowley and Head 2017, Peters 2017). The renewal of interest in the concept of wicked problems is, then, one index of a widespread adoption of expansive concepts drawn from design thinking – broadly understood as a field of practice focussed on developing participatory practices for imaging future scenarios (see Grove *et al* 2019, Gründel 2015). It is part of a wider movement in which a design imagination focussed on learning through collaborative practices of prototyping and ongoing

user-oriented testing has become a staple feature of both academic and policy discourses (see Zivkovic 2018).

Beyond the renewed interest in the wicked problems idea in design studies *per se* (e.g. Coyne 2005, Farrell and Hooker 2013), as well as its widespread proliferation in popular business and management literatures on leadership and innovation, the generalisation of the concept of wicked problems is evident in the range of academic disciplines now making reference to the idea. The idea is now invoked in disciplines ranging from economics to international relations and political science to environmental philosophy. The generalisation across academic fields is associated with all sorts of national-level policy issues being re-framed as wicked problems. The management of public health systems, mental health and wellbeing issues, and a wide variety of environmental and sustainability issues are now presented as wicked problems, including ecosystem service management, and environmental health issues such as air and water pollution and hazardous waste management.

However, the renewed interest in the wicked problems idea is most evident in its application to a range of emergent ‘global challenges’. These include issues such as food security (e.g. Grochowska 2014), humanitarian relief (e.g. Patham and Houghton 2011), and international development (Ramalingam et al 2014). Above all, climate change is now routinely presented as not just a wicked problem (Head 2014), but often as a ‘super wicked problem’ (see Lazarus 2009, Levin *et al* 2012).

Stretching across academic debates but also encompassing various fields of practice-based knowledge, the idea of wicked problems is most often invoked to emphasise the inherently uncertain qualities of policy interventions (e.g. Head 2008, Peters 2017). The renewed of interest in wicked problems is, however, not a uniform process. It is useful to distinguish between different interpretations of uncertainty in accounts of the wicked problems idea (see also Roberts 2000). The prevalent emphasis is upon thinking of uncertainty primarily as a *cognitive* challenge. The idea that uncertainty is derived from the inherently *contentious* quality of the means and ends of policy interventions is often absent. And when it is acknowledged, it often tends to be sublimated back into an essentially cognitive perspective.

The strongly cognitive emphasis is evident in fields in which wicked problems are presented as primarily issues of complexity that can be solved by appropriate forms of data analysis. New forms of data-led science often assert their capacity to solve what are initially presented

as wicked problems (e.g. Gould et al 2018; Ketter *et al* 2015). Sciences of complexity are thus promoted as having the potential to tame wicked problems. On the other hand, the dimension of uncertainty associated with wicked problems idea is also sometimes invoked to promote collaborative, dialogic and participatory models of intervention. Here, the theme of wickedness is used to address conflict over values and is associated with a more sustained reflection on models of expertise (e.g. APSC 2007, Head and Alford 2013).

The difference in interpretations of uncertainty is related to a second aspect of the revival of the idea of wicked problems. As already indicated, urban issues were originally presented as exemplars of wicked problems. The renewal of interest in the wicked problems idea as a relevant way of framing all sorts of twenty-first century challenges often involves the claim that urban spaces are now the privileged sites for addressing any number of inherently complex problems (e.g. Alberti 2017, Davison *et al* 2015, Head and Xiang 2016). This modification in the status of the city is related to a transformation in the meaning of problems themselves, now understood as not just a set of challenges, but as challenges that open up opportunities and harbour potentialities. Under this description, cities are ascribed with the potential to creatively and perhaps even proactively respond to a range of problems whose causes may or may not be ascribed to urban processes.

The next section further clarifies the contrasting images of rationality associated with the revival of the wicked problems idea. In tracing the status of urban themes across two distinct strands of thought, it identifies a shared emphasis on imagining the city as the arena in which the authoritative exercise of expertise can be reconciled with acknowledgements of contingency, partiality, and uncertainty. At the crux of contrasting interpretations of the wicked problem idea lay real differences over the best posture to adopt towards ‘problems’. But in tracing the genre conventions of the revival of the wicked problems, what emerges is a continued attachment to the view that fields of expert knowledge are defined primarily by their responsibilities as problem-solving enterprises (see Bacchi 2017).

5 WAYS TO BE WICKED

The ascription of a wide range of task responsibilities to urban spaces in the renewal of interest in the idea of wicked problems is often associated with an elision of the critical intention of the idea as Rittel, Webber and others originally developed it. This elision works either by presenting wicked problems in technocratic terms as tameable, or by recuperating

the argumentative dimension of wicked problems into practices of deliberation oriented towards developing shared consensus.

The emphasis on taming problems is most closely associated with the on-going evolution of complexity and systems thinking. With the rise of the concept of cities as ‘complex adaptive systems’ (e.g. Nel *et al* 2018), the wicked problem idea has been rediscovered as a concept primarily concerned with cognitive uncertainty (e.g. Sengupta *et al* 2016, p. 971). Complexity science is presented as having the potential to tame what at first appear to be impossibly complex challenges. In the second strand of new thinking on wicked problems a more strongly communicative imagination is at work (e.g. Brown *et al* 2010). From this second, sharing perspective, the emphasis on value pluralism in Rittel and Webber’s original account is rendered into the challenge of drawing more voices into dialogues and conversation – wicked problems are presented as opportunities for sharing insights, perspectives and expertise for common purposes. In both cases, the ascription of task responsibility to urban-scaled processes plays an important role in the imaginative resolution of the troublesome qualities of wicked problems.

5.1 Taming Wicked Problems

One crucial context for the revival of the wicked problems idea in public policy debates has been the emergence of the ‘new urban science’ or the new ‘science of cities’ (e.g. McPherson *et al* 2013, McPherson *et al* 2016). The deployment of the wicked problems idea in recent systems-led urban discourse marks a distinctive inflection of the visions and promises of systems thinking. Planning issues are now reformulated as arising from the challenges of managing dynamic complex systems (e.g. Lundstrom *et al* 2016). Conceptualising cities as complex adaptive systems underwrites the assertion that “most of the problems that we now deal with in planning tend to be ‘wicked’” (Batty 2013a). It is claimed that systems research has moved decisively on from the forms of top-down, linear systems thinking that had served as one of the primary targets of the original account of wicked problems. Complexity science, from the perspective of the science of cities, is finally equal to the criticism originally levelled by Rittel and Webber: “The idea that there are closed systems in cities and in planning has gone forever. Innovations, discontinuities, abrupt change, fast change, historical accidents, diversity, plurality, heterogeneity – these are now the watch words of this new science” (Batty 2013c, pp. 7-8). The posited rapprochement between systems thinking and the wicked problem idea in the new urban science is dependent on a shift away from a

mechanical-engineering imagination towards a view of cities as natural, ecological systems (Batty 2007, p. 3).

Alongside conceptual innovations associated with complexity science, the consolidation of the new urban science illustrates the degree to which the interest in urban issues across all sorts of fields is an effect of changing dynamics of data-generation, knowledge and data-analysis (Townsend 2015; see also Kinsley 2015, Kitchin 2013). It is claimed that the availability of masses of data about measurable properties of cities holds the potential to generate universal laws of urban processes, that can in turn serve as the basis for “a more scientifically grounded practice of urban planning” (Bettencourt 2013b, p. 1). For example, in the burgeoning literature on the laws of urban scaling, the basic premise is that the increasing population size of settlements facilitates high levels of specialization, interaction, and complexity, leading in turn to higher productivity, income, and growth (see Batty 2013b, Bettencourt 2013a, Ortman et al 2014, West 2018).

The new urban science is a prime example of the urbanization of responsibility outlined at the start of this paper: “cities supply solutions as well as problems, as they are the world’s centres of creativity, power and wealth. So the need is urgent for an integrated, quantitative, predictive, science-based understanding of the dynamics, growth and organization of cities. To combat the multiple threats facing humanity, a grand unified theory of sustainability with cities and urbanization at its core must be developed” (Bettencourt and West 2010, p. 912). Here, we see clearly articulated the view of problems not just as more or less surmountable challenges to be overcome or solved, but as opportunities for transformation. Drawing direct equivalences, not mere comparative analogies, between biological sciences and social systems, the new urban science promises to supplant “policy as usual”, in so far as it can analyse urbanization in “a scientifically predictable, quantitative way” is able in turn to inform “policy led by a new quantitative understanding of cities” (ibid. p. 913).

In the confident declarations of the possibility of a predictive science of urban systems that is capable of generating actionable solutions, urban social science has come full circle. It has returned to that moment of optimism represented by the promises of urban cybernetics in the 1960s that were the original target of Rittel and Webber’s formulation of the wicked problem idea. The same image found in rational planning paradigms in the 1960s - of using innovative technologies for processing information to inform efficient and comprehensive decision-making across whole urban systems - is visible in twenty-first century discourses of the new

urban science, the science of cities, urban informatics, and urban physics (see Goodspeed 2015).

At its core, the new urban science is rooted in an understanding that science is able to tame problems, both epistemologically and practically. The elision of the original sense of the wickedness of urban processes is made explicit in the claim that since “cities are approximately scaled versions of one another”, then policy initiatives in cities “should be viewed as experiments that, if carefully designed and measured, can help support the creation of an integrated, predicative theory and a new science of performance-based planning” (Bettencourt and West 2010, p. 913). This vision of urban experimentation as a means of taming problems stands in stark contrast to Rittel’s own emphatic statement that “There is no experimentation with wicked problems” (Rittel 1972, p. 393). From Rittel’s perspective, wicked problems are not subject to experimental testing since every solution to a wicked problem is a “one-shot operation” - there is no opportunity to learn by trial-and-error with wicked problems (see also Barnett 2020). In contrast to the claims of the new urban science, the original account of wicked problems rested on the assumption that planning and design could not simply involve the application of knowledge to solve problems (e.g. Kunz and Rittel 1970). Rittel envisioned designers and planners as “mid-wives of problems” - a decidedly less heroic role than that suggested by the image of problem-solver - playing a part in inherently argumentative processes of raising questions, sharing factual knowledge, and arguing about the advantages and disadvantages of alternative courses of action (Rittel 1972, pp. 394-395). The trace of this irreducibly political vision of wicked problems is developed most fully in the second of the two perspectives from which the wicked problem idea has been revived - the sharing perspective.

5.2 Sharing in wicked problems

Alongside the taming perspective exemplified by the burgeoning field of urban data science, the wicked problem idea has also been revived as part of initiatives to conceptualise and design forms of participatory engagement with complex issues (e.g. Whyte and Thompson 2012, Duit and Lof 2015). From this sharing perspective, the idea that wickedness is an impediment that can be removed by better-quality evidence or improved forms of data analysis is explicitly challenged (see Parkhurst 2016). The distinctive design issues that had originally led Rittel and Webber to formulate the concept are now generalised across the divide between science and design (Farrell and Hooker 2013). Crucially, the proposition that

science is actually characterised by relatively tame problems is questioned. It is argued instead that all forms of scientifically informed practice rest on interactional expertise (e.g. Conklin 2005, Hocking *et al* 2016, Innes and Booher 2016). The wickedness of problems is, in this view, presented as an occasion for developing methodologies for mapping ‘social messes’, in order to generate shared understandings of how to proceed in relation to them (Ritchey 2013). Rather than taming complexity, the focus is on harnessing conflict, by integrating different interests and perspectives into transformed professional practices and governance institutions (e.g. Van Bueren *et al* 2003; Weber and Khademian 2008; and Ferlie *et al* 2011).

In the sharing perspective on wicked problems, the emphasis on wickedness as a medium for developing common understandings transforms the very sense of what counts as a ‘solution’. In work informed by Mary Douglas’s cultural theory of risk (Douglas 1992), wicked problems are presented as only ever resolved by clumsy solutions, generated through dialogue-based forms of engagement with issues (e.g. Hartmann 2012, Ney and Verweij 2015, Verweij 2011). The clumsy solutions approach acknowledges the coexistence of competing principles and values. Rather than proposing that wicked problems can be solved by the application of scientific expertise, they are presented instead as “chronic conditions that can be managed more or less well” (Rayner 2012, p. 112). In the literature on clumsy solutions, the emphasis is on how responsibility for addressing the risks associated with wicked problems is distributed between a range of actors. Clumsy solutions are ones where “all the ‘voices’ (are) heard and responded to by the others” (Verweij *et al*, 2006, p. 822).

The sharing perspective on the governance of wicked problems combines the dual aspect of responsibility characteristic of contemporary metrophilia, with the emphasis on both the cognitive understanding of problems, and the practical dimension of generating appropriate responses (see Alford and Head 2017). The avowedly practical emphasis in accounts of wicked problems informs a critical disposition towards existing practices of governance (Termeer *et al* 2013). The sharing perspective deploys the wicked problems idea to promote normative models of institutional transformation and development (Termeer *et al* 2015). The starting assumption is that “existing governance institutions are, in general, poorly equipped to enable alternative government strategies that deal with wicked problems” (Termeer *et al* 2016, p. 18). And it is here that we can glean the sense in which the revival of wicked problem idea is indicative of new forms of governmentality. Both the taming and the sharing

perspective on wicked problems involve explicit “critical reflection” on settled understandings of the relationship between knowledge and action (see Foucault, 2008, p. 321). The focus on the limits of existing models of governance characteristic of the renewal of interest in the idea of wicked problems often crystallises around an emphasis on the city as a site of opportunity for addressing global challenges. Cities are presented as a favoured scale at which “governance solutions” can and should be sought: “cities and metropolitan areas are ideal environments for addressing wicked problems” (Hämäläinen 2015, p. 39).

For example, the cultural theory approach to clumsy solutions explicitly presents contemporary urban transformations as an opportunity in which the density of population, infrastructure, or social networks can be mobilised in and across cities to generate innovative approaches to the mitigation of climate change or the development of alternative energy systems (e.g. Schroeder *et al* 2013, Stewart and Rayner 2016). From the sharing perspective on wicked problems, the ascription of task responsibility to cities entrains three distinct but related senses of ‘the urban’, combining descriptive and practical elements into a recurring claim about the responsive and pro-active capacities of urban-scale practices. First, cities are understood in terms of the agglomeration of people and resources in urban settlements. This feature is held, second, to facilitate the proximity needed for collective learning and innovation as well as the access to resources necessary to mobilise cooperation. And thirdly, these characteristics inform the assertion that cities are agile and effective spaces of experimentation. However, from this perspective it is not the idea of cities as bounded laboratories that can yield results that can scaled-up and across other contexts that is invoked: it is a sense of experimentation in terms of opportunities for collaborative learning, trying out prototypes, and being creative (see Gieryn 2006).

In both the taming and the sharing view of wicked problems, a strong epistemological imagination underwrites the ascription to urban spaces of task responsibility for addressing varied issues. This imagination informs assumptions about the explanatory power of new forms of data-driven complexity science, as well as assumptions about the epistemological benefits of participatory forms of learning. And in both cases, the city emerges as the figurative space in which the limits of expert knowledge under conditions of generalised uncertainty can be squared with heightened imperatives to link knowledge to action in response to and in anticipation of multiple global challenges.

6 CONCLUSION

The analysis developed here has been informed by a sense that the practical orientation of urban thought, in the expansive sense of that term, cannot be adequately understood by forms of ideology-critique aimed at uncovering the ruses of ‘instrumental reason’ or ‘urbanology’ (e.g. Brenner 2009, Peck 2016). To deepen an understanding of the politics of twenty-first century urban thought requires more than ideological exposure or laments about flawed epistemological assumptions. It requires instead a form of descriptive analysis of problematizations (see Orford 2012). In the case of urban thought, this type of analysis focusses on how knowledge-claims about cities are mobilised in institutionalised processes which assign capacities to specific actants. The aim of this paper has been to illustrate how the analysis of ascriptions of responsibility can serve as a route to better understandings of how certain objects emerge into the public realm as actionable fields of intervention. It has treated the renewal of interest in the idea of wicked problems as a case with which to illustrate the analysis of problematizations. We have seen that the wicked problems idea is the archetypal example of the discursive urbanization of responsibility that characterises contemporary metrophilia. And reconstructing the revived interest in this idea reveals how far the problematization of urban processes in the twenty-first century is intimately related to transformations in the politics of expertise. It is an idea that has become an instrumental device for the promotion of new interdisciplinary methodologies of complexity and participation. And it has also been central to assertions about the importance of urban-scaled interventions in responding to varied global challenges.

Across both perspectives discussed in the previous section, the attraction of the wicked problems idea lies in providing a justification for the continuing authority claimed by specific fields of expert knowledge under wider conditions of uncertainty, complexity and pluralism. While the disturbing force of the original formulation of the wicked problems idea lies in the proposition that wickedness might be irreducible, it remains the case that placing an issue under the description of wicked problems is, and not nor was it ever meant to be, a disabling move. It serves as a preliminary to claims about the potentials of selected professional fields of expertise to be able to better address those issues through the application of their specific form of expertise (see Wexler 2009). Seen in the light of the preceding analysis of ascriptions of responsibility, via the case of the revival of the wicked problems idea, contemporary metrophilia no longer appears as a natural response to objectively given problems of

urbanization. It is better thought of as one expression of a motivated problematization of existing assumptions about the relationships between data, institutional capacity, and accountability. The assertive view of the importance of urban-scaled practices found in the recent literature on wicked problems, hedged around by varied invocations of experimentation, indicates that metrophilia is a function of the opportunities that the spatial figure of the city provides for imagining the further pursuit of knowledge-based forms of expertise, authority, and influence.

REFERENCES

- Abbott, J. (2005). Understanding and managing the unknown: the nature of uncertainty in planning. *Journal of Planning Education and Research* 24, 237-251. <https://doi.org/10.1177/0739456X04267710>
- Abram, S. (2014). The time it takes: temporalities of planning. *Journal of the Royal Anthropological Institute* 20, 129-147. <https://doi.org/10.1111/1467-9655.12097>
- Ackoff, R.L. (1974). *Redesigning the future: A systems approach to societal problems*. New York, John Wiley and Sons.
- Alberti, M. (2017). Grand challenges in urban science. *Frontiers in Built Environment* 3:6, 1-5. <https://doi.org/10.3389/fbuil.2017.00006>
- Alford, J. and Head, B. (2017). Wicked and less wicked problems: A typology and a contingency framework. *Policy and Society* 36, 397-413. <https://doi.org/10.1080/14494035.2017.1361634>
- Angelo, H. and D. Waschmuth. (2015). Urbanizing urban political ecology: A critique of methodological cityism. *International Journal of Urban and Regional Research* 39, 16-37. <https://doi.org/10.1111/1468-2427.12105>
- Australian Public Service Commission. (2007). *Tackling Wicked Problems: a public policy perspective*. Canberra.
- Bacchi, C. (2017). Problematizations in health policy: questioning how 'problems' are constituted in policies. *SAGE Open* 6:2, April. <https://doi.org/10.1177/2158244016653986>

Baier, K. (1991). Types of responsibility. In P. A. French (ed.), *The Spectrum of Responsibility*. New York: St. Martins Press, pp. 117–122.

Barnett, C. (2012). Changing cities. In Butcher, M., Clark, N., Smith, J., and Tyszczyk, R. (eds). *Atlas: Geography, Architecture and Change in an Interdependent World*. London, Black Dog Publishing, pp. 72-79.

Barnett, C. (2015). On Problematization: elaborations on a theme in “Late Foucault”. *nonsite.org* 16. Available at: <https://nonsite.org/on-problematization/>

Barnett, C. (2020). The Strange Case of Urban Theory. *Cambridge Journal of Regions, Economy and Society* 13, 443-459. <https://doi.org/doi:10.1093/cjres/rsaa026>

Barnett, C. and Bridge, G. (2017). The situations of urban inquiry: thinking problematically about the city. *International Journal of Urban and Regional Research* 40, 1186-1204. <https://doi.org/10.1111/1468-2427.12452>

Barnett, C., Cloke, P., Clarke, N., and Malpass, A. (2011). *Globalizing Responsibility: The Political Rationalities of Ethical Consumption*. Chichester, Wiley-Blackwell.

Barnett, C. and Parnell, S. (2016). Ideas, implementation and indicators: epistemologies of the post-2015 urban agenda. *Environment and Urbanization* 28, 87-98. <https://doi.org/10.1177/0956247815621473>

Barnett, C., Robinson, J., and Rose, G. (eds.) (2008). *Geographies of Globalisation: A Demanding World*. London, Sage.

Barnett, C. and Scott, D. (2007). The reach of citizenship: Locating the politics of industrial pollution in Durban and beyond. *Urban Forum* 18, 289-309. <https://doi.org/10.1007/s12132-007-9015-4>

Batty, M. (2007). *Complexity in City Systems: Understanding, Evolution, and Design*. Working Paper 117. London, Centre for Advanced Spatial Analysis, UCL.

Batty, M. (2013a). Great planning disasters: how we should tackle complexity by taming wicked problems. In: Tewdwr-Jones, M and Phelps, N and Freestone, R, (eds.) *The Planning Imagination*. Routledge, pp. 28-39.

Batty, M. (2013b). A Theory of City Size. *Science* 340, 1418-1419.
<https://doi.org/10.1126/science.1239870>

Batty, M. (2013c). *The New Science of Cities*. MIT Press.

Bear, L. (2016). Time as technique. *Annual Review of Anthropology* 45, 487-502.
<https://doi.org/10.1146/annurev-anthro-102313-030159>

Bettencourt, L. (2013a). The Origins of Scaling in Cities. *Science* 340, 1438-1441.

Bettencourt, L. (2013b). *The kind of problem a city is*. SFI Working Paper. Santa Fe Institute.

Bettencourt, L. and West, G. (2010). A unified theory of urban living. *Nature* 467, 21st October, pp. 912-913. <https://doi.org/10.1038/467912a>

Bevir M. (2017). Democratic Governance: A Genealogy. In Bek-Thomsen J., Christiansen C., Gaarsmand Jacobsen S., Thorup M. (eds) *History of Economic Rationalities*. Economic Reasoning as Knowledge and Practice Authority. Springer, pp. 103-111.

Blumer, H. (1971). Social problems as collective behavior. *Social Problems* 18, 298–306.
<https://doi.org/10.2307/799797>

Brenner, N. (2009). What is critical urban theory? *City* 13:2/3, 198-207.
<https://doi.org/10.1080/13604810902996466>

Brenner, N. and Schmid, C. (2015). Towards a new epistemology of the urban? *City* 19, 151–182. <https://doi.org/10.1080/13604813.2015.1014712>

Brown, V.A., Harris, J.A., Russel, J.Y. (eds.) (2010). *Tacking wicked problems through the transdisciplinary imagination*. London, Earthscan.

Buchanan, R. (1992). Wicked problems in design thinking. *Design Issues* 8:2, 5-21.

Caprotti, F., & Cowley, R. (2016). Interrogating urban experiments. *Urban Geography* 38, 1441-1450. <https://doi.org/10.1080/02723638.2016.1265870>

Churchman, C.W., Protzen, J-P, and Webber, M.M. (2006). In Memorium: Horst W.J.Rittel. *Design Issues* 22:4, 18-20.

Churchman, C.W. (1967). Wicked problems. *Management Science* 14:4, 141-142.

Cochrane, A. (2007). *Understanding Urban Policy: A Critical Introduction*. London, Sage.

Collier, S. (2017). Neoliberalism and rule by experts. In V. Higgins and W. Larner (eds.) *Assembling Neoliberalism: Expertise, Practices, Subjects*. Palgrave Macmillan, pp. 23-43.

Conklin, J. (2005). *Dialogue Mapping: Building Shared Understanding of Wicked Problems*. John Wiley & Sons.

Coyne, R. (2005). Wicked problems revisited. *Design Studies* 26, 5-17.
<https://doi.org/10.1016/j.destud.2004.06.005>

Crowley, K. and Head, B. (2017). The enduring challenge of 'wicked problems': revisiting Rittel and Webber. *Policy Sciences* 50, 539-547. <https://doi.org/10.1007/s11077-017-9302-4>

Davison, A., Patel, Z. and Greyling, S. (2015). Tackling wicked problems and tricky transitions: change and continuity in Cape Town's environmental policy landscape. *Local Environment* 21:9, 1063-1081. <https://doi.org/10.1080/13549839.2015.1066321>

Donaldson, A., Ward, N., and Bradley, S. (2010). Mess among disciplines: interdisciplinarity in environmental research. *Environment and Planning A* 42, 1521-1536.
<https://doi.org/10.1068/a42483>

Douglas, M. (1992). *Risk and Blame: Essays in Cultural Theory*. London, Routledge.

Duit, A. and Lof, A. (2015). Dealing with a wicked problem? A dark tale of carnivore management in Sweden 2007-2011. *Administration and Society* 50(8), 1072-1096.
<https://doi.org/10.1177/0095399715595668>

Farrell, R. and Hooker, C. (2013). Design, science and wicked problems. *Design Studies* 34:6, 681-705.

Ferlie, E., Fitzgerald, L., McGivern, G., Dopson, S., and Bennett, C. (2013). *Making Wicked Problems Governable? The Case of Managed Networks in Health Care*. Oxford, Oxford University Press.

Forrester, J., Taylor, R., Pedoth, L., and Matin, N. (2019). Wicked Problems: Resilience, Adaptation, and Complexity. In. H. Deeming et al (eds.), *Framing Community Disaster Resilience: Resources, Capacities, Learning, and Action*. Chichester, John Wiley, pp. 61-75.

Foucault, M. (2008) *Security, Territory and Population: Lectures at the Collège de France 1978-1978*. Palgrave Macmillan, London.

Gaston, K.J. (ed.). (2012). *Urban Ecology*. Cambridge, Cambridge University Press.

Gieryn, T.F. 2006. City as truth-spot: Laboratories and field-sites in urban studies. *Social Studies of Science* 36:1, 5-38.

Goodspeed, R. (2015). Smart cities: moving beyond urban cybernetics to tackle wicked problems. *Cambridge Journal of Regions, Economy and Society* 8(1), 79-92. <https://doi.org/10.1093/cjres/rsu013>

Gordon, I., & Buck, N. (2005). Introduction: Cities in the New Conventional Wisdom. In N. Buck, I. Gordon, A. Harding & I. Turok (Eds.), *Changing Cities: Rethinking Urban Competitiveness, Cohesion and Governance*. Basingstoke, Palgrave Macmillan, pp. 1-21.

Gould, F. Brown, Z.S., and Kuzma, *et al.* (2018). Wicked evolution: Can we address the sociobiological dilemma of pesticide resistance? *Science*, May 18th, 360(6390), 728-732. <https://doi.org/10.1126/science.aar3780>

Government Office for Science. (2016). *Future of Cities: The Science of Cities and Future Research Priorities*.

Grochowska, R. (2014). Specificity of Food Security Concept as a Wicked Problem. *Journal of Agricultural Science and Technology B* 4, 823-831. <https://doi.org/10.17265/2161-6264/2014.10.010>

Grove, K., Krivy, M., Rickards, L., Schliwa, G., Collier, S., Cox, S., Gandy, M. (2019). Interventions on design and political geography. *Political Geography* 74, 1-10. <https://doi.org/10.1016/j.polgeo.2019.04.009>

Gründel, A. (2015). Design governmentality: the power of data in urban positions. *PLOT(S)* 2, 44-55.

Guyer, J.I. (2007). Prophecy and the near future: thoughts on macroeconomic, evangelical, and punctuated time. *American Ethnologist* 34(3), 409-421. <https://doi.org/10.1525/ae.2007.34.3.409>

Hacking, I. (1983). *Representing and Intervening*. Cambridge, Cambridge University Press.

Hämäläinen, T.J. (2015). Governance Solutions for Wicked Problems: Metropolitan Innovation Ecosystems as Frontrunners to Sustainable Well-Being. *Technology Innovation Management Review* 5(10), 31-41.

Harrison, T. (2000). Urban policy: addressing wicked problems. In H. Davies, S. Nutley, and P. Smith (eds.), *What Works? Evidence-based policy and practice in public services*. Bristol, Policy Press.

Hartmann, T. (2012). Wicked problems and clumsy solutions: planning as expectation management. *Planning Theory* 11:3, 242-256. <https://doi.org/10.1177/1473095212440427>

Head, B.W. (2008). Wicked problems in public policy. *Public Policy* 2, 101-118.

Head, B.W. (2014). Evidence, uncertainty, and wicked problems in climate change decision making in Australia. *Environment and Planning C: Government and Policy* 32, 663-679. <https://doi.org/10.1068/c1240>

Head, B.W. (2019). Forty years of wicked problems literature: forging closer links to policy studies. *Policy and Society*, 38:2, 180-197. <https://doi.org/10.1080/14494035.2018.1488797>

Head, B.W. and Alford, J. (2013). Wicked problems: implications for public policy and management. *Administration and Society* 47, 711-739. <https://doi.org/10.1177/0095399713481601>

Head, B.W. and Xiang, W-N. (2016). Why is an APT approach to wicked problems important? *Landscape and Urban Planning* 154, 4-7. <https://doi.org/10.1016/j.landurbplan.2016.03.018>

Hocking, V.T., Brown, V.A., and Harris, J.A. (2016). Tackling wicked problems through collective design. *Intelligent Buildings International* 8:1, 24-36. <https://doi.org/10.1080/17508975.2015.1058743>

Innes, J.E. and Booher, D.E. (2016). Collaborative rationality as a strategy for working with wicked problems. *Landscape and Urban Planning* 154, 8-10. <https://doi.org/10.1016/j.landurbplan.2016.03.016>

Iossifova, D., Doll, C., & Gasparatos, A. (eds.). (2018). *Defining the urban: Interdisciplinary and Professional Perspectives*. Routledge.

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. Geneva, IPCC.

IRP. (2018). *The Weight of Cities: Resource Requirements of Future Urbanization*. Swilling, M., Hajer, M., Baynes, T., Bergesen, J., Labbé, F., Musango, J.K., Ramaswami, A., Robinson, B., Salat, S., Suh, S., Currie, P., Fang, A., Hanson, A. Kruit, K., Reiner, M., Smit, S., Tabory, S. A Report by the International Resource Panel. United Nations Environment Programme, Nairobi, Kenya.

Keith, M., O'Clery, N., Parnell, S., and Revi, A. (2020). The future of the future city? The new urban sciences and a PEAK Urban interdisciplinary disposition. *Cities* 105. <https://doi.org/10.1016/j.cities.2020.102820>

Ketter, W., Peters, M., Collins, and Gupta, A. (2016). Competitive Benchmarking: An IS Research Approach to Address Wicked Problems with Big Data and Analytics. *MIS Quarterly* 40(4), 1057-1080. <https://doi.org/10.25300/MISQ/2016/40.4.12>

Kinsley, S. (2015). Memory programmes: the industrial retention of collective life. *Cultural Geographies* 22(1), 155-175. <https://doi.org/10.1177/1474474014555658>

Kitchin, R. (2013). The real-time city? Big data and smart urbanism. *GeoJournal* 79, 1-14. <https://doi.org/10.1007/s10708-013-9516-8>

Kunz, W, and Rittel, H.W.J. (1970). *Issues as elements of information systems*. Working Paper 131, Institute of Urban and Regional Development. Berkeley, University of California.

Lange, T. (2016). Rittel's Riddles: Design Education and "Democratic" Planning in the Age of Information. In Á. Moravánszky & K. R. Kegler (eds.), *Re-Scaling the Environment: New Landscapes of Design, 1960-1980. Volume 2*. Berlin, De Gruyter, pp. 61-80.

Laurence, P. (2006). The Death and Life of Urban Design: Jane Jacobs, The Rockefeller Foundation and the New Research in Urbanism, 1955-1965. *Journal of Urban Design* 11:2, 145-171. <https://doi.org/10.1080/13574800600644001>

Lawton, P. (2020). Tracing the provenance of urbanist ideals: A Critical Analysis of *The Quito Papers*. *International Journal of Urban and Regional Studies*, 44:4, 731-742. <https://doi.org/10.1111/1468-2427.12871>

Lazarus, R. (2009). Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future. *Cornell Law Review* 94:5, 1153-1223.

Levin, K., Cashore, B., Bernstein, S. et al. (2012). Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy Sciences* 45:2, 123-152. <https://doi.org/10.1007/s11077-012-9151-0>

Lönngren, J. and van Poeck, K. (2020). Wicked problems: a mapping review of the literature. *International Journal of Sustainable Development & World Ecology*, <https://doi.org/10.1080/13504509.2020.1859415>.

Lundstrom, N., H. Raisio, P. Vartiainen, J. Lindell. (2016). Wicked games changing the storyline of urban planning. *Landscape and Urban Planning* 154, 20-28. <https://doi.org/10.1016/j.landurbplan.2016.01.010>

McGranahan, G. and Satterthwaite, D. (2014). *Urbanisation: Concepts and Trends*. London, International Institute for Environment and Development.

McPhearson, T., Pickett, S.A., Grimm, N.B., Niemela, J., Alberti, M., Elmqvist, T., Weber, C., Haase, D., Breuste, J., and Qureshi, S. (2016). Advancing Urban Ecology toward a Science of Cities. *BioScience* 66:3, 198-212. <https://doi.org/10.1093/biosci/biw002>

McPhearson, T. (2013). Wicked Problems, Social-Ecological Systems, and the Utility of Systems Thinking. *The Nature of Cities*, January 20th, 2013. <https://www.thenatureofcities.com/2013/01/20/wicked-problems-social-ecological-systems-and-the-utility-of-systems-thinking/>

Nel, D., du Plessis, C., & Landman, K. (2018). Planning for dynamic cities: introducing a framework to understand urban change from a complex adaptive systems approach.

<https://doi.org/10.1080/13563475.2018.1439370>

Ney, S. and Verweij, M. (2015). Messy institutions for wicked problems: How to generate clumsy solutions? *Environment and Planning C: Government and Policy* 33, 1679-1696. <https://doi.org/10.1177/0263774X15614450>

Orford, A. (2012). In praise of description. *Leiden Journal of International Law* 25, 609-625. <https://doi.org/10.1017/S0922156512000301>

Ortman, S.G., Cabaniss, A.H.F., Sturm, J.O., & Bettencourt, L.M.A. (2014). The Pre-History of Urban Scaling. *PLOS* 9:2, 1-10. <https://doi.org/10.1371/journal.pone.0087902>

Parkhurst, J.O. (2016). Appeals to evidence for the resolution of wicked problems: the origins and mechanisms of evidentiary bias. *Policy Sciences* 49:4, 373-393. <https://doi.org/10.1007/s11077-016-9263-z>

Patham, P. and Houghton, L. (2011). The wicked problem of humanitarian logistics and disaster aid relief. *Journal of Humanitarian Logistics and Supply Chain Management* 1:1, 15-31. <https://doi.org/10.1108/20426741111122394>

Peck, J. (2016). Economic Rationality meets Celebrity Urbanology: Exploring Edward Glaeser's City. *International Journal of Urban and Regional Research* 40:1, 1-30. <https://doi.org/10.1111/1468-2427.12321>

Pesch, U. and Vermaas, P.E. 2020. The wickedness of Rittel and Webber's Dilemmas. *Administration and Society* 52(6), 960-979. <https://doi.org/10.1177/0095399720934010>

Peters, G.B. (2005). The problem of policy problems. *Journal of Comparative Policy Analysis* 7:4, 349-370. <https://doi.org/10.1080/13876980500319204>

Peters, G.B. (2017). What is so wicked about wicked problems? A conceptual analysis and a research program. *Policy and Society* 36(3), 385-396. <https://doi.org/10.1080/14494035.2017.1361633>

Ramalingam, B., M. Laric, & J. Primrose. (2014). *From best practice to best fit: understanding and navigating wicked problems in international development*. ODI Working Paper. Overseas Development Institute, London.

Rayner, S. (2012). Unconformable knowledge: the social construction of ignorance in science and environmental discourses. *Economy and Society* 41:1, 107-125. <https://doi.org/10.1080/03085147.2011.637335>

Romero-Lankau, P. *et al* (2018). Urban transformative potential in a changing climate. *Nature Climate Change* 8, 754-761. <https://doi.org/10.1038/s41558-018-0264-0>

Ritchey, T. (2013). Wicked problems: modeling social messes with morphological analysis. *Acta Morphologica Generalis* 2:1, 1-8.

Rith, C. and Dubberly, H. (2006). Why Horst W.J. Rittel Matters. *Design Issues* 22:4, 1-6.

Rittel, H.J.W. (1972). On the planning crisis: systems analysis of the 'First and Second Generations'. *Bedriftsøkonomen* 8, 390-396.

Rittel, H.J.W. and Webber, M.M. (1973). Dilemmas in a general theory of planning. *Policy Sciences* 4, 155-169.

Roberts, N. (2000). Wicked problems and network approaches to resolution. *International Public Management Review* 1, 1-19.

Savransky, M. (2020). Problems all the way down. *Theory, Culture and Society* 38:2, 3-23. <https://doi.org/10.1177/0263276420966389>

Schroeder, H., Burch, S, and Rayner, S. (2013). Novel multisector networks and entrepreneurship in urban climate governance. *Environment and Planning C: Politics and Space* 31, 761-768. <https://doi.org/10.1068/c3105ed>

Sengupta, U., Rauw, W.S., and de Roo, G. (2016). Planning and complexity: engaging with temporal dynamics, uncertainty and complex adaptive systems. *Environment and Planning B: Planning and Design* 43, 970-974. <https://doi.org/10.1177/0265813516675872>

Simon, H. (1974). The structure of ill-structured problems. *Artificial Intelligence* 4(3-4), 181-201. [https://doi.org/10.1016/0004-3702\(73\)90011-8](https://doi.org/10.1016/0004-3702(73)90011-8)

Skaburskis, A. (2008). The origin of "Wicked Problems". *Planning Theory and Practice* 9:2, 277-280. <https://doi.org/10.1080/14649350802041654>

Slater, T. (2021). *Shaking Up the City: Ignorance, Inequality and the Urban Question*. Berkeley, CA: University of California Press.

Stewart, A. and Rayner, S. (2016). Planning mega-event legacies: uncomfortable knowledge for host cities. *Planning Perspectives* 31(2), 157-179. <https://doi.org/10.1080/02665433.2015.1043933>

Swilling, M. and Anneke, E. (2012). *Just transitions: Explorations of sustainability in an unfair world*. Cape Town, UCT Press.

Swilling, M. and Hajer, M. (2017). Governance of urban transitions: towards sustainable resource efficient urban infrastructures. *Environmental Research Letters* 12 125007.

Termeer, C. Dewulf, A., and Breeman, G. (2013). Governance of wicked climate adaptation problems. In J. Knieling and W. Leal Filho (eds.), *Climate Change Management*. Berlin, Springer, pp. 27-39.

Termeer, C., Dewulf, A., Breeman, G., and Stiller, S. (2015). Governance capabilities for dealing wisely with wicked problems. *Administration and Society* 47:6, 680-710. <https://doi.org/10.1177/0095399712469195>

Termeer, C., Dewulf, A., Karlsson-Vinkhuyzen, M., van Vliet, M. (2016). Coping with the wicked problem of climate adaptation across scales: The Five R Governance capabilities. *Landscape and Urban Planning* 154, 11-19. <https://doi.org/10.1016/j.landurbplan.2016.01.007>

Townsend, A. (2015). Cities of Data: examining the new urban science. *Public Culture* 27:2, 201-212. <https://doi.org/10.1215/08992363-2841808>

Turnbull, N. and Hoppe, R. (2018). Problematizing ‘wickedness’: a critique of the wicked problems concept, from philosophy to practice. *Policy and Society* 38(2), 315-337. <https://doi.org/10.1080/14494035.2018.1488796>

Uhrqvist, O. and Lobrand, E. (2014). Rendering global change problematic: the constitutive effects of Earth System research in the IGBP and the IHDP. *Environmental Politics* 23, 339-356. <https://doi.org/10.1080/09644016.2013.835964>

Van Bueren, E.M., Klijn, E.H., and Koppenjan, J.F.M. (2003). Dealing with Wicked Problems in Networks: Analyzing an Environmental Debate from a Network Perspective. *Journal of Public Administration Research and Theory* 13:2, 249-267. <https://doi.org/10.1093/jpart/mug017>

Verweij, M. (2011). *Clumsy Solutions for a Wicked World*. Palgrave.

Verweij, M., Douglas, M., Ellis, R., Engel, C., Hendriks, F., Lohmann, S., Ney, S., Rayner, S., and Thompson, M. (2006). Clumsy solutions for a complex world: the case of climate change. *Public Administration* 84, 817, 843. <https://doi.org/10.1111/j.1540-8159.2005.09566.x-i1>

Waite, D. and Morgan, K. (2019). City deals in the polycentric state: The space and politics of Metrophilia in the UK. *European Urban and Regional Studies* 26(4), pp. 382-399. <https://doi.org/10.1177/0969776418798678>

Watts, D.J. (2017). Should social science be more solution-oriented? *Nature Human Behaviour* 1, 0015. <https://doi.org/10.1038/s41562-016-0015>

Webber, M. (1969). Planning in an environment of change: Part II: Permissive Planning. *Town Planning Review* 39:4, 277-295.

Weber, E. and Khademian, A. (2008). Wicked problems, knowledge challenges, and collaborative capacity builders in network settings. *Public Administration Review* 68:2, 334-349. <https://doi.org/10.1111/j.1540-6210.2007.00866.x>

West, G. (2017). *Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies*. Penguin.

Wexler, M. 2009. Exploring the moral dimension of wicked problems. *International Journal of Sociology and Social Policy* 29:9/10, 531-542. <https://doi.org/10.1108/01443330910986306>

Whyte, K.P. and P.B. Thompson. (2012). Ideas for How to Take Wicked Problems Seriously. *Journal of Agricultural and Environmental Ethics* 25:4, 441-445. <https://doi.org/10.1007/s10806-011-9348-9>

Xiang, W.-N. (2013). Working with wicked problems in socio-ecological systems: awareness, acceptance, and adaptation. *Landscape and Urban Planning* 110, 1-4. <http://dx.doi.org/10.1016/j.landurbplan.2012.11.006>

Young, I.M. (2013). *Responsibility for Justice*. Oxford, Oxford University Press.

Zellner, M. and Campbell, S.D. (2015). Planning for deep-rooted problems: what can we learn from aligning complex systems and wicked problems? *Planning Theory and Practice* 16:4, 457-478. <https://doi.org/10.1080/14649357.2015.1084360>

Zivkovic, S. (2018). Systematic Innovation Labs: a lab for wicked problems. *Social Enterprise Journal* 14, 348-366. <https://doi.org/10.1108/SEJ-04-2018-0036>