

Cluster 2

Theme: Technology Policy, Regulation and Precaution

Technology regulation has long been an area of governance where the intrinsically problematic nature of knowledge has often spilled out, sometimes uncontrollably, into wider public and political settings. In large part this reflects a recurring tendency, on the part of scientific and policy institutions everywhere, to define what is legitimately and self-evidently at issue in this domain, and therefore subject to collective agency, as only a relatively narrow range of direct biophysical vulnerabilities from individual technological artifacts and processes, and to treat such vulnerabilities as fully comprehensible, *ex ante*, and manageable - as issues of probabilistic risk, or at least as resolvable technical uncertainty.

For well over half a century, social and natural scientists have challenged this depiction, insisting that a) irresolvable scientific uncertainty is a common regulatory predicament; b) that ignorance is an inherent feature of anticipatory assessment; and c) that the objects of regulatory attention (such as civil nuclear power generation) are far more open ended and indeterminate than is generally acknowledged, in both their scientific dimensions as well as in terms of meanings and values. Given the latter, there are always critical ambiguities (and so legitimate differences of opinion) about how to define and bound regulatory objects, the potential vulnerabilities they generate, and the ways in which any particular vulnerability can then be legitimately characterized and analyzed. In practice the resolution of such ambiguities is often tacit; a reflection of multiple judgments, assumptions and scientific conventions that are exquisitely sensitive to the political and institutional contexts in which regulation occurs (and sometimes ripe for tactical selection). Knowledge and regulatory politics and policy are, to use the jargon, 'co-produced'.

An important response to these richer understandings of 'uncertainty' and its political dynamics has been the emergence of precautionary thinking, in the form of a range of novel, but often politically and practically challenging, approaches to knowledge production and decision-making. One element of this is a shift of attention and potential intervention to more 'upstream' aspects of technology/innovation policy, in part a

consequence of treating democratically public concerns about the overall human purposes and motivations associated with particular technological trajectories (that were simply denied by traditional policy institutions), but also widespread recognition that sustainability challenges require transformation of entire technological systems, in contexts where preferences about both desired and undesired directions of change, and knowledge of the consequences of those options, are highly contested, uncertain and incomplete.

This session takes stock of some of these developments, and explores some of the challenges involved in experimentation with more open, plural and ambitious forms of knowledge production, decision-making and intervention in this area of policy.

Theme lead

Patrick van Zwanenberg , CENIT, Argentina

Panel

Silke Beck, Helmholtz Centre for Environmental Research, UfZ

Brian Wynne, University of Lancaster

Fern Wickson, North Atlantic Marine Mammal Commission (NAMMCO) & GenØk Centre for Biosafety

Jack Stilgoe, Department of Science and Technology Studies, UCL

Panel:

Patrick van Zwanenberg, CENIT

Civil society as an arena for regulatory innovation

Experimentation, by civil society, with more sustainable sociotechnical practices often anticipates norms and institutions that do not yet exist, and so novel, informal 'regulatory' rules and practices are sometimes created and experimented with too. Reflecting on our research centre's involvement in the development of an open source seed breeding initiative in Argentina this five minute presentation will suggest that: a) informal regulatory rules and practices created by civil society are a (positive) response to policy institutions' typically narrow and inevitably partial framing of the meanings and vulnerabilities associated with technological systems; b) established regulatory institutions and practices can become more democratic by linking or opening to such initiatives; and c) the

demonstration of new sociotechnical practices is an important source of agency in seeking to persuade institutions that have formal regulatory roles to broaden out issues considered in decision-making.

Silke Beck, Department of Environmental Politics, Helmholtz Centre for Environmental Research - UFZ

What role for fictional expectations in decision-making under uncertainties? The case of Negative Emissions in the climate regime

My talk focusses on the question what roles 'fictional expectations' play when it comes to decision-making under uncertainties. My contribution will examine challenges and uncertainties which may arise from basing policy-making on future pathways with reference to Negative Emissions Technologies (NETs) in the context of Post-Paris climate regime. In the Post-Paris constellation science is expected to project and evaluate the performance of policies in the future. By providing future pathways, expert bodies such as the Intergovernmental Panel on Climate Change (IPCC) also offer sites where climate futures are imagined and transformed into actionable collective future and thus contribute to shape political choices in the present. Based on the concept of 'sociotechnical imaginaries' (Jasanoff) and 'imagined futures' (Beckert), I will explore how NETs work as 'fictional expectations' which enable actors to make decisions in situations of extreme uncertainty and political contestation independently of whether the promises of the technologies at their core are actually fulfilled.

References (open access):

Beck, S., & Mahony, M. (2018). The IPCC and the new map of science and politics. *Wiley Interdisciplinary Reviews: Climate Change*, 9(6), e547.

Beck, S., & Mahony, M. (2018). The politics of anticipation: the IPCC and the negative emissions technologies experience. *Global Sustainability*, 1.

Fern Wickson, North Atlantic Marine Mammal Commission (NAMMCO) & GenØk Centre for Biosafety

The Ambiguities of Environmental Harm

This short presentation will use examples from the regulation of bio- and nano-technologies to emphasise the significance of ambiguity as a form of uncertainty. Using concrete examples, it will illustrate how both the concept of environmental harm and research on environmental safety can be differentially framed by diverse values and beliefs. It highlights the importance of recognising the ambiguities of environmental harm for effectively scrutinising technology regulation and political decision-making.

Jack Stilgoe, Department of Science and Technology Studies, UCL

Who's driving? Self-driving cars and the privatisation of uncertainty

Abstract forthcoming

Theme: Critical Infrastructures and Reliability

What can we learn from those whose job it is to actively manage uncertainty—indeed, manage many types of uncertainty, in real time and over time?

One such group are the reliability professionals found in control rooms and support units of society's conventional critical infrastructures, including control centers for large-scale water supplies, energy (electricity and natural gas), hazardous fuels, transportation, and emergency services, to name a few. Their mandate is to ensure the continuous and safe provision of a critical service in real time, even during (especially during) uncertain times. In doing so, they must work in teams or groups, networked together.

These networks have four key, inter-related features of interest to the Symposium audience:

1. High stakes: Managing uncertainty is a matter of life and death if critical services fail;
2. Real-time uncertainty: The networks manage in real time—if you can't manage uncertainty now when it matters why would we believe your promises to manage better later on?;
3. Uncertainty management: Network professionals manage urgent uncertainties in ways that do not stand or fall on undertaking formal risk methodologies to do so; and
4. Under-recognized expertise: Last but not least, their professionalism, domains of practice and processes of "infrastructuring" are often under-acknowledged by expert opinion and certification.

Ongoing research finds that the skills and processes of these networked professionals—in recognizing system-wide patterns and practices, in formulating action scenarios based in design but modified in light of local

contingencies, and in translating both into reliable service provision at the system level—can also be found in settings considered opposite to “modern” control rooms. Typologies such as that of Andy Stirling give added insights into how infrastructure reliability professionals manage reliably and their implications for real-time rural and urban development activities in the global South.

Theme lead

Emery Roe, Center for Catastrophic Risk Management, UC Berkeley

Panel

Paul Schulman, Mills College, Oakland

Below are propositions based on a long observation and analysis of infrastructures which have been effective in managing hazardous technical systems with reliability and safety. I’d like to expand upon them briefly in my STEPS panel presentation.

1. Uncertainty is assumed by some complexity theorists to constitute a major threat to the reliability and safety of complex, hazardous technical systems, not least of which are society’s critical infrastructures for water, energy, telecommunications, transportation and financial services
2. But the relationships between uncertainty, reliability and safety are themselves more complex than complexity theorists often perceive. These relationships, moreover, have implications for the management of uncertainty in large complex systems generally.
3. Uncertainty can be differentiated into several types, each with different challenges and implications for reliability and safety. In this sense, uncertainty actually conveys information that can be used in both technical design and managerial settings.
4. High reliability managers in a number of critical infrastructures differentiate types of uncertainty and apply different strategies for managing it, in real time and across time.
5. For these managers the reciprocal of knowledge, is not uncertainty or ignorance, but error.

6. "Error" is in many respects an exacting context for both learning and managing in the face of uncertainty when operating under mandates of ensuring the safe and continuous provision of a critical service.
7. High reliability and safety can still be pursued under conditions of uncertainty through the identification and differentiation of this uncertainty in relation to a distinctive framework of error to be described at the panel.

Arjen Boin, Leiden University

‘The Twilight Zone between Crisis and Risk Management: Challenges for Organizing Detection under Deep Uncertainty.’

Traditionally, the worlds of crisis and risk management have been clearly demarcated and neatly separated. The world of risk management is largely one of calculating probabilities of nasty events and assessing the level of impact should these materialize. It’s about managing day-to-day activities so as to mitigate the likelihood of adverse events from occurring. The world of crisis management begins where the risk world ends. It handles ‘risks come true’- acute events that are described in terms of urgency, threat and uncertainty.

These worlds are governed with very different tools. The world of crisis management is one of urgent decision-making where a distinct threat has materialised. The world of risk management is one of careful assessment, regulation and monitoring. No immediate threat has been discovered and no urgency exists. But the threat has been defined and its paths of emergence are more or less known. In this world, the day-to-day operation is marked by standard operating procedures governing reporting requirements, inspections and potential interventions to alter behaviours so as to ensure crisis non-occurrence. It is a world of monitoring to ensure timely discovery of emerging threats, but also seeking to safeguard the smooth operation of the system in question.

This traditional distinction has become increasingly blurred. The recognition of more and more threats that may impact critical systems soon, or may not, has given rise to expanding definitions of crisis.

Particularly relevant in this regard is the current fascination with so-called creeping crises: those slow-moving, hard-to-detect and ever-developing threats that lurk under the radar. Examples include demographic or climate change, the shifting security environment, exotic diseases in “far-away” countries, economic anomalies, energy challenges, cyber-attacks on private companies launched by hostile sovereign actors and, of course, Brexit.

This is the Twilight Zone between risk and crisis land. It is marked by deep uncertainty about both the chance that a threat may materialize and the escalatory trajectory it may follow. In this domain, threats do not develop in a linear or even cumulative fashion; apparent improvements in the situation may conceal longer-term deepening of the threat(s). This deep uncertainty is accompanied by an absence of immediate urgency, even if the destructive potential of the threat is easy to imagine, including likely accompanying political dynamics.

This blurring of the worlds of crisis and risk present distinct challenges for the worlds of research and practice. We lack a proper mode of governance for this domain. This presentation sketches the outlines and challenges of this domain, and explain the questions that drive our research agenda.

Petter Almklov, NTNU Samfunnsforskning

‘Infrastructure and emergent dependencies.’

This presentation explores ways of better understanding critical infrastructures through the prism of ‘infrastructuring’ and the uncertainties its processes (ex)pose. This way of parsing critical societal operations is particularly useful for discussing the emergence of new infrastructures or “infrastructure-like systems” in terms not just of the benefits they promise but also the vulnerabilities they materialize. This analytic focus is particularly appropriate given the accelerating introduction, and wider implications of new digital technologies, taking on infrastructural roles for work practices and social and societal organization.

I understand infrastructure not as technologies or a technical system per se. Rather, infrastructure is more productively understood as the result of a co-evolution of practice and a networked system, where the practice ends up depending on the network and in this way where the network becomes infrastructural for said practices. This co-evolution and dependence represent a relational understanding of infrastructures, in the sense that what we describe as infrastructure refers to a specific form of relation between the system and practice.

Why is this important for understanding and better addressing wider uncertainty?

Critical infrastructures have traditionally been seen as Achilles' heels of modern societies, a source of vulnerability either for internally caused failures or to external threats, such as storms or floods or intentional attacks. As a consequence, researchers interested in societal security and resilience have had an interest in societies' exposure and vulnerability to break-downs. The perspective presented here complicates the matter by showing how innovative success and potential infrastructure breakdowns are emerging relational phenomena.

Taking the most noted example, a couple of decades ago GPS was a system for specialists, necessitating specialized equipment and competence. GPS is now everywhere in our lives, finding new usages both in professional and private sector practices and networks. It is something we depend upon and has become, more formally, an underlying structure (infra-structure) in relation to which everyday and professional practice is built. It is an infrastructure, not primarily due to its technical design, but also because the innovation that occurs on top of it. Conversely, some systems, such as the Norwegian digital mail system Digipost, are built to be infrastructures, and fulfil all the technical requirements to be just that, without establishing the relations with practice that makes it an infrastructure, let alone a critical one.

For professionals and researchers interested in society-wide security and resilience, this means new dependencies and associated uncertainties are emerging all the time, the upshot being that such infra-structuring makes it imperative to trace uncertainty outside of traditional infrastructure domains. Critical infrastructure, understood as large-scale socio-technical systems upon whose reliability societal key societal functions depend, cannot be reduced to the traditional lists such as energy, telecom, water supply, transport etc., but need to be seen as a dynamic phenomenon where a relational understanding of the emergence of dependency is put in the centre. Infrastructuring, in this view, can and does occur in settings without large-scale infrastructures and densities associated with wealthier nations.

For policy and public administration, this means that risk and uncertainty management focuses not only on preventing or mitigating technical breakdowns, but also on emerging dependencies whose innovation-side has yet to evolve or emerge into more visible vulnerabilities and uncertainties. But just what are those uncertainties ahead? This presentation seeks to provoke new discussion how such uncertainties regarding new, often hard to find, pathways of dependency are and can be managed.

Theme: Expanding cities

The twenty-first century is the urban century. Cities are heralded as the places that will address climate change, reinvent economic growth, and create new forms of political and social inclusion. At the same time cities are chronically underfunded and over-burdened, home to deeply divided communities and decrepit infrastructure, struggling with chaotic unplanned growth and chronic pollution. These divergent narratives of hope and despair spring from a deep uncertainty surrounding the future of humanity as an urbanised species. What will the megacities of the future look like and how will they cope with unprecedented scale and complexity? What new ways of governing, planning and living cities will emerge to make us happier and healthier? Whose responsibility it is to even address these questions? Never before has the future of cities been so uncertain, and yet so important to our future prospects.

This session asks how uncertainty is driving new approaches to urban challenges. It asks how different kinds of uncertainty are determined and managed in cities, by who, and based on what types of knowledge and techniques of governance. Uncertainties posed by large scale automation of workforces, disease outbreaks and chronic long-term health challenges of disease, obesity, pollution and aging present transformative challenges to urban authorities and inhabitants. The session will outline how these forms of uncertainty are stimulating experimental forms of urban development and governance and with what implications. It will interrogate the degree to which such approaches can become business as usual, and develop an understanding of how uncertainty can generate positive transformation.

Theme lead

James Evans, University of Manchester

‘Beyond the Experimental City: From the governance of experiments to experimental governance.’

This paper seeks to recover urban experimentation as a progressive and transformative project by understanding its role in mediating uncertainty.

Contrasting examples are used to argue that while traditional organisations are fundamentally unable to adapt to uncertainty while they are based upon fictional promises of certainty, uncertainty can be addressed by conceiving of urban experimentation as a deeper process of experimentation with governance itself.

The first example comes from smart cities in the global north and relates to digitally enabled urban observatories that use cutting edge sensors to monitor urban processes. Urban observatories promise cities the ability to make more efficient and effective decisions and policy based on real time data that reveals hitherto invisible insights into how cities operate. In practice the promise that ubiquitous data will vanquish uncertainty is misleading though, and actually postpones the organisational changes required for cities to manage their resources more sustainably. The second example focuses on informal transport in East Africa, which shows a remarkable level of resilience and adaptation to urban uncertainty. Informal transport is largely ignored by planners though as it does not 'fit' with the fictional certainties of formal planning categories and strategies. Informal transport is too uncertain and, borrowing from Ranciere, is excluded from debate as it does not inhabit the realm of the sensible.

In both cases, experimentation is required with both physical and organisational contexts simultaneously to open up space for uncertainty. Put another way, uncertainty requires the governance of experiments to be accompanied by experiments in governance that enable organisations to be able to work with, rather than against, uncertainty. The paper concludes by examining proto-examples from the UK and the Netherlands of what this might look like at the level of the municipality.

Panel

Sobia Ahmad Kaker, Department of Sociology, Goldsmiths

'Circulating uncertainty: Governing ordinary uncertainty in Karachi.'

This paper departs from debates that address uncertainty as a security condition that is governed through anticipatory politics that apply the precautionary principle (DeGoede and Randalls, 2009; Zedner, 2007;

Anderson, 2010). Instead, it focuses on 'ordinary uncertainty' as an everyday urban condition in many contested cities. In this paper, I will explore 'ordinary uncertainty' as a condition that is tied to insecurity events such as everyday street crime, protests, political conflict, and police operations; and as a condition that is experienced by urban residents in their daily movements in and about the city. By presenting the case of Karachi, the Pakistani megacity, I argue that urban residents are able to navigate ordinary uncertainty by applying their knowledge of a shifting future, learnt from futures past. Having lived through recurrent moments of severe insecurity for the last three decades, I argue that Karachiites have developed a sensibility- a learning of the city- based on the city's violent past. Their ability to predict times and places of future insecurity, however, is heavily dependent on the exchange of information. Warnings spread through social media, unfortunate personal encounters and experiences of victimization shared over causal conversations, and news gleaned from local and national newspapers and news channels are all important to Karachiites, who use this information to predict and speculate on what consequences each violent act will have on particular ethnic groups or urban spaces and at what times. After outlining the practices and technologies used by residents in living the uncertain city, I will conclude by arguing that although current practices mostly 'work', it is important not to romanticize them as a celebration of 'urban capabilities'. A careful analysis of existing infrastructures of informational exchange reveals that security related information which urban residents overwhelmingly rely on is largely political. Questions relating to how this information is produced, who is mobilising it in position to other interests, and with what results signify how the very medium that ameliorates uncertainties for urban residents is also productive of uncertainty in Karachi.

Saska Petrova , Geography, SEED, MUI, University of Manchester

'Urban(ised) energy precarity: uncertainty and timeframes of action.'

'Precarity' has been used as a signifier of crisis and uncertainty. It also allows us to revisit current debates about emerging conditions of urban living. This presentation deploys the conceptual frame of 'energy precarity' to examine the everyday dealings associated with uncertainty and

precarious energy infrastructures in urban geographies. The presentation unpacks how people who are faced by uncertainty develop specific timeframes of action. To capture how energy precarity is manifested and experienced as a socio-material process in uncertain times, it argues for an understanding of precarity in flux, to account for the dynamic politics of vulnerability and agency in relation to space and time. The arguments are supported by evidence from case studies in South Africa and Greece.

Gabriele Schliwa, Utrecht University

‘Computational problem-solving in response to uncertainty?
Understanding urban governance innovation through the lens of “design thinking.”’

This talk raises attention to still understudied design thinking practices in contemporary governance innovation to understand their relevance in relation to urban uncertainty. Design thinking originates from ICT development and gained prominence after the 2008 financial crisis as an approach for creative problem-solving in the context of business management and innovation. Meanwhile, design thinking is increasingly promoted and appropriated across fields as diverse as public policy (Kimbell, 2011; Bason, 2014), urban resilience (Grove, 2017) or military operations research (Zweibelson, 2016). Particularly civic hackathons and innovation labs represent energetic workshop-type events that are facilitated by designers or through design thinking toolkits in the promise of solving complex urban issues with multiple stakeholders - in less than 48 hours. In line with this development, design is today understood as knowledge culture (Mareis, 2011). As contemporary innovation activity tends to maintain or even reinforce existing inequalities (Krivý, 2016; Luque-Ayala and Marvin 2016; Kaika, 2017; Hodson et al. 2018), the question arises how to conceptualise emerging innovation practices to counteract these tendencies.

This research is grounded in 18-months of active participation in civic hackathon events in Manchester and 4 years of ethnographic study of different urban innovation events. Drawing on the notion of urban computational dispositif (Gabrys, 2014), I conceptualise design thinking as a device that introduces an operational logic of computational problem-

solving into urban governance. Human thought and knowledge production become thereby interoperational with digital technologies as a result of the computational nature of innovation practices and events. This trend runs risk to depoliticise ways of thinking as well as normalise operational modes of governing and knowledge production. Considering the 'design methods movement' of the 1960ies, that emerged in times of global uncertainty, today's design thinking movement indicates a reoccurring phenomenon that requires critical engagement to harness its potentialities in expanding cities.

Federico Cugurullo, Department of Geography, Trinity College Dublin

'Autonomous cars and the sustainability of the city: the roads ahead.'

Autonomous cars are increasingly being integrated into the transport portfolio of cities, and there are many question marks regarding how the built environment might evolve, to accommodate this transformative technology. More specifically, there is a great deal of uncertainty about how autonomous cars will impact on the sustainability of cities.

If the advent of autonomous cars is aligned with sharing services, for example, car ownership and so the number of cars in the city can potentially decrease. As a result, many urban spaces currently designed for cars could become obsolete, thereby becoming prone to being repurposed as cycling lanes, gardens and public places, to improve the sustainability of cities. However, the development of highly comfortable self-driving cars promising productive and recreational onboard activities, could increase the demand for cars, and so the amount of urban spaces and energy that is necessary to sustain them.

The narrative of this paper is twofold. First, it explores some of the likely urban scenarios that the diffusion of autonomous cars might realize, with a focus on their sustainability implications. Second, it examines the evolution of the city of autonomous transport as a political process. The argument is that in an era of self-driving cars, urban sustainability will not be merely a matter of technological innovation, but rather of urban politics and governance.

Andrew Karvonen

KTH Royal Institute of Technology

Uncertainty is a defining characteristic in the governance of climate change in cities, both in defining the problem at hand as well as developing potential solutions. There is increasing acknowledgement by urban stakeholders of the indelibly provisional and dynamic character of urban change and the subsequent embrace of adaptive styles of governance that can respond to the emergent properties of urban systems. A particularly intriguing manifestation of uncertainty can be found in peri-urban areas where climate impacts, risks, and vulnerabilities will arguably hit hardest. It is here where there is both a significant need as well as multiple opportunities to develop innovative approaches to governance that simultaneously draw upon spatial development, ecosystem services, and networked economies. These synergistic modes of governance are informed less by conventional instruments of policies, incentives, and regulations and more by responsive and flexible approaches that are simultaneously adaptive, negotiated, and opportunistic. In this presentation, I will share some early insights on a new project, PERI-CENE: Peri-Urbanisation and Climate-Environment Change, that involves a comparison of the peri-urban areas in Chennai in Southern India and Manchester in Northern England. The aim of the project is to develop synergistic modes of governance that leverage the spatial uncertainties in peri-urban areas to enhance long-term climate resilience.

Matthew Cook

School of Engineering and Innovation, The Open University

‘Constructing Risk and Uncertainty in Smart Cities.’

Smart city developments have emerged as one of the main ways for cities to address climate change, promote economic development and augment infrastructure. However, while smart cities are the subject of a burgeoning literature there is a paucity of research which explores how notions of risk and uncertainty manifest in the actually existing smart city.

In response, this contribution draws on longitudinal case study research that investigates how a smart city platform called MK:Smart was constructed to resolve problems with ageing infrastructure in Milton Keynes (MK). Focusing on actors and relations in governance spaces situated in the formal and informal institutional landscapes associated with MK, the research reveals a profoundly political process with different versions of smart and different versions of MK co-constructed along with notions of risk and uncertainty.

The work suggests that although smart city visions tend not to lack humility, constructing actually existing smart city developments may be emblematic of governance modalities based on tentative processes of 'trial and error'. In the absence of formal learning, whether such activity meaningfully accords with an urban living laboratory disposition or provides a convenient positive post hoc rationalisation is unclear. Further, while smart city projects in MK are variously aligned with city transport planning priorities (e.g. to reduce congestion), there is a palpable sense in smart city governance of a capacity for action but not of control; of the need to steer social messy, contingent processes. Indeed, despite the rhetorical claims of various planning epochs, planning practice has perhaps never been a modern technocratic institution but one mainly founded on negotiation, identifying and realising 'windows of opportunity', perhaps embracing uncertainty rather than risk. Thus when the smart city is constructed through existing city governance practices its technocratic intents are perhaps, far from fully realised.