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Urban governance and policy mixes for nature-based solutions and integrated water policy

Nick Kirsop-Taylor[a], Duncan Russel [a] and Anne Jensen[b]

[a]Politics Department, University of Exeter, Exeter, UK; [b]Department of Environmental Science, University of Aarhus, Aarhus, DK

ABSTRACT

This paper explores how varied systems of governance work at the European city level to deliver different policy mixes for implementing nature-based approaches which support integrated water management and policy. Urban systems provide unique insights here due to the concentration of consumption, economic activities and excessive land-use pressures. However, few studies are providing generic insights, rooted in policy and political theory perspectives, on the dynamic impact of urban governance systems on different mixes of policies to integrate urban nature and water management approaches. The paper fills this gap through an extensive literature review. It first draws on analysis that focuses on institutional logics of operation to understand how urban institutional arrangements of governance shape the framing of the policy problem and how this influences the choice of policy approaches. It then explores the related administrative processes including decision support tools, participatory approaches, and funding regimes. These administrative approaches deliver, potentially, different policy responses that take into account integrated nature-based policy approaches to urban water governance.

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1. Introduction

Across cities in Europe, climate change impacts expose critical challenges for water management particularly in relation to flooding and run off which tend to be beyond the scope of traditional command and control policy interventions. Dense populations and non-porous man-made surfaces make urban areas particularly susceptible to poor drainage, with associated increasing risks of flooding of public, commercial, and domestic infrastructure. The problems that climate change poses to urban water management are complicated by the fact that solutions reside in different policy sectors (Schaub et al., 2021) (e.g. planning, transport, recreation, nature conservation) and require integrated policy approaches (see, e.g. Adelle & Russel, 2013; Russel et al., 2020). Crucially, while interdisciplinary approaches are recognised as at the forefront of integrated environmental decision making to address such issues (Perz et al., 2010), there is a historic and growing body of scholarly studies seeking to address interdisciplinary governance challenges (e.g. Fish et al., 2010; Russel et al., 2018). One facet of this literature considers the role of governance types and mixes of policy instruments on driving policy innovation that targets integrated policy making for governance. Within this context, urban spaces are increasingly seen as critical testing grounds for the challenges of developing and operationalising integrated socio-environmental policy across multiple levels of governance (Bulkeley, 2010; Bulkeley et al., 2016; Jensen et al., 2020).[1]

Perhaps the most pressing concern in integrated policy innovation in European city contexts lies around its agenda for the use of nature-based solution (NBS). As per the International Union for the Conservation of Nature (2020), NBS is:

CONTACT Nick Kirsop-Taylor n.a.kirsop-taylor@exeter.ac.uk Politics Department, University of Exeter, Amory building, Rennes Drive, Exeter, Devon, UK

actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.

Policymakers increasingly acknowledge NBS as offering solutions to key societal challenges within multiple sectors in urban/peri-urban governance (Dunn et al., 2017). In parallel, the potential of NBS for delivering solutions (Connop et al., 2016; Raymond et al., 2017a) that concomitantly benefit improved citizen wellbeing and health, community cohesion, enhancing and restoring urban biodiversity, sequestering carbon, improving air quality, and urban flood management (see: Connop et al., 2016; Halbe et al., 2018), thus integrating water management with other key challenges.

The term NBS is often used interchangeably with others, such as urban ecosystem services (Almensar et al., 2021), green infrastructure (Rolf et al., 2020), green–blue spaces and urban greening (Baravikova, 2020); though as noted by Pauleit et al. (2017), the term NBS represents a distinctive type of governance intervention. Among cities and policy makers, NBS, most often in the form of their synonymous terms, have gained recognition over the last decade, and especially in the last five years after the EU's strategic focus on using NBS to address climate change (Baravikova, 2020; Pasimeni et al., 2019). NBS increasingly form a cornerstone of the EU's climate policy, and Europe has seen a proliferation of NBS experiments in Germany (Albert et al., 2019; Duskova & Haas, 2020; Frantzeskaki et al., 2017) Sweden (Suleiman et al., 2020), Italy (Pasimeni et al., 2019), the Netherlands (Dunn et al., 2017), the UK (Connop et al., 2016; Frantzeskaki et al., 2020) among others (Baravikova, 2020; Camps-Calvet et al., 2015). Urban NBS has been shown to complement integrated water management approaches across EU member-states (Krause & Wagner, 2019) and holds a yet underexplored potential for urban policy innovation, such as using NBS for reducing water pollution in integrated peri-urban spaces in Italy (Liquete et al., 2016) or in supporting communal gardens as part of integrated water management approaches (van der Jagt et al., 2017). NBS is increasingly advocated as lower-cost alternatives to technological solutions (Droste et al., 2017). Crucially, NBS is viewed as multifunctional and integrated policy approaches to using nature to achieve broader policy objectives around well-being and equity, and are at the sharp end of the implementation of integrated water management at local scales (Bennett et al., 2016); i.e. through taking an integrated multi-functional perspective (Dorst et al., 2019), the implementation of NBSs offers important insights for integrated urban water policy and management. Currently, the literature at the nexus of integrated water management, innovative policy approaches and NBS is however fragmented, while holding an important potential for addressing challenges around integrated water management. This paper therefore examines advances in the existing literature on urban governance experiences with NBS solutions, with the overall aim of gaining insights on advances in NBS as approach to integrated water management, particularly in relation to the challenges that manifest around pursuing integrated urban water governance. A crucial aspect concerns how NBS is operationalised and put into policy action to mitigate challenges for integrated water management. Operationalisation of NBS as element around which policies are developed is manifest in the choice and design of policy instrument that supports the policy objectives. By policy instruments, we refer to 'myriad techniques at the disposal of governments to implement their policy objectives' (Howlett, 1991, p. 2). The uptake of NBS in urban policy thus affect not only the design of policy, but also the instruments to implement them, and may signpost a change in the way policies and policy making is conceived and conducted, i.e. the logic of operation in the policy institutions.

There has been a growing research literature into NBS spurred on by the EU Science and Policy agenda for NBS (Frantzeskaki et al., 2020). These highlight a proliferation of EU urban policy experiments seeking to operationalise NBS (Frantzeskaki et al., 2020) to deal with critical issues such as water management in European cities. A mounting subset of this literature has started to acknowledge the importance of transferring these experimental approaches into national and municipal level policy frameworks (Albert et al., 2019; Bush, 2020). Whilst there have been thought-provoking contributions delineating boundaries to the NBS policy discussions (Frantzeskaki et al., 2020; Raymond et al., 2017a), and experimental politics (Bulkeley et al., 2016), contributions from a policy science perspective are frustratingly few, reflecting how only a few studies have invested efforts in applying the approaches of policy sciences to the problem of operationalising NBS in governance. This paper seeks to meet this deficit by systematically reviewing the extant urban European NBS

policy literatures, with the aim of analysing the body of current literature that provides insights on cases of experimentation that precipitates the development of policy instruments (see: Jordan et al., 2013) for the implementation of NBS policy. In assessing the literature selected for the review, the study asks the question of whether existing case studies indicate how different governance configurations in European urban settings promote different mixes of policy instruments for NBS.

The next section of the paper introduces and explains the key terminology and conceptualisations used in the review of the literature. Section 3 offers a methodology for the systematic review, before the key findings are set out in Section 4. Section 5 offers a discussion of the findings ahead of Section 6, which presents the principal contribution of the paper and areas for future research.

2. Key concepts

Governance configurations denote the context for policy development, where policy institutions develop particular perceptions of how policy problems are addressed and policies designed (Olsen, 2001). Policy institutions operate with institutional logics that determine not only how policy issues become policy problems and policies are designed to manage these, but also how this process takes place, i.e. who are assigned roles and agency in the policy process, and which forms of (institutional) practices are promoted, e.g. NBS/water management policy and mixes of policy instrument to implement these (March & Olsen, 1994). This paper thus approaches the questions of what insights can be gained on how urban governance configurations, i.e. the policy institutional setting, promote mixes of policy instruments for NBS through assessing the current literature using two specific analytic lenses: (1) institutional logics of operation (see: Russel et al., 2018), and (2) how these impact upon institutional dynamics (processes, institutions, tools/instruments, regime).

Before proceeding, key terminologies are clarified. As noted in Schaub et al. (2021) earlier in this special issue, water governance crosses many interests. This leads to complex management decision-making rife with trade-offs, policy responses (Tosun & Lang, 2017) and ultimately mixes of policies (Howlett & Rayner, 2007; Pakizer et al., 2020; Schmidt & Sewerin, 2019). *Policy mixes* refer to the various and differencing assemblages of policy instruments that policy makers seek to design for meeting complex interdisciplinary policy areas (Pedersen et al., 2020). And although policy mix designs ostensibly seek to maximise synergistic effects through coherent policy mixes (Howlett & Rayner, 2007), they can often lead to counterproductive effects (Howlett & Cuenca, 2016). Whilst a wide array of different policy instrument mixes are utilised internationally, this paper focuses on the three most common types of instruments used in environmental policy (Jordan et al., 2013); mixes of knowledge-based instruments (KBIs), market-based instruments (MBI), regulatory instruments (RI).

As mentioned above, *institutional logics of operation* refer to the 'socially constructed historical patterns of material practices, assumptions, values, beliefs, and rules by which produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality' (Thornton & Ocasio, 2008). Such institutional logics have been shown to play a significant role in determining whether integrated approaches to environmental policy are successful or not (see, e.g. Russel et al., 2018). We are therefore interested in whether they have a role in the success of NBSs, assist in promoting the uptake of NBS, and what this might mean for integrated water management.

In addressing the link between generic or the higher-level politics of water management and urban policy making to manage water challenges within institutional logics of operation, the practice of everyday policy making in public administration are particularly relevant. *Administrative dynamics* are common conditions and concerns that delineate and permeate the practices of public administration (Gulick, 1983). These dynamics often bridge the theoretical and practical in normative public administration scholarship (e.g. Wiemer, 2020); issues such as autonomy, centralisation, discretion, accountability; or budgeting, organisation, or learning and trust.

3. Methodology

This paper undertakes a systematic review of the literature pertaining to show how varied systems of governance (at European city level) deliver different policy mixes for the delivery of NBS policy approaches.

Systematic reviews are important approaches to synthesising key learning from complex and rapidly developing literatures (Bramer et al., 2018; Wilczynski, 2017), especially from emergent policy literatures, and produce findings that are systematic, précised, and robust (Malterud et al., 2018). Systematic reviews in the social sciences can engage with both qualitative and quantitative contributions for mixed-method review types (Bramer et al., 2018); and differ from narrative reviews (Usman, 2011) which tend to be descriptive, un-systematic, and prone to author selection bias (Hemmingway & Bereton, 2009).

We use a systematic review to systematically capture the diversity of findings from the rapid proliferation of NBS-policy studies in European contexts in recent years (Seddon et al., 2020). We first devised a systematic review process (Khan et al., 2003) comprised of (a) framing research questions, (b) identifying all relevant studies, (c) assessing the quality and contribution of each, (d) synthesising and analysing the findings, and (e) interpreting findings to draw impartial and balanced conclusions. Crucially step b) should be extensive and without language barriers, and selection criteria followed from our overall research aim. Studies were included if they (a) were based on European urban cases, (b) had a policy-orientation and (c) had a water-management and/or NBS subject matter.[2]

Congruent with contemporary best practices for systematic reviews (see: Xie et al., 2018) we utilised multiple digital academic search engines and bibliographies due to their near-total digitisation of paper sources (Bramer et al., 2017), namely Google Scholar Web of Science and the EBSCO database. The three principal search strings that were utilised, and reporting on the findings at each stage of the process outlines above (Khan et al., 2003) can be found at Appendix 1.

4. Findings

Of 55 articles identified 32 were focused on the EU, 25 of them gave references to forms of policy instrument, 16 of them discussed the administrative dynamics of NBS, and 18 discussed the institutional settings of NBS. The articles explored European NBS and policy approaches across multi-level governance; totalling 14 articles at the municipality-scale, three regional-scale articles, three national-scale articles, and 15 EU-scale articles. The majority of articles conceptualised the policy approach as NBS ($n-15$) compared to urban green infrastructure ($n-4$) and ecosystem-based adaptation ($n-3$); and others discussed NBS in terms of other management concepts ($n-4$).

The case-based articles offered a broad spread of EU geographic cases, including, at the municipality-scale in Spain (Barcelona – Suleiman et al., 2020), Poland (Poznań – Zwierzchowska et al., 2019), Sweden (Stockholm – Frantzeskaki et al., 2017), the UK (London – Raymond et al., 2017a), Germany (Leipzig – Duskova & Haas, 2020), Belgium (Genk – Frantzeskaki et al., 2020), and the Netherlands (Rotterdam – Dunn et al., 2017).

4.1. Policy instruments

Of 25 articles that discussed forms of policy instruments in the implementation of NBS, 11 focused on municipal-regional scale cases ($n-2$), one was at national-scale, and three at EU-scale (with the others being generic). Many focused on policy instruments in the same discourse as planning ($n-21$) (e.g. Albert et al., 2019; Raymond et al., 2017a; Suleiman et al., 2020). Fewer articles focused with detail on MBI ($n-6$) (e.g. Raymond et al., 2017b), on KBI ($n-9$) (Bush, 2020), and on RI ($n-5$) (Zwierzchowska et al., 2019). Some offered examples of policy instrument mixes, such as Suleiman et al.'s (2020) case study of Barcelona, Spain, where both KBI and MBI were used simultaneously to incentivise NBS. Or Zwierzchowska et al.'s (2019) case of Poznań (Poland) on the combined use of both KBI and RI to facilitate the development of urban NBS.

4.2. Administrative dynamics

The review revealed 18 articles that discussed the role of 'administrative dynamics' in the operationalisation of NBS policy mixes. Three articles discussed the role of public municipality funding, in terms of accessibility, longevity, and the discretionary abilities of public servants to support NBS schemes (Droste et al., 2017;

Raymond et al., 2017b). Similarly, Frantzeskaki et al. (2017) found that more devolved local city level administrative autonomy in Stockholm facilitated longer and better support of urban NBS experiments. A similar observation was made by Sarabi et al. (2019), where limited administrative autonomy was argued to be detrimental to the experimental requirements of urban NBS. Baravikova (2020) highlighted the challenges to NBS experiments where politicians and policy makers hold antithetical political views about climate change and urban renewal. Similarly, Dunn et al. (2017) noted the potential temporal mismatch between political-funding cycles and long-term NBS projects. In contrast, Suleiman et al. (2020) found that political support is critical to overcoming administrative barriers. The subject of administrative siloing was raised in five different studies (Davis & Naumann, 2017; Frantzeskaki et al., 2017, 2020; Papparlardo & La Rosa, 2020; Sarabi et al., 2019), where it was seen as a key barrier to NBS policy instrument success. In Stockholm, this included the role of 'silo-busting' city administrators who sought to break down administrative silos that often-stymied new NBS projects straddling different departmental interests (Frantzeskaki et al., 2017). Dunn et al. (2017) explored the criticality of boundary actors for working across silos in facilitating and encouraging NBS in the city of Rotterdam. Suleiman et al. (2020) noted how periods of political/administrative change and reform had the potential to open 'windows of opportunity' for developing NBS projects. An important finding in three studies was the importance of public administrators as foci for bottom-up collaborative governance-based NBS partnerships (Frantzeskaki et al., 2020; Nesshover et al., 2017; Raymond et al., 2017b).

4.3. Institutional logics

There were however fewer (n−18) findings related to the institutional logics effecting NBS experiments. Sarabi et al. (2019) investigated how financial resources, agency, path-dependencies and institutional fragmentation in post-austerity planning agencies afforded barriers for NBS instrument implementation. Similarly, Droste et al. (2017) noted how the structures of municipal revenue generation can hinder the long-term support of NBS experiments. Baravikova (2020) made a related point about how municipality-scale politics and power structures can weaken NBS policy instrument effectiveness – where politicians and policy makers are dismissive or uninformed about the value of NBS. This was part of a wider argument (Sarabi et al., 2019) about the orientation of institutional path-dependencies towards grey urban water management solutions (as opposed to NBS). Davis and Naumann (2017) argue that institutional awareness of, and comfort with, private-public partnership governance approaches at municipal scales can support the operationalisation of NBS. In a similar vein, Duskova and Haas (2020) note that governance cultures of bottom-up, citizen-led and participatory NBS experiments were more likely to be successful over the longer term in Leipzig. Both Frantzeskaki et al. (2020) and Sarabi et al. (2019) also noted how an availability of land and space in urban settings for NBS experiments was also an important success factor and helped to steer the selection of policy instruments.

5. Analysis

5.1. Policy instruments for urban NBS

The systematic review revealed the use of four key policy instrument types for urban NBS experimentation. These were comprised of mixes of KBI, MBI and RI (see: Jordan et al., 2013). These three principal types represent, arguably, a limited range of instruments; though this correlates with the nascent nature of NBS experimentation in Europe over the last five years suggesting that the 'toolbox' of instruments that policy makers might use in cases of NBS is limited and still quite exploratory in nature.

5.1.1. Knowledge-based instruments (KBIs)

The majority of studies discussed the use of KBI for operationalising urban NBS experiments (e.g. Baravikova, 2020; Davis & Naumann, 2017; Frantzeskaki et al., 2017; 2020; Raymond et al., 2017a; Zwierzchowska et al., 2019). The articulated instances of KBI were aimed at audiences across multi-levels of governance – from

knowledge about projects aimed at engendering community-scale stakeholder support, to reporting aimed at municipality-scale public actors, or brokering results and evidences about NBS experiments to influence national policy making and policy development activities. They included public awareness campaigns, information about NBS options for community groups, information for citizens about new NBS regulations etc.

5.1.2. Market-based instruments (MBI)

A limited number of articles examined cases where MBI were utilised. These took the form of limited incentive schemes for the setting up on NBS experiments, and revenue generation schemes for the maintenance of NBS schemes (Barcelona). There were only a few examples of MBI for NBS given in the literature and these were mainly utilised at community scales (Raymond et al., 2017a; Sarabi et al., 2019).

5.1.3. Regulatory instruments (RI)

Many of the studies also discussed the use of city-level RI for promoting the uptake and operationalisation of NBS. These were legislative tools for coercing engagement and compliance with certain aspects of NBS in the city. These included regulations around natural urban drainage (Davis & Naumann, 2017; Papparlardo & La Rosa, 2020), afforestation (Baulenas & Sotirov, 2020), building regulations for green roofs (Suleiman et al., 2020).

5.2. Public administrative dynamics and instrument selection of NBS

The review discerned four key dynamics of public administration that influenced policy instrument mixes for NBS. Each of these administrative dynamics is shown in Appendix 2 in terms of its strong and weak occurrence and of the implications of these upon instrument mix selection-occurrence.

5.2.1. Control over and longevity of municipal funding

How public funding was controlled, allocated and used to support experiments through time was found to be an important element in the success of urban NBS (Droste et al., 2017; Dunn et al., 2017; Frantzeskaki et al., 2017). Where funding to support experimental projects was longitudinally high and consistent there was a tendency to use instrument mixes of collaborative, broad and participatory urban planning (Duskova & Haas, 2020); and to use KBI to increase awareness amongst stakeholders and policy/administrative actors. In contrast, where municipal funding was viewed as inappropriately low and longitudinally inconsistent, there appeared a tendency to prioritise un-collaborative and top-down instruments such as, local RI, and/or shifting responsibility for NBS projects away from the 'public sphere' to market mechanisms (Droste et al., 2017; Frantzeskaki et al., 2017). Broadly speaking, high levels of decentred control over funding streams leading to funding consistency led to more bottom-up orientated policy instrument mixes (Kabisch et al., 2017). Conversely, more centralised control of funding streams led to lower levels of funding for NBS experiments and less consistency of funding, which precipitated more top-down orientated policy instruments (congruent with Pakizer et al., 2020; Pedersen et al., 2020; Schmidt & Sewerin, 2019).

5.2.2. Bureaucratic discretion and autonomy

The review found that the relative degrees of autonomy and discretionary decision-making enjoyed by public administrators were an enabling component in urban NBS experiments (Frantzeskaki et al., 2017). Where there were high levels of autonomy and discretion there was a tendency to utilise policy mixes of participatory planning and knowledge (Droste et al., 2017). This tendency was due to perceptions of place-based complexity and inter-disciplinarity being best resolved through bottom-up citizen initiatives supported (and guided) by facilitative bureaucratic and voluntary partners. Where municipality-scale administrators were allocated discretionary powers to experiment with urban NBS, they tended to select open and plural instrument mixes (Sarabi et al., 2019). In contrast, where administrators enjoyed less discretion and autonomy there was a tendency to employ top-down RI combined with KBI to stimulate the implementation of NBS policy experiments (Raymond et al., 2017b).

5.2.3. Administrative cohesiveness

The review also revealed the important role of administrative cohesiveness; that is, the degree to which administrative organisations, institutions, and service delivery mandates at municipal scales are coherent and cohesive (Davis & Naumann, 2017; Frantzeskaki et al., 2017; Sarabi et al., 2019). The studies often reported a tendency to relate administrative cohesiveness to administrative siloing (Davis & Naumann, 2017; Frantzeskaki et al., 2017, 2020). Counter intuitively, where administrative units were deemed coherent, there was an expressed sentiment of them being more likely to be willing to engage in interdisciplinary work across silos – a critical endeavour for successful NBS experiments (Frantzeskaki et al., 2017). Conversely, those administrative units considered to be fragmented were often also discussed in terms of their limited capacities for working in interdisciplinary fashion beyond their own silos (Papparlardo & La Rosa, 2020). In the relatively more cohesive, and therefore interdisciplinary administrative units (see: Frantzeskaki et al., 2017; Suleiman et al., 2020), there was an expressed preference towards participatory planning and KBI (Howlett & Rayner, 2007). Conversely, in fragmented and siloed administrative settings there was an expressed tendency towards using non-participatory planning processes, RI, and MBI (Frantzeskaki et al., 2020). In short, increasing administrative cohesiveness precipitated enhanced interdisciplinary 'silo busting', NBS experiments and bottom-up style policy instruments (Frantzeskaki et al., 2017); and decreased administrative cohesiveness, leads to greater siloing and precipitates more top-down and coercive style instrument mixes.

5.2.4. Political actors

The review also revealed several perspectives on the role of political and/or institutional boundary actors in the success of urban NBS experiments (Baravikova, 2020; Duskova & Haas, 2020; Frantzeskaki et al., 2020; Suleiman et al., 2020). Where city or regional level politicians were engaged in the process of supporting NBS experimentation there was a proclivity towards supporting the use of evaluating policy instruments performance to construct more robust cases for support and development (Suleiman et al., 2020). The involvement was often accompanied by an understanding of the power of (quantified) evidence derived from monitoring for continuation and enhancement (Suleiman et al., 2020). It was also found that active political champions tended towards also being supporters of bottom-up participatory planning approaches and the use of certain types of knowledge dissemination as a tool for shaping behaviours and interests (Duskova & Haas, 2020). In contrast, where political actors were reported as being disengaged with urban NBS experimentation, there was a propensity for non-participatory planning and RI – often discussed in terms of urban administrators using the most defensible policy instruments to hedge against potentially negative political interventions (Baravikova, 2020; Zwierzchowska et al.; 2019). Taking this further, in the sole case where political actors were discerned as hostile to urban NBS there was an even greater sense of instrument selection being about defending bureaucratic accountability.

5.3. Institutional logics of operation

The second analytical frame deployed in this study was the *institutional logics of operation* (see: Pierre & Peters, 2012; Russel et al., 2018). The review revealed five key strands of institutional logics pertaining to NBS experimentation in EU urban spaces – see Appendix 3.

5.3.1. Institutional logics of policy experimentation

Across multiple cases, the review revealed the importance of the place-based institutional logics about policy experimentation. Some evidenced what can be described as a more 'bottom-up' institutional logics of policy experimentation (Raymond et al., 2017a), while others considered policy experimentation a top-down and policy elite activity (see: Pagano et al., 2019; Zwierzchowska et al., 2019). These differing institutional logics were seen to affect the selection and/or occurrence of policy instrument mixes in cases. For example, in the case of Stockholm (Frantzeskaki et al., 2017) and Leipzig (Duskova & Haas, 2020), pervasively bottom-up institutional logics precipitated more inclusive and broad policy instrument co-creation in participatory planning. Conversely, in Polish urban examples Zwierzchowska et al. (2019) discerned that a general institutional

logic towards top-down policy experimentation precipitated out in elite decision making for RI supported by limited KBI.

5.3.2. Institutional logics about/for urban planning

The review discerned different institutional logics at play, with more rational and apolitical logics dominating discussions about planning for urban NBS; and more disjointed incrementalist (Lindblom, 1979) logics dominating discussions about translating planning experiments into policy. In many cases, NBS experiments were presented as being developed in apolitical planning (and administrative) environments in which logics of process, structure and the rational exposition of evidence dominated discourse and decision-making. Some cases explored how the apolitical institutional logics of planning precipitated co-benefits such as building social inclusiveness and perceptions of citizen agency over the urban landscapes (Frantzeskaki et al., 2017, 2020). Others reported on institutional planning logics were attuned to managing risk. Frantzeskaki et al. (2017) reporting on the city of Denk (BL), for example, found that there appeared to be a pervading logic that apolitical planning had the potential to inculcate the values of openness and collaboration into wider urban sustainability transitions, and in so doing support greater citizen trust, agency and ownership of NBS.

5.3.3. Institutional logics about/for urban politics and policy

A smaller number of cases discussed the challenges of reconciling the institutional logics of planning with the political logics of translating NBS into policy, challenging extant distributions of power in urban spaces (Zwierzchowska et al., 2019), or navigating politically fraught power structures (Baravikova, 2020). Suleiman et al. (2020) reported on how cases in London and Barcelona where local political actors orientated towards the logics of interdisciplinary problem-solvers who could rise above siloed interests to bring NBS projects forward. In these cases, local political actors were more likely to focus on instruments to support short and long-term project funding, leading to the use of MBI coupled with KBI to inform citizens and partners about the NBS – and the MBI that had been put in place. In contrast, Baravikova (2020) found that where urban political actors were more institutionally power-orientated, there was a preference for controlling NBS experiments to meet wider political ends, leading to the use of RI as tools of coercive control.

5.3.4. Institutional logics about/for path dependencies

Many of the articles discussed the challenges of overcoming institutional path-dependencies for NBS experiments; discussed in terms of traditional and existing approaches hindering 'new' approaches, finding the physical space for NBS (Kabisch et al., 2017), and inhibiting the creation of new purposeful RI (Sarabi et al., 2019). Many of the studies implied that in path-dependent urban governance settings there were institutional barriers towards innovation in NBS experiments, such as in their adherence to engineered urban water management solutions (Pakizer et al., 2020). In these cases, it was suggested that NBS experiments were increasingly faced the challenge of being pushed towards elite-managed/controlled and exclusionary institutional logics of planning which detrimented interdisciplinarity and experimental innovation. This can be summarised as institutional calcification in extant path dependencies will likely detriment interdisciplinary NBS innovation and experimentation.

5.3.5. Institutional logics about/for culture

Whilst it might be contentious to frame culture as a function of institutional logics, the review did highlight a limited number of studies discussing the relationships between culture, sub-cultures, and institutional logics in urban NBS experimentation. Though none of these offered suggestions about how these relationships effect policy instrument selection or mixes. For example, McVittie et al. (2018) considered how national and local cultures for collaboration should be considered as institutionally inclusive – and that would be broadly beneficial to NBS experiments. In contrast, Frantzeskaki et al. (2020) reporting on the city of Poznan noted how what was described as exclusive and elite institutional cultures could hinder the experimentation of urban NBS.

6. Conclusions

Our paper has synthesised and drawn lessons from the burgeoning literature on European urban NBS. As outlined in the introductory section, we take the perspective that multifunctional integrated approaches NBS are at the sharp end of policy implementation for integrated water management. Our systematic review approach identified 55 articles for review, and from these, we discerned some important new understandings about how instrument selection for (urban) NBS is contingent upon institutional logics of operation and administrative dynamics. In so doing we draw three broad conclusions from this review in relation to the NBS as policies addressing integrated water management at the local level, particularly with regards to integrated and multifunctional decision making.

6.1. One: knowledge instruments for multiple uses

Our review found that KBI was by far the most widely utilised policy instrument for pursuing integrated and multi-functional approaches to the environmental decision-making through urban NBS experimentation in the EU. Some used knowledge and information about local NBS experiments as a way of raising awareness, of engaging citizens in the process and projects, and for discussing and trialling future plans. Others found KBI being used as a tool for informing citizens about the new NBS RI. The use and purpose of KBI were varied. Some studies used knowledge to inform citizens about local scale urban challenges and how NBS might address these (to elucidate), others to catalyse the development of bottom-up NBS experiments within citizen and stakeholder groups, and others again to inform citizens about top-down decisions about NBS (e.g. RI). This has relevance to other integrated management problems (see: Krause & Wagner, 2019; Liquete et al., 2016). In the relatively early stages of experimenting with 'new' solutions to complex interdisciplinary urban governance challenges (such as integrated water management and policy issues), there is likely a preference for KBI that inform and elucidate opportunities and ideas for multi-functional understandings to inform more integrated policy-making approaches.

6.2. Two: top-down vs. bottom-up logics

The various studies offered many and competing perspectives on the institutional logics embedded in application of urban NBS, which have implications – some considered them a tool for building social solidarity, agency and resilience, and others as tools for replicating extant urban power and control architectures. However, in both cases, how these institutional logics shaped the forms and relative successes of NBS experiments was significant. These logics are clearly inter-related with issues of power, culture and path dependency, and this is an area for further exploration particularly with regards to how they facilitate or thwart the use of NBSs in their tackling of integrated and multifunctional decision making in complex policy areas such as integrated urban water management.

6.3. Three: instrument selection – institutions and administration

Our review found a growing body of literature highlighting the import of administrative dynamics and institutional logics on the policy instrument mixes for urban NBS in the EU. These findings reflect wider understandings about successfully delivering integrated urban water policy and management. It suggests that there is, potentially, a larger role for administrative and institutional forces in designing the policy instrument mixes that are used to address integrated management concerns. However, these various studies and reflections remain disjointed and do not yet amount to a critical narrative on the importance of public administrative dynamics for policy experiments, or on the role and importance of institutional logics in the roll-out of NBS across the EU to better include integrated thinking for integrated decision making at the local level.

Finally, this review and our analysis have revealed where there are gaps in knowledge which must be further explored. These gaps and other questions offer important building blocks for a future research agenda

spanning public policy, public administration and urban studies. The review revealed a paucity of research from the field of public policy about the challenges and opportunities of scaling up NBS policy and planning experiments into larger and more substantive policy. The 'scaling up agenda' is at the leading edge of considerations of how NBS will play a substantive role in helping the EU meet its ambitious climate agenda, and there are clearly opportunities for public policy scholarship exploring this scaling up phenomena. Moreover, the review revealed the emergence of a distinct yet nascent NBS policy literature, and there is thus further research to be conducted in delineating the dynamics and substance of the new NBS policy discourse. This review also revealed little about governance configurations and patterns for urban NBS – which, we feel, could offer a great deal of insights into the NBS field. Similarly, whilst some few studies touched upon the influence of politics and politicians in urban NBS projects, this was a relatively under-developed area with significant scope for additional research into the political motivations, drivers and contestations for NBS in urban settings. Finally, whilst this review revealed a number of studies discussing the influences of administrative dynamics on NBS policy experiments there are no dedicated applications of public administration theory to this, which appears a significant opportunity for evidencing the influence of different administrative settings on policy processes.

Notes

1. In the case of European Union (EU), integrated urban environmental policy is a key area for research and innovation funding (Frantzeskaki et al. 2020).
2. Conversely, studies are excluded where (a) they are duplicates, (b) they are not retrievable, (c) not about the key subject areas (e.g. European, policy orientation, water-management NBS).

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Notes on contributors

Nick Kirsop-Taylor is a Lecturer in the Politics Department at the University of Exeter in the UK. His problem-orientated research agenda explores and addresses critical global environmental challenges through the conceptual lenses of the state, governance, public policy and administration.

Duncan Russel is a Professor of Public Policy at the University Exeter. His research mainly focuses on environmental policy in the areas of climate change and biodiversity.

Anne Jensen is a Senior Scientist in the University of Aarhus' Department of Environmental Science (Environmental social science and geography); and iCLIMATE, the Aarhus University Interdisciplinary Centre for Climate Change.

ORCID

Duncan Russel http://orcid.org/0000-0003-3843-7892

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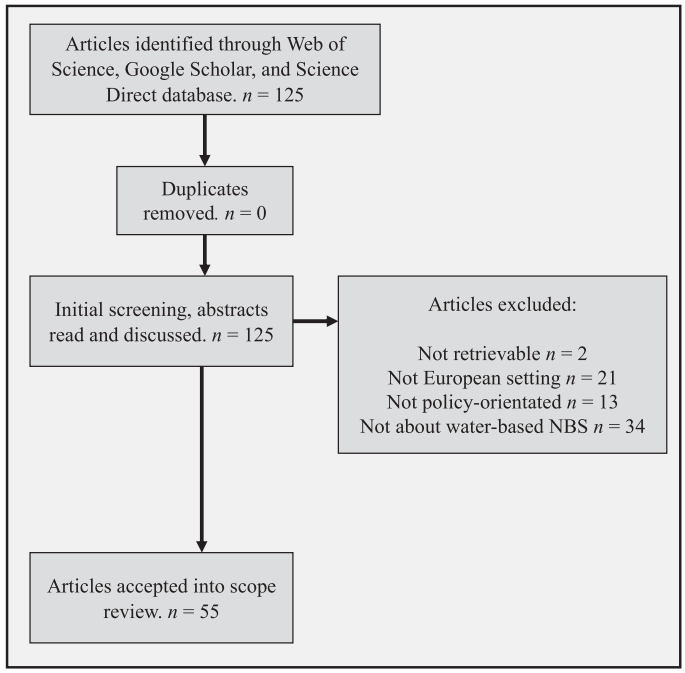
Appendices

Appendix 1. Systematic review search strings & process and findings

1. "Europe OR European + nature OR natural + based solutions"
2. "Policy + nature OR natural + based solutions"
3. "Water + policy + nature OR natural + based solutions"



Appendix 2. Administration and instrument mixes

Administrative dynamic	Occurrence and form	Instruments utilised
1. Control over & longevity of municipal funding	High & consistent	Participatory planning; Knowledge
	Low & inconsistent	Non-participatory planning; Regulation; Market based
2. Bureaucratic Discretion/Autonomy	High	Participatory planning; Knowledge
	Low	Regulation; knowledge
3. Administrative cohesiveness	Cohesive and multi-disciplinary	Participatory planning; Knowledge
	Fragmented & siloed	Market based; Regulation; Non-participatory planning
4. Political actors	Engaged & activist	Monitoring/evaluation; Knowledge; Participatory planning
	Disengaged &/or combative	Regulation; Non-participatory planning (where at all)

Appendix 3. Institutional logics of operation and urban NBS policy instrument mixes

Institutional logics for/about:	Source and nature of institutional logic	Instrument mix
Policy experimentation	Bottom-up	MBI; KBI; RI
	Top-down	RI; MBI
Urban planning (rational)	Inclusivity & cohesiveness	KBI
	Risk, power & control	RI; MBI
Urban politics (disjointed – incrementalist)	Problem-orientation	MBI; KBI
	Power-orientation	RI
Path dependencies	Fluid	KBI
	Calcified	Situational
Culture	Inclusive, collaborative, plural	-
	Exclusive & elite	-