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How Local Policy Priorities Set the Smart City Agenda

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ABSTRACT

The smart city concept has emerged as a key subject pursued by local governments. Yet, it is not clear how policymakers narrow down the topics to focus on with respect to their smart city agenda. As a result, the aim of this paper is to propose a theoretical contribution that explains how local governments define their smart city policy agenda. It is suggested that the agenda is influenced by policy priorities at the local level from other urban domains. To support this notion, policy studies literature is used to show that three streams of problems, policy, and politics, when aligned, set the policy agenda. The smart city agenda will be formed from key ideas existing at the local political level, such as policy priorities, that have now been matched with solutions framed in the smart city context, all underpinned by a favourable political environment. In addition, from smart city policy related documents, a topic modelling analysis illustrates a set of topics that are associated to the smart city policy agenda in two cities, London and Melbourne. This shows how some topics on the smart city agenda can be likened to issues that are the primary topic of another policy domain.

1. Introduction

Local governments are looking to the smart city as a way to manage increasing pressures, such as climate change, urbanization, and higher populations (Bibri and Krogstie, 2017; Estevez et al., 2016). As a result, the smart city has attracted the attention of policymakers as a way to solve these problems (Caragliu et al., 2011; Caragliu and Del Bo, 2020; Neirotti et al., 2014). While the literature has suggested that the smart city agenda can contain technological and managerial aspects, as well as numerous policies (Haarstad and Wathne, 2019), no work has been found that specifies how policymakers narrow down the list of topics to focus on with respect to their smart city agenda.

This paper therefore aims to frame how local governments define their smart city policy agenda. As the local context influences the development of smart cities (Desdemoustier et al., 2019; Wathne and Haarstad, 2020), the research question considered in this paper is: how do local urban policy domains influence the setting of the smart city agenda? To answer this question, this paper proposes a theoretical contribution for how problems and their associated solutions make it on to the smart city agenda. This also clarifies how smart city policy domains develop in a local area. In doing this, the notions of the smart city policy domain and the smart city policy agenda are formalized. A policy domain is defined as "a component of the political system that is organized around substantive issues" (Burstein, 1991: 238), whereas the agenda is the list of topics dealt with in the domain (Kingdon, 1984).[1] Therefore, the smart city policy domain is the part of a local political system that is organized around the smart city and the smart city policy agenda is the list of topics that are dealt with in the smart city policy domain. These concepts are important for policymakers because improving the understanding of the processes within and around the policy domains helps explain policy outcomes (Burstein, 1991; Sabatier, 1988).

In line with previous smart city literature (Haarstad and Wathne, 2019; Tang et al., 2019; Yigitcanlar, 2018), this paper suggests that there is no general "smart city policy". Rather, cities focus on a set of topics when developing a smart city that supports local policy objectives. Effectively, in local areas there exist pressing problems. These problems are typically dealt with through policies in their respective domain. For instance, traffic problems are traditionally managed by transport policy. However, with increasing urban pressures, local governments look to the smart city as a way to manage problems (Estevez et al., 2016). As a result, the smart city policy agenda will be influenced by the local context, and the smart city solutions will be adopted to address local problems (Wathne and Haarstad, 2020). The agenda is set when a given

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[1] Other common words to describe the concept of a policy domain include, amongst others, a "policy area" or "policy field". However, policy domain is used throughout this paper for clarity and consistency.

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problem aligns with an appropriate smart city solution, which is all supported through conducive political conditions. This theoretical contribution is supported through use of the Multi-Streams Framework (Kingdon, 1984), that shows how issues make their way onto the political agenda and why a given solution emerges (Kingdon, 1993). Moreover, literature on place-based policies underpins the importance of local knowledge and preferences for developing policies (Barca, 2009; Magro and Wilson, 2019). To provide some evidence of this theoretical contribution, a topic modelling analysis of documents related to smart city policy for London, England and Melbourne, Australia shows that the topics that make it onto the smart city agenda, and thus shape the smart city policy domain, are influenced by other local policy domains and their priorities.

This contributes to the literature on smart cities by first formalizing existing work showing how the smart city concept cuts across sectors (Albino et al., 2015; Smigiel, 2019; Vanolo, 2014) in the language of policy studies. Second, it adds to the literature by addressing how the agenda may be set in smart cities, and ultimately showing how the smart city policy domain is related to other policy domains in the local context. This helps explain the certain path dependant nature of smart cities (Ben Letaifa, 2015). Thus, this goes beyond considering the trends of the smart city concept, and provides insight into why cities may lean toward one set of characteristics more than others.

The rest of the paper is as follows. Section 2 covers the recent smart city literature, showing the ways in which the concept of the smart city has been framed. Section 3, using policy studies theory and insights from place-based policy research, explains why the smart city policy agenda and its broader domain may be related to other local policy domains. Section 4 describes the methodology for the analysis. Section 5 discusses the results. Section 6 concludes.

2. Literature review

This section serves to understand the different ways in which the concept of the smart city has been framed. First, the viewpoint of smart cities through given characteristics or dimensions is covered. Then, a brief overview of some proposed stages of smart cities is presented. Finally, key conceptual frameworks are considered. It ultimately shows how, despite a wealth of ways to view the smart city, the clear emergence of why smart city policy domains and their agendas develop in a given way is still absent in the current literature.

In the now seminal report by Giffinger et al. (2007), the smart city was framed through six different characteristics: smart economy, smart environment, smart governance, smart living, smart mobility, and smart people. The "smartness" of cities was then evaluated by how well they performed across these characteristics. These six characteristics are now widely used to represent different areas of a smart city (for examples, see Appio et al., 2019; Caragliu et al., 2011; De Guimarães et al., 2020). Moreover, these characteristics have further been used to classify smart city projects or policies (Estevez et al., 2016). Characteristics of smart cities have also been derived through analysing strategies (Angelidou, 2016, 2017; Tang et al., 2019). This stream of literature suggests that certain characteristics may be useful as guidelines for policymakers who support the development of smart cities (Angelidou, 2017) or to identify smart city archetypes (Tang et al., 2019).

The above studies that identify the different characteristics of smart cities give insight into some common structures and content found across contexts. Moreover, these studies link characteristics of the smart city to its policies. Several additional studies exist in this line, using slightly different approaches.[2] This is useful for identifying meaning and trends behind the smart city concept, but it does not explain why certain cities may lean towards one or a set of characteristics more than others.

However, some scholars have provided a more detailed understanding of how these characteristics may be linked to the local context of the smart city. For example, Desdemoustier et al. (2019) showed how common characteristics of the smart city may be understood differently at the local level according to a given institutional framework. As the understanding of the concept shapes the policies used to achieve a smart city (Joss et al., 2019), this demonstrated how the local understanding of smart cities can influence policy development. Smigiel (2019) also considered local, as well as national and regional, influencing factors for the smart city, ultimately suggesting that smart city strategies are embodied in a larger assortment of political strategies. Moreover, the smart city strategies were viewed as more adaptable to local socio-political contexts compared to other types of urban strategies. Therefore, the literature has introduced the importance of local context and how it shapes smart city policies.

The evolution in the literature of what features are necessary to consider in order to develop a smart city has led to a reconceptualization of the concept. For instance, it has been suggested that the emergence of smart cities was techno-centric with little space for the citizen. Yigitcanlar et al. (2019) call this the first generation of smart cities. Second generation smart cities moved to create a larger role for local governments, yet still minimized the role of citizens. A third generation, or smart cities that are now "responsive cities", more widely embraces the citizen, and aims to improve living standards via smart solutions. However, it is argued that more progress is needed for smart cities, and that a fourth generation is required to develop smart and sustainable cities (Yigitcanlar et al., 2019).

More recently, smart cities have also been considered through holistic conceptual frameworks. In detail, Yigitcanlar et al. (2020) operationalize a framework to support the holistic development of smart cities (see also: Yigitcanlar, 2018, 2019). This framework relies on a "systems of systems" approach, based on an Input-Process-Output-Impact Model, that addresses how *inputs* to the smart city effect *processes* within the smart city, leading to given *outcomes*, which ultimately result in *impacts*. The impacts themselves feed into the system as inputs, continuing the cycle. Here, technology is considered as only a means to achieving the sustainable and knowledge-based outputs that, in theory, accompany smart city development. This framework notably considers policy as a core factor for smart cities, emphasizing that it is crucial to develop appropriate policies for smart cities at the local level. Effectively, this underscores the importance of local governments adopting technological solutions in appropriate ways to advance the smart city development. This conceptual framework has moreover been leveraged to build a "Smart City Assessment Model", which evaluates smart city outcomes according to a multi-variable indicator base. This framework has previously been used to pinpoint best practices across successful smart city initiatives (Yigitcanlar et al., 2019).

Finally, while the smart city has now been characterized or conceptualized in various ways, little is known about how smart cities actually emerge, and even more specifically, the deliberate efforts to drive smart city development. This issue is addressed by Desouza et al. (2020), who then consider three deliberate pathways to a smart city: the creation of entirely new smart cities, the development of new smart city projects within a part of the city, and the retrofit of cities with smart technologies within the city organization. Comparing these pathways revealed the pros and cons of each option with respect to the outcomes related to key themes found in the smart city: smart city governance and services, infrastructure, and sustainability and social capital. Ultimately the authors suggest the smart city strategy should be aimed at the policy goals of the local administration.

This review has shown there is no one set of agreed-upon characterizations of the smart city from the current literature, and the above examples suggest that a variety of characteristics can be used to frame a

[2] In addition to the studies featured directly in the literature review, other authors have also identified common characteristics or dimensions of smart cities, including, but not limited to, Gil-Garcia et al. (2015), Komninos (2011) and, Nam & Pardo (2011).

given smart city. This has led to the classification of different projects, initiatives, or policies by the same characterization. This application in the smart city research accounts for common practices, as well as local circumstances, as the weight of each characteristic varies according to each city. Additional studies have explored other ways in which the smart city can be framed, for example through stages of maturity ("generations") or conceptual frameworks. To build on these contributions, it is proposed here that instead of relying on commonly cited characteristics that may describe a smart city to understand smart city policies, the smart city policy domain – while it may indeed include policies tailored to one or more of these characteristics – is also affected by the local political context. In fact, it may be the local political context, specifically the local policy priorities, that is leading to the adoption of these characteristics. Therefore, certain policy domains that are also present at the local level may shape the smart city policies. This has not yet been captured by the available smart city literature. This adds an extra layer in the understanding of why certain cities may be more heavily weighted to one aspect of the smart city. As a result, the following section provides insight into how the local political context may set the smart city agenda and shape the smart city policy domain.

3. Theoretical expansion

The approach to a smart city is varied across contexts. Some cities have strongly rooted the smart city as a policy domain in their local context through strategies, projects, a dedicated department, and/or a smart city manager. In some cases, cities may even be pursuing the smart city to drive the development of other policy domains (Yigitcanlar, 2018). Whatever the case, it is argued that the smart city policy domain and its agenda are shaped by policy priorities at the local level. Indeed, policy domains do not exist in a vacuum, as they are a part of the overall political system (Burstein, 1991). Before building on these ideas, a set of key definitions is presented in Table 1 for clarity.

To understand why the smart city policy domain develops in a certain way, theory concerning the development of policy agendas is used. Drawing on the Multi-Streams Framework developed by Kingdon (1984) and thereafter widely adopted by scholars to explain current policy development (Béland, 2016; Rawat and Morris, 2016), three streams are present in a given political setting: problems, policy, and politics. Problems are the issues facing a government. Policy accounts for the potential policy solutions, or "alternatives", that are proposed to solve problems. Finally, politics, which can be political events or specific political conditions, occur. These political conditions are linked to three components: the national or local "mood", which is the state of mind or the public opinion about a subject in a given area, organized political forces, and the government itself, often seen through a turnover in key people or administrations. These three streams act independently, until one point where they all come together, leading to an "open policy window". At this time, the problem is recognized, a solution is available, and the political conditions are appropriate. This process captures the first steps of public policymaking, which are the setting of the agenda and the specification of different alternatives, from which a choice will be made.[3] While this theory was originally formulated for the United States at the federal level, it has since been used across different geographic contexts (Rawat and Morris, 2016), at different government levels, including the subnational level (Robinson and Eller, 2010), and for both a different geographic context and at the subnational level (Ridde, 2009).

Table 1
Key policy terms explained.

Term	Definition
Policy domain	A component of the political system that is organized around substantive issues (Burstein, 1991).
Policy agenda	The list of topics dealt with in the policy domain, which considers a range of problems (Kingdon, 1984).
Alternatives	The set of possible solutions that can be implemented to solve a problem (Kingdon, 1984).
Policy subsystem	The interaction of actors from different institutions, including actors such as interest groups, interested in a policy area or policy domain (Sabatier, 1988).

These open policy windows can be used by actors in a given policy subsystem, which is defined as "the interaction of actors from different institutions interested in a policy area" (Sabatier, 1988: 131), to drive the political issues that matter to them[4] (Béland and Howlett, 2016; Howlett, 1998). Kingdon thus focuses on "not about how issues get decided, nor about how decisions are implemented and what impacts they have, but rather how issues come to be issues in the first place" (Kingdon, 1993: 40). Effectively, Kingdon responds to the question of what makes government actors pay attention to some subjects and not others (Béland, 2016).

In order to better understand the broader concept of the smart city policy domain, the questions here then become: What problems define the smart city agenda and what solutions are proposed to solve them? While no work was found that identifies how smart city agendas are set,[5] the aforementioned literature does suggest that the conceptualization of the smart city can be reduced to a set of characteristics or categories (Angelidou, 2017; Giffinger et al., 2007; Tang et al., 2019), thus providing boundaries of potential policy topics (Caragliu and Del Bo, 2020). Moreover, the smart city has been framed as a wide array of political strategies that adapt to local circumstances and other types of strategies. Thus, ultimately the nature of the smart city helps create adaptability to other policy objectives (Smigiel, 2019). As a result, it is argued that the smart city policy domain may be conceptually pre-defined according to a wide set of commonly accepted characteristics, such as "smart economy" (Giffinger et al., 2007) or "technology, ICTs, and the Internet" (Angelidou, 2017), but the topics that end up being pursued at the local level, or the content of the agenda, will be linked to the local political context. In effect, the smart city can "reshape leverage for locally driven solutions" (Wathne and Haarstad, 2020: 132).

Recall that local governments look to the concept of a smart city for new ways to solve urban problems. The application of technical and innovative smart solutions in the urban context enables local governments to better address these urban challenges (Estevez et al., 2016). It is proposed that the smart city agenda will therefore come from a set of existing pressing urban *problems*. The *alternatives* are smart city solutions that give new insights into dealing with these problems. This is supported through appropriate *political conditions*. For the smart city, all three types of political conditions are relevant. The local mood may demand the new solutions promised by the smart city to deal with urban pressures, political forces may view the smart city as an appropriate pursuit, and/or local or national government change may bring in new leadership that values the ideas of the smart city. While all three components are important, the local mood carries significant weight since the smart city is popularly seen as a response to urgent rising urban pressures (Bibri and Krogstie, 2017; Nicolas et al., 2020). Moreover, the overarching mood can be seen clearly through the uptake of regional (e.g., Smart City initiatives by the European Commission), national (e.g.,

[3] Kingdon (1984) suggests policymaking is a process with four steps: 1) setting the agenda, 2) specification of solutions from which a choice has to be made, 3) an authoritative choice, and 4) implementing a decision.

[4] In the original work by Kingdon (1984), he rather refers to policy communities, which "are composed of specialists in a given policy area" (pg. 117).

[5] Neirotti et al. (2014) do however suggest that the political agenda at the country level may shape local smart city policies, and Haarstad & Wathne (2019) speak more broadly of a smart city agenda, but rather focus on how it shapes local policy frameworks and specifically on what smart city agendas do for energy sustainability strategies.

Smart City Challenges or Missions seen in Canada or India), and specific locally developed strategies to support smart city development, as well as through the general increase in interest of the smart city concept by policymakers (Caragliu et al., 2011; Caragliu and Del Bo, 2020; Neirotti et al., 2014). This tendency across local politics, supported by higher levels of government, underpins the influence of the local mood and therefore supports the use of the Multi-Streams Framework.

When this set of streams – an urban problem, plausible smart city alternatives that can solve this problem, and political conditions – come together, the smart city policy agenda emerges with a set of feasible solutions.[6] This is iterative, meaning that the process can be repeated or be layered to accommodate more than one topic on the agenda. Literature from smart city strategies suggest that this process may be seen through top-down guidance from, for example, the regional or national level pushing smart city solutions, as well as a bottom-up presence in the form of businesses seeing economic opportunities, academic and research institutions providing evidence-based suggestions, and civil society demanding change (Mora et al., 2019). This process is underpinned by new technologies that make these alternatives innovative and different from previous proposals. The domains from which the problems originated will then contribute to shaping the smart city policy domain.

It must be noted that key political actors play an important role in various ways throughout the agenda setting process. For instance, "policy entrepreneurs" may invest heavily in certain alternatives, which can bring an idea to prominence over other competing proposals (Kingdon, 1984; Normann, 2015). These entrepreneurs can take advantage of brief policy windows (Béland, 2016). Another example is when individuals in the government gauge that the public mood is appropriate to listen to the promotion of certain solutions (Kingdon, 1984). Here, the importance of key political actors is emphasized, but their particular role is not elaborated on for this present study. Despite this, some results in Section 5 do recognize certain important actors.

Fig. 1, developed by the authors, shows a depiction of this theoretical contribution. Effectively this figure was developed to represent how the three streams, each of various importance to the local context, exist together in a given local area. These streams align when a problem (represented by a triangle) is matched with a policy (represented by a square), and is supported in politics (represented by a circle). This result then defines a topic as a smart city priority with potential solutions on the policy agenda. This agrees with previous smart city literature that suggests there is a certain path dependency for smart city development (Ben Letaifa, 2015). Moreover, it is suggested that this gives insight into the development of smart city characteristics that much of the literature has sought to uncover and classify. As the smart city policy domain begins to gain prominence in the local urban context, other policy domains may then bridge their agenda to that of the smart city, in order to leverage these alternatives to their own set of problems and match the current political mood, although this is not fully explored in this paper.

This aligns with recent work on place-based policies. Beginning with a widely consulted report prepared for the European Commission, place-based policies recognize that areas have unique characteristics and local institutions, which should be considered when drafting policies. The foundation for this paradigm is threefold: 1) there is a place-specificity of natural and institutional resources, individual preferences, and individual knowledge, 2) there is a role played by linkages between places to be accounted for, and 3) local interventions should be tailored to places (Barca, 2009). For smart cities, these policies should be designed in a way that accounts for these unique features of a city or local area (Caragliu and Del Bo, 2012). As a result, the smart city policy domain will be shaped with local tacit knowledge and competences (Magro and Wilson, 2019), as well as local preferences (Barca, 2009), within the boundaries of the smart city concept. This underpins the Multi-Streams argument as there are already issues known to local policymakers, and that the policymakers have experience, tacit knowledge, and preferences that add to the political context in supporting the smart city approach. Lessons from place-based policy work not only support the idea that the smart city policy domain is influenced by other local policy domains, but also may provide further insight into how alternatives are narrowed down in the smart city context.

Moreover, the literature on smart city strategies corroborates the place-based approach. Cities implement smart strategies according to local geographies, laws or governance systems, cultures, and conceptions of quality of life. Indeed, smart cities have varied visions and priorities, and their strategic choices depend on their identified strengths and resources available (Dameri et al., 2019). In fact, it has been argued that, in order to reinforce urban development, smart cities should focus on these strengths to pursue their comparative advantage (s) (Ben Letaifa, 2015; Lazaroiu and Roscia, 2012). It is proposed that the same sort of linkages apply to why a given topic makes it onto a smart city agenda, and then becomes associated with the smart city policy domain. The local government aims to reinforce synergies and coherencies between major local political priorities and smart city policy. Thus, local policymakers aim to address these priorities when identified problems align with solutions associated to the smart city, all within a favourable political context.

4. Methodology

Drawing inspiration from the policy studies literature that searches for a set of key words to identify policy domains (Baumgartner and Jones, 1993; May et al., 2006) and frame policy domains through the use of topics (Baumgartner et al., 2002), a topic modelling analysis is used to uncover latent topics across the documents for London and Melbourne, respectively. However, instead of attempting to identify a set of specific policy domains at the local level, the aim is to rather identify topics that are related to the smart city policy domain. These topics are interpreted as the main issues that are on the smart city policy agenda. In turn, it is shown how some of these topics cut across both the smart city policy domain and other policy domains that touch the smart city. This shows how the smart city is related to other policy areas and vice versa. Thus, this reveals not only that the smart city policy domain is shaped by the local political context, but moreover how the "characteristics" or areas of smart city policy, as they are identified throughout the literature, are shaped by the local political context.

Fig. 2 describes in detail the methodology used for this study. The first step was selecting the case studies. The second step involved collecting smart city policy-related documents for the two cities selected. These documents were required to run the analysis adopted for this study – a topic modelling analysis called Latent Dirichlet Allocation (LDA). The documents were pre-processed in the third step. Finally, the fourth step involved running the LDA and finding the different topics associated to the smart city policy domain in each city.

4.1. Case studies: London and Melbourne

4.1.1. Selecting the case studies

In order to provide some evidence for the theoretical contribution developed in Section 3, this paper aims to illustrate how local policy domains may influence the setting of the smart city agenda, and thus the smart city policy domain more broadly. To show this, two cities, London, England and Melbourne, Australia, are analysed. These cases were selected for a few main reasons. The first is that they are widely cited as examples of smart cities. Evidence is provided for each case below. In addition, these cities in particular are selected for both their commonalities in advancing their smart city objectives, as well as their differences in the approaches they have taken along the way. Finally, in a more practical manner, these cities have open data platforms that

[6] This process implicitly refers to the "policy primeval soup" concept presented by Kingdon (1984).

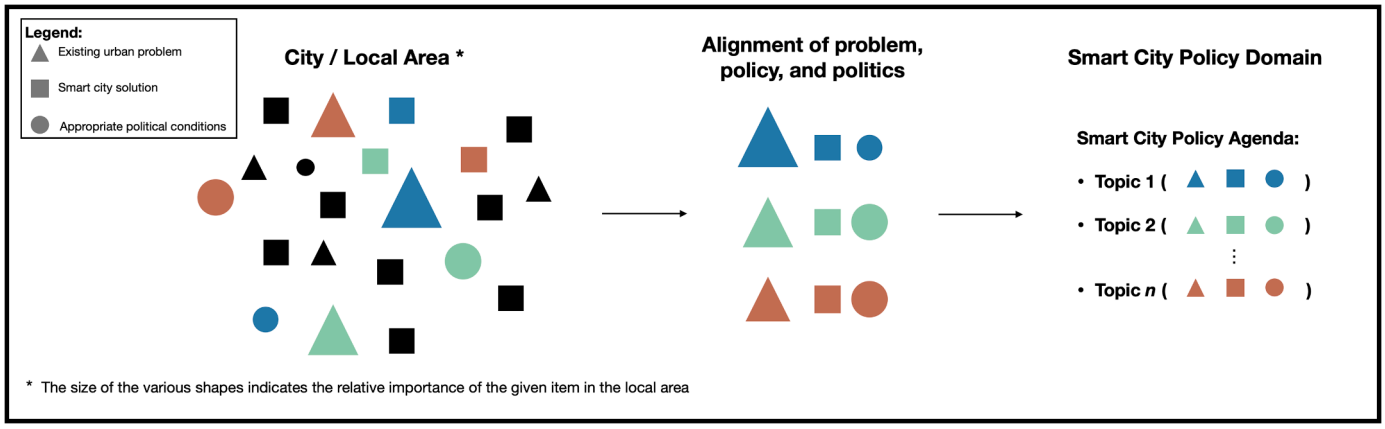

Fig. 1. Depiction of theoretical contribution. The smart city policy agenda is set when an existing urban problem is coupled with a smart city solution, and moreover supported by the local political conditions. Urban problems have been previously identified as priorities in their local policy domain. The process is iterative, indicating that multiple topics can be on a given agenda. Source: Authors' elaboration.

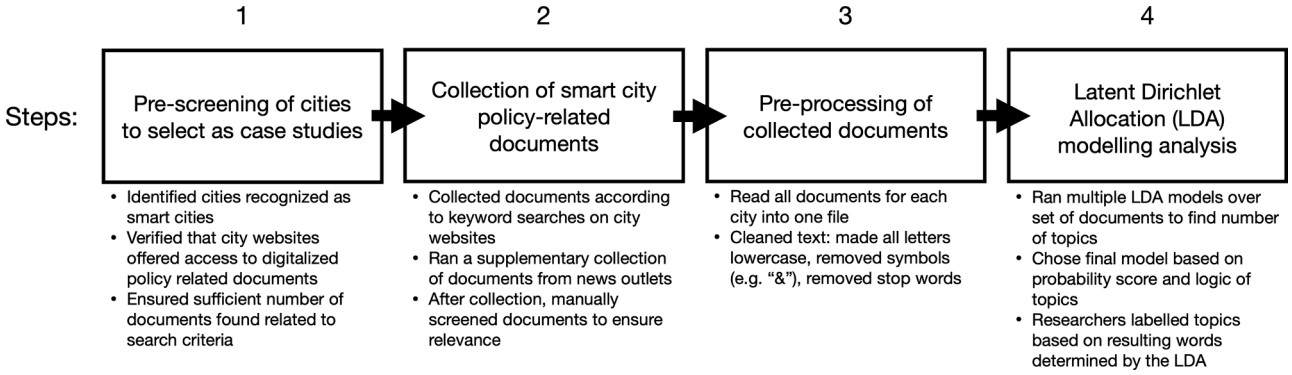

Fig. 2. Explanation of methodology. Source: Authors' elaboration.

provide ample access to documents and data, which facilitates research on the smart city policy domain. Indeed, in order to conduct the topic modelling analysis performed in this study, it was necessary to collect a maximum amount of policy related documents. As a result, the choice of cities was restrained to those that widely publish a variety of digitalized documents on their public websites. A sufficient number of documents with the search criteria, explained in Section 4.2, was also needed. This means that before collecting the documents and filtering them for relevance, numerous city websites were screened to evaluate if enough smart city policy related documents could actually be found. It was also necessary, after the topics were determined, to go back and read through the different documents to better understand what the topics were representing. For this, the researchers needed to have the ability to read the language of the documents. It was moreover beneficial to have a common language across the two cases to pick up on similarities or trends. As a result, the cases are limited to anglophone cities, which are notably both recognized as international, prosperous cities. Future studies would benefit from considering more diverse situations. While this is viewed as a limitation of the paper, it still offers a comparison of how two cities will have different versions of the smart city policy domain, as it relates to their respective policy priorities in other local policy domains.

4.1.2. London

London was selected as a case study for this paper due to its widespread recognition as a leading smart city. For example, London is ranked 1 (out of 174 cities) in the 2019 Cities in Motion Index by the IESE Business School (IESE Business School, 2019), 1 (out of 50 cities) in a ranking for the Top 50 Smart City Governments (Eden Strategy Institute and ONGandONG Pte Ltd., 2018), and 20 (out of 102 cities) in the 2019 IMD Smart City Index by the IMD Business School (IMD, 2019). Reasons for ranking London as a successful smart city are related to, amongst other factors, involving citizens in smart city decision making (Willems et al., 2017) and the extensive promotion and use of data to support improved governance in the city (Barns, 2018). Due to how London has managed to spearhead the smart city, it has moreover been studied in detail in academic papers and books (for examples, see Angelidou (2017); Ben Letaifa (2015); Bibri & Krogstie (2020); Willems et al. (2017); Zvolska et al. (2019)), revealing London as a best practice for smart cities, and thus supporting the choice in this paper to use it as a case study.

London is additionally seen as a relevant case to study, as it has a strongly documented set of development plans for the smart city. London released its smart city roadmap "Smarter London Together" in 2018, with the ambition of shaping London into the "smartest city in the world" (Greater London Authority, 2018: 3). This roadmap has five missions: 1) more user-designed services, 2) strike a new deal for city data, 3) world-class connectivity and smarter streets, 4) enhance digital leadership and skills, and 5) improve city-wide collaboration. Moreover, the roadmap expressively aims to facilitate objectives of other strategies in the local context, such as the environment and transport strategies, respectively. The roadmap is the successor of an earlier smart city document, "Smart London Plan", which was first released in 2013 and then updated in 2016. The Smart London Plan was originally drawn up as a response to both the heightened pressures on city resources, and to the increased opportunities seen in technological solutions (City of London, 2013). As a result, the smart city policy domain emerged as a rather new area in politics, focusing largely on institutional and digital

improvements in the face of new challenges (Angelidou, 2016).

4.1.3. Melbourne

Melbourne is also widely featured across various smart city rankings. For example, Melbourne is ranked 20 in the 2019 Cities in Motion Index (IESE Business School, 2019) and 24 in the 2019 IMD Smart City Index (IMD, 2019). For the smart city governance score, Melbourne ranked 8 overall, with a performance rating of "relatively high" (Eden Strategy Institute and ONGandONG Pte Ltd., 2018). In addition to being featured in several international rankings, Melbourne also won a smart city grant by the multinational technology company IBM in 2016. The partnership with IBM aimed to use data to enhance potential city emergency responses. As a part of this package, Melbourne also received access to historic Twitter data to leverage the growing use of technology to improve livability in the city (City of Melbourne, 2016). Melbourne has additionally been cited as a best practice with respect to their use of data to monitor certain aspects of the smart city, such as mobility (Carter et al., 2020). The high scores in international rankings and the willingness to adopt innovation technology to improve quality of life for residents indicate the suitability of Melbourne as a case study for this paper.

The smart city in Melbourne seems to follow in the paths of its other urban policies. For instance, Yigitcanlar et al. (2021) have suggested that the smart city in Melbourne is a rebranded version of the knowledge city. It is worthwhile to note that other research has linked the emergence of the smart city in Melbourne to local sustainability objectives (Anthopoulos, 2017), although this may not be mutually exclusive. The City of Melbourne has not written their smart city strategy in a formalized series of documents like London, but they established the smart city in a portfolio, or an area of responsibility, in the city council (Anthopoulos, 2017; Dowling et al., 2019). This is complemented by the stated objectives surrounding their interpretation of the smart city, found on their smart city website: "Our vision for Melbourne as a smart city is simple: to enhance the aspects of our city that make us uniquely Melbourne, and intelligently prepare for the changing needs of the community, the environment and the economy" (City of Melbourne, n. d.). This vision is complemented by smart city initiatives, such as emerging technology testbeds and the 24-hour pedestrian counting system. Therefore, the smart city policy domain in Melbourne seems to have emerged from other key local objectives, such as the knowledge city, but has since found its own space in the local political area.

4.2. Collection of policy documents

After selecting the cities for the case study, it was necessary to collect smart city policy related documents in order to illustrate the relationship between the smart city policy domain and other local policy domains. To ensure a close relation to policy, the majority of documents are collected from the official city websites. Moreover, a significant percentage of documents came from local committee or council documents for each city (approximately 30% for London and 49% for Melbourne). This is key for the analysis, as the issues brought up for consideration at local council meetings align well with the idea of a local governmental agenda (Baekgaard et al., 2018). Media articles were also collected to supplement the sample. All documents for this study were collected in 2020. Practically speaking, this collection included creating a large Excel file with the identifying information of each document, such as document title and type, and then saving each document as a PDF to a folder.

For London, 296 smart city policy related documents were collected. These documents were found using a keyword search "smart city" (with and without the quotes) in local government websites (democracy.cityoflondon.gov.uk and london.gov.uk), resulting in a collection of minutes from council meetings and committee documents, press releases, blog posts, and a more general category called "documents", which, amongst other types, included recorded decisions taken by local government, strategy documents, and reports. In order to augment the number of available documents, media articles were also included, but the keywords "London" and "policy" were added and each article was assessed by the researchers to ensure relevance. The timeframe for the documents is the period 2012 to 2019, therefore beginning one year before the first smart city strategy was released.

The same document collection process was carried out for Melbourne, resulting in a total of 344 collected documents. These documents were found using keyword search "smart city" (with and without the quotes) in the local government website (https://www.melbourne.vic.gov.au/Pages/home.aspx), resulting in a collection of committee or council documents, press releases, official City of Melbourne magazine issues, and general documents, which included, amongst other types, white papers and information leaflets, local city plans, reports, and strategy documents. As was the case for London, media articles were also included, but the keywords "Melbourne" and "policy" were added and the articles were screened for relevance. To ensure comparability with London, the documents also come from the period 2012 to 2019. Table 2 summarizes the scope of documentation used for London and Melbourne. The table notes a category called "Alternative forms of communication", which are the blog posts for London and the magazines for Melbourne.

4.3. Pre-processing of documents

After the collection of documents for each city, it was necessary to clean and organize the text in order to do the topic modelling analysis. To do this pre-processing step, the text from all the documents for each city along with key pieces of information about the documents were first inputted into one singular data file. At this stage, the key information kept in the file was the identification number of the document, title of the document, the type of document, and the text within the document.

Once the text was inputted into the data file, it was cleaned. This entails making all letters lowercase, removing symbols found in the text (for example, "&"), and implementing a set of standard stop words. Stop words are common words found in the English language that can be removed in order to reduce noise in the texts. After running a series of preliminary models, a set of additional stop words were included in order to reduce repetition of words across topics and remove irrelevant words, for example "considered" or "appendix" The language Python was used to clean and process the text using the Natural Language Toolkit (NKTK) library (Bird et al., 2009).

4.4. Latent dirichlet allocation analysis

After the data file was prepared, the analysis was run with Latent Dirichlet Allocation, a type of topic modelling analysis. Generally, topic modelling is a type of statistical model that reveals concealed arrangements in a corpus, or a group of documents, and then specifically LDA is

Table 2
Types of London and Melbourne smart city policy related documents.

Type of document	London Number of documents	Percentage of documents	Melbourne Number of documents	Percentage of documents
Committee or council document	88	29.73%	169	49.13%
Press release	73	24.66%	40	11.63%
Local government document (general)	75	25.34%	67	19.48%
Alternative forms of communication	6	2.03%	24	6.98%
Media article	54	18.24%	44	12.79%
Total	296	100%	344	100%

a generative probabilistic model that aims to uncover these arrangements. In detail, LDA analysis represents each document as a mixture of topics, and each topic as a distribution over words (Blei et al., 2003; Blei and Lafferty, 2006). The LDA model was run using the Gensim library (Řehůřek and Sojka, 2010) in Python.

LDA using the Gensim library was chosen to run this analysis for a few reasons. First, this setup has been used recently to study government communications with citizens in smart cities (Nicolas et al., 2021), as well as to uncover the main subjects treated across climate change literature (Dayeen et al., 2020). Thus, this application of LDA has been successfully used in the literature on smart cities and in other current subjects to uncover hidden topics across a large set of text documents, suggesting its suitability. Second, LDA in particular was chosen as the method of choice over other types of text analyses because the analysis fully automates textual data, and thus can handle hundreds of documents. LDA then "accurately reduces text dimensions without influencing topic discovery, through context-aware properties" (Nicolas et al., 2021: 6). This makes it an ideal analysis for uncovering the main subjects across hundreds of policy documents, some of which can be dozens of pages in length or more. Other types of software or programming languages exist to accomplish similar tasks, such as NVivo, but they require more human intervention (Nunez-Mir et al., 2016). Considering the number of documents used in this study, the Gensim library, with its automatized approach, was deemed most practical. Moreover, after the topics are determined, subsequent analysis can link up any given document to the topics assigned to it. This enables a deeper understanding of what the topics represent, and thus provides additional details about the subjects making their way on to the smart city agendas for each case.

The processes for running the LDA and then for selecting the number of topics for the two cases are as follows. A set of models were run with the number of topics ranging from 4 to 15, each with 25 passes. The number of passes chosen indicates how many times the model goes through the documents to define the topics, with a higher number leading to more robust results. This step aims at reducing the number of possible models to choose from. After, the average probability scores were found for each model. These probability scores reflect how well the different topics actually describe the documents, and thus a high score indicates a better model fit.

Starting with the results from London, 4 topics had the highest score (0.65) and 5 topics had the second highest score (0.62). This narrowed down the possibilities for the number of topics, but a second step further reduced the possibilities by running models with 4 to 8 topics, each with 50 passes. The results from the second test show that 4 topics and then 5 topics gave the best possibilities out of the set, with respective scores of 0.64 and 0.61. Since these scores were very close, the topics were manually inspected. This process, which involves a mixture of using evaluation scores given by the LDA model results and manual inspection to ensure the topics are meaningful, follows previous research using topic modelling (Dayeen et al., 2020). This resulted in the selection of a 5-topic model since, when moving from 4 to 5 topics, there was a clear additional subject, Infrastructure. A last model was run with 5 topics and 500 passes to obtain the final results.

The same process was done for Melbourne. In detail, after the preprocessing stage, models with 4 to 15 topics were run, each with 25 passes. This process identified that 4 topics gave the best score (0.53), with 5 topics having the second-best score (0.49). This narrowed down the numbers to consider in the second round, which was done for 4 to 8 topics with 50 passes each. A model with 4 topics had the highest probability score (0.52), and then 5 topics (0.48). However, a manual evaluation of the words associated with each topic was additionally completed, which suggested selecting 5 topics. In detail, selecting only 4 topics left out a clear topic, Urban management. After, a model was run for 5 topics with 500 passes.

To clarify, the model determines the words associated to the main latent topics, however it was the researchers who named the topics manually according to the associated words.

5. Results and discussion

For both London and Melbourne, the LDA revealed five topics for each city. To give the results beginning with London, the first topic was labelled as a general Urban planning topic. This is because the words largely account for urban planning, such as "plan", "development", "policy", and "space". In line with the original research by Kingdon (1984), some subjects that feature prominently on policy agendas involve certain implementation features. An example is the cost of medical care on the health policy agenda. The second topic is an Environment topic, which is characterized by words like "energy", "environment", and "resource". This topic also reflects some key actors in the city, such as the mayor and chairmen of various municipal committees. The third topic is a Technology & innovation topic. This topic contains words that are most closely associated with the concept of the technological component of the smart city. For instance, it includes the words "smart" as well as "data", "digital", "technology", and "innovation". The word "mayor" also appears in this topic. While the specific role of political actors was not brought into the scope of the theoretical contribution in this paper, the presence of the word mayor across two topics, as well as chairman being cited in the Environment topic, highlights the importance of political actors in the agenda setting process. The fourth topic is Transport & mobility, which is represented by words like "transport", "vehicle", "cycle", "traffic", and "road". The fifth topic is Infrastructure. The words here are associated with infrastructure projects. For example, the word "column" is related to a structure that embodies 4 G and/or 5 G equipment. The ten most salient words associated to each topic are shown in Table 3.

These topics are moreover shown in Fig. 3 on an Intertopic Distance Map. This map is found using the LDAvis package in Python (Sievert and Shirley, 2014). For the left panel of the map, the circles, which each represent a topic, are plotted through a multidimensional scaling algorithm. This enables the visualization of the topics in a two-dimensional space. This visualization shows an overview of the topic model, giving insight to the prevalence of each topic, shown by the size of a circle, and how the different topics relate to one another, shown by the relative proximity of the circles. Put differently, the closer two topics are to one another, the more words they have in common. On the right panel of the map, the most relevant words overall (meaning not for a given topic) are displayed.

As a result, it is shown that Topics 1 and 4, or Urban planning and Transport & mobility, are closely related to one another. Topics 2 and 3, or Environment and Technology & innovation, are close to one another, but less tightly related. Finally, Topic 5 representing Infrastructure is less connected. Topics 1 through 4 are roughly the same size, indicating a similar prevalence, with Topic 5 being slightly smaller. Despite some topics having a closer relationship to others or being shown as slightly more prominent, all five topics are still relevant for smart city policy as they were identified through the document analysis. The words found across the Transport & mobility and Infrastructure topics at times allude

Table 3
Topics for London.

Topics	Words
1. Urban planning	plan, development, area, local, policy, building, space, corporation, site, issue
2. Environment	energy, environment, director, cost, officer, development, scheme, chairman, mayor, resource
3. Technology & innovation	data, digital, mayor, technology, smart, business, people, sector, innovation, tech
4. Transport & mobility	proposal, transport, vehicle, people, change, cycle, traffic, impact, plan, road
5. Infrastructure	lighting, system, cost, think, term, highway, wayfinding, column, mile, time

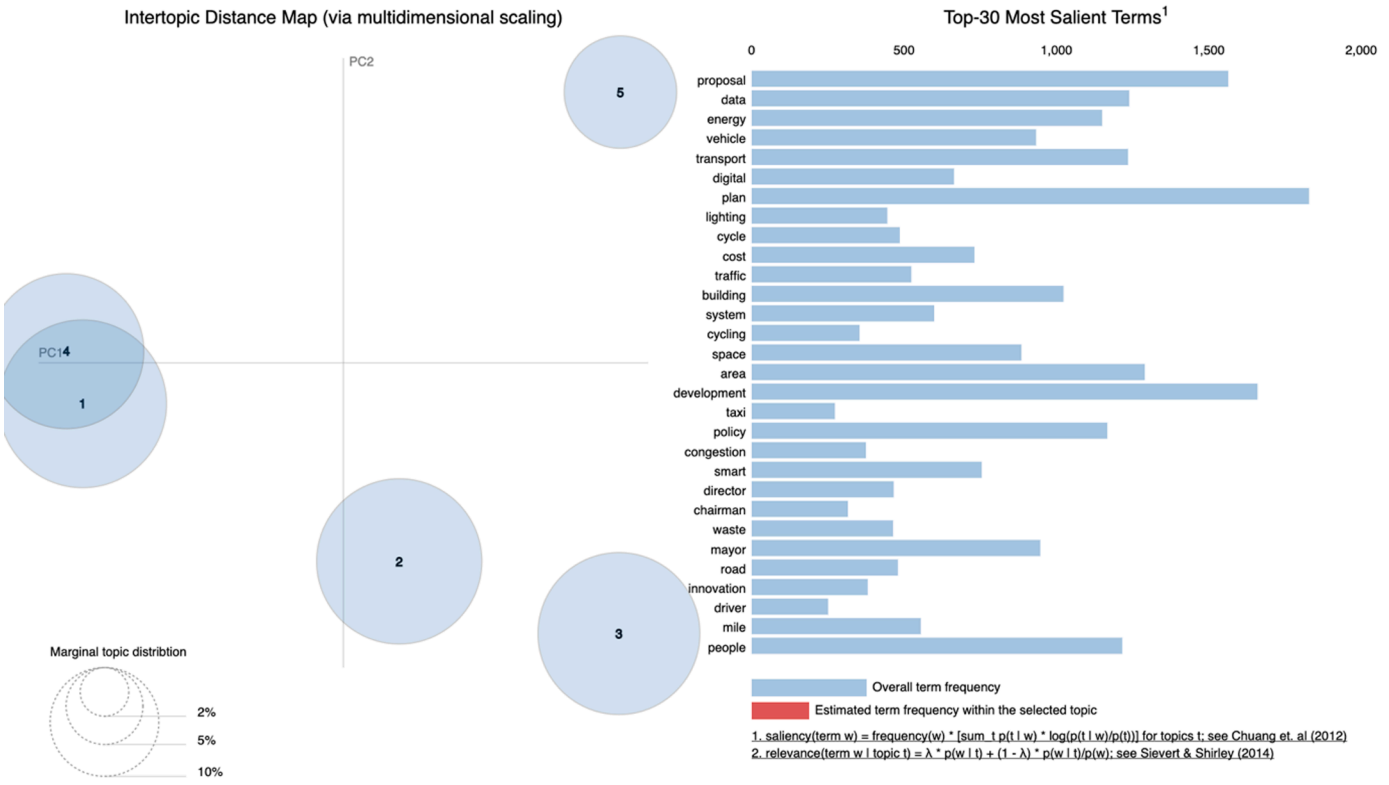

Fig. 3. On the left panel, topics for London are shown on the Intertopic Distance Map. On the right panel, the most salient words are listed for the corpus (blue bars). The estimated term frequency for a given topic (red bar) is not shown, as no topic in particular is selected for the figure.

to a similar subject – transportation – but appear far away from one another on the Intertopic Distance Map. This can be explained by the fact that the two topics focus on different aspects of transportation. The topic Transportation & mobility speaks to the overall mobility flows in the city and the different methods of transport available to residents. The Infrastructure topic rather encompasses components that may be used to design, facilitate, or measure transport infrastructure, such as "highway", "wayfinding", and "mile". For instance, wayfinding refers to the physical implementation of signage that supports navigation across a particular transport infrastructure. The words highway and mile can be found in documents that speak to infrastructure around the city, that – for example – supports or allows a given speed. These conceptual differences in how transport is treated across the two topics, in addition to including words that are related to other aspects of infrastructure, reflect the differences in words being associated to each topic.

For Melbourne, the first topic is Transport & mobility, which includes words largely related to transport, such as "transport", "road", "car", and "parking". The second topic is Urban management, which is labelled as such due to the set of words that reflect daily management of a city. For example, "report" and "work" are general words that can be associated to management, while "committee" and "councillor" are more specific terms that identify key actors in urban management. As was seen for London, the term "councillor" reveals the important role these actors play in the agenda setting process. The third topic is Recreation & community services, which includes words such as "recreation", "library", "art", and "registration". Some insights from recent research clarify aspects of this finding by suggesting that libraries play an important role in the strategy to become a smart city in Melbourne (Leorke and Wyatt, 2018). The fourth topic is Knowledge City. This topic is specifically labelled after a separate Melbourne strategy, the "Knowledge City Strategy", since the key words refer to "knowledge", "business", and "development", which are components found in the strategy. Moreover, there is a Melbourne Knowledge Week, which is one of the key events that Melbourne hosts to support the Knowledge City (City of Melbourne, 2014). Additional support for this topic is found in the research that has noted the relationship between the smart city and the knowledge city in Melbourne (Arup, 2010; Leorke and Wyatt, 2018; Yigitcanlar et al., 2021). Finally, the fifth topic is the Built environment, which is represented by words such as "building", "heritage", and "significant". The topics for Melbourne are slightly more spaced out compared to London on the Intertopic Distance Map, shown in Fig. 4, but Topics 1 and 4, or Transport & mobility and Knowledge City, are strongly connected to one another. This closeness may be due to the fact that both the Transport & mobility and Knowledge City topics indicate they are concerned with space, development, and future opportunities.[7] The topics moreover show up as roughly the same size, with Topic 1 and Topic 2 being slightly larger, which indicates they are more prevalent. The words associated to each topic are shown in Table 4.

Globally, the purpose of identifying these topics is to show what main subjects are found on the smart city agenda, which then define the smart city policy domain. In doing this, it is shown how other policy domains are also present. Indeed, for some topics there is a more obvious connection to a policy domain, for example, Transport & mobility. This type of illustration, however, does not provide a detailed list of the alternatives London or Melbourne have chosen, but the list of words associated to each topic can provide general insights. For example, for London, according to the Infrastructure topic, some key words are "column" and "lighting". As briefly mentioned above, these words refer to a project to replace street signs and furniture with electrified columns that support 4 G and 5 G wireless Internet coverage.

6. Conclusion

This paper offered a theoretical contribution that aimed to explain

[7] This is suggested by comparing the 30 most salient words for each of the respective topics. A list of these words is available upon request.

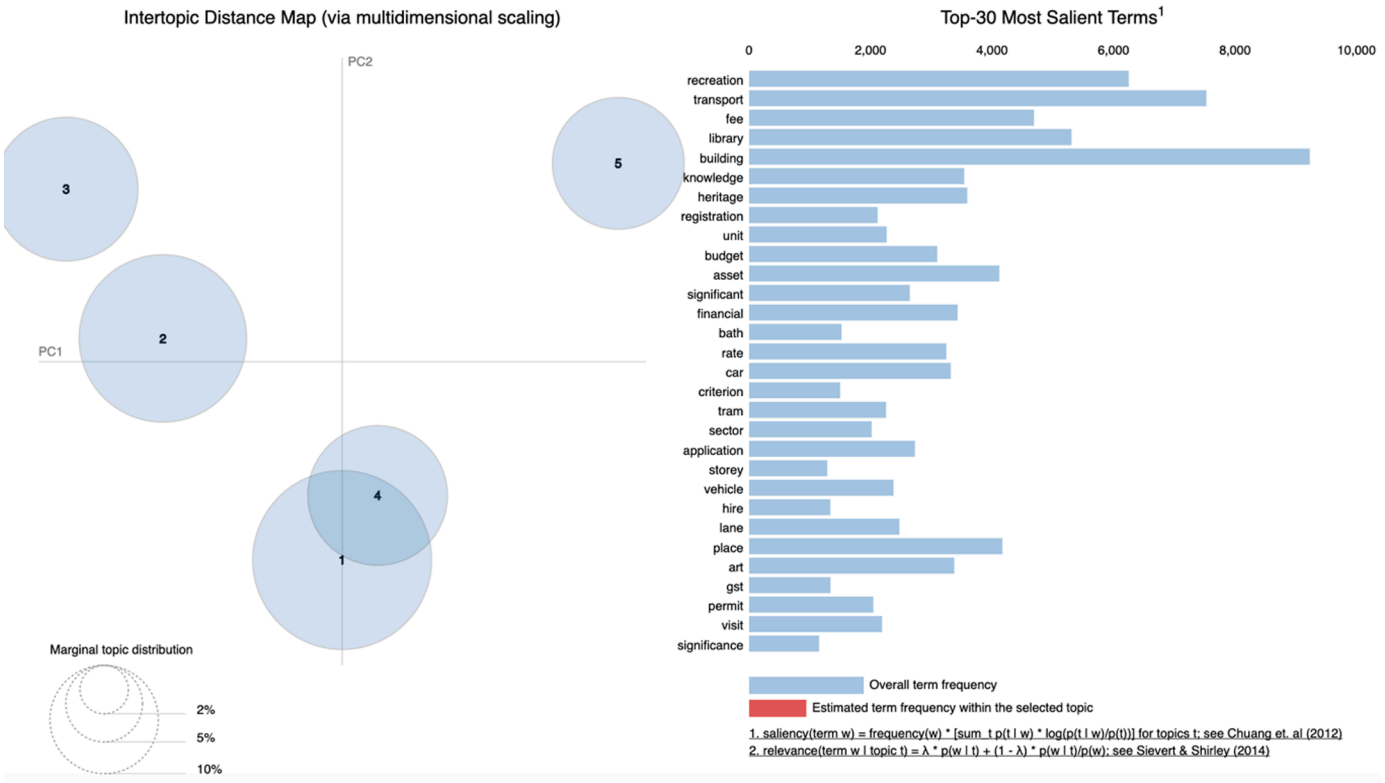

Fig. 4. On the left panel, topics for Melbourne are shown on the Intertopic Distance Map. On the right panel, the most salient words are listed for the corpus (blue bars). The estimated term frequency for a given topic (red bar) is not shown, as no topic in particular is selected for the figure.

Table 4
Topics for Melbourne.

Topics	Words
1. Transport & mobility	transport, public, people, area, road, space, car, change, support, parking
2. Urban management	work, asset, financial, committee, report, management, waste, value, business, councillor
3. Recreation & community services	recreation, library, fee, unit, building, budget, registration, application, rate, art
4. Knowledge City	knowledge, business, design, sector, development, structure, event, research, visitor, space
5. Built environment	building, heritage, place, significant, site, lane, criterion, storey, built, significance

how smart city policy agendas are set and, by extension, how smart city policy domains are shaped by local politics. This is largely based on the Multi-Streams Framework, which suggests that there are three streams operating in a given political setting: problems, policy, and politics. In the local context, there are existing problems being treated by traditional urban policy domains. There also exist smart city solutions that can provide new and innovative ways to deal with the problems. These two points are underpinned by political conditions conducive to smart city development. When an urban problem can be coupled with a suitable smart city solution, and political conditions are appropriate, there is an open policy window that sets the agenda and puts forth a selection of smart city solutions. Effectively, this considers what smart city problems governments are paying attention to, and what types of solutions are proposed to solve these problems.

These newly framed problems and their accompanying solutions highlight how the smart city policy domain is locally determined. Indeed, there is no "one-size-fits-all" smart city policy, but rather it is developed from local policy priorities, supported by local knowledge, preferences, and institutions. Therefore, this contribution is further grounded by place-base policy work. As a result, it may be less useful to consider typologies of smart city policies, and more insightful to understand why smart city policies emerge in the first place, and what they aim to accomplish. This supports literature on smart city strategies.

The above illustration using text documents not only identifies a set of topics related to the smart city agenda, but also reveals how other policy domains are connected to the smart city policy domain. This study has not attempted to identify all the points of contact between the smart city policy domain and other domains in London and Melbourne. Its purpose is rather to support the idea that smart city policy domains are shaped through the intersection of other key urban policy domains for a given local context. As a result, it is suggested that there is no generalized "smart city policy", but rather cities may implement a set of actions aimed at creating a smart city as it can fit in with and support local policy objectives more broadly. The local priorities of some domains will be transposed onto the smart city agenda and ultimately shape the nature of the smart city policy domain.

These findings provide insights for future work on smart cities. For smart city research, this paper offers avenues for subsequent research on smart city policy development in a given area. It provides a springboard for considering subsequent steps of smart city policymaking, such as making policy choices and implementing decisions (Kingdon, 1984). Future studies could extend this work to consider a dynamic approach, in order to understand – once the agenda is set – how smart city policy develops over time. Future studies can also expand on the diversity of cases studied, since, as mentioned above, two anglophone, prosperous cities were considered here. For smart city policymakers, the results suggested by this paper indicate that, when developing a smart city strategy, policymakers can map out their current priorities, and then analyse how smart city solutions can serve to accomplish goals that are set, but not yet seeing positive results. In other words, policymakers can consider how smart city solutions can be applied to a given urban problem to enhance progress in that particular policy domain. Importantly, smart city policy makers can leverage the skills, knowledge, and preferences developed from existing policy and apply it to the smart city

domain. This will enable contextually appropriate smart city solutions.

This study was limited with its consideration for the policy subsystem and the key political actors in the policymaking process, which has been suggested by the literature as an important influencer of smart city agendas (Haarstad and Wathne, 2019; Wathne and Haarstad, 2020). For example, this paper suggested that some major political actors were important in setting the policy agenda and thus shaping the local smart city policy domain, but this was not expanded on. This sort of relation may have an explanation in theories able to better explain the dynamism of the policy subsystem, such as advocacy coalition theory (Howlett et al., 2017). It is envisaged that this study could be extended to show how actors influence the development of the smart city agenda and larger domain. These types of questions should be explored for future research. Theories that explain the historical evolution of policy domains, such as historical institutionalism and policy feedback theories, may also lend transparency to the subject.

Declaration of Competing Interest

We have no conflicts of interest to disclose.

References

Albino, V., Berardi, U., Dangelico, R.M., 2015. Smart cities: definitions, dimensions, performance, and initiatives. Journal of Urban Technology 22 (1), 3–21. https://doi.org/10.1080/10630732.2014.942092.

Angelidou, M., 2016. Four European Smart City Strategies. Int J Soc Sci Stud 4 (4), 18–30.

Angelidou, M., 2017. The Role of Smart City Characteristics in the Plans of Fifteen Cities. Journal of Urban Technology 24 (4), 3–28. https://doi.org/10.1080/10630732.2017.1348880.

Anthopoulos, L., 2017. Smart utopia VS smart reality: learning by experience from 10 smart city cases. Cities 63, 128–148. https://doi.org/10.1016/j.cities.2016.10.005.

Appio, F.P., Lima, M., Paroutis, S., 2019. Understanding Smart Cities: innovation ecosystems, technological advancements, and societal challenges. Technol Forecast Soc Change 142, 1–14. https://doi.org/10.1016/j.techfore.2018.12.018.

Arup, 2010. C40 UrbanLife: Melbourne Smart City.

Baekgaard, M., Mortensen, P.B., Seeberg, H.B., 2018. The bureaucracy and the policy agenda. Journal of Public Administration Research and Theory 28 (2), 239–253. https://doi.org/10.1093/jopart/mux045.

Barca, F., 2009. In: An Agenda for a Reformed Cohesion Policy: A place-based approach to meeting European Union challenges and expectations. https://www.europarl.europa.eu/meetdocs/2009_2014/documents/regi/dv/barca_report_/barca_report_en.pdf.

Barns, S., 2018. Smart cities and urban data platforms: designing interfaces for smart governance. City, Culture and Society 12, 5–12. https://doi.org/10.1016/j.ccs.2017.09.006.

Baumgartner, F., & Jones, B. (1993). *Agendas and Instability in American Politics*F. Baumgartner & B. Jones (eds.). The University of Chicago Press.

Baumgartner, F., Jones, B., Wilkerson, J, 2002. Studying Policy Dynamics. In: Baumgartner, F., Jones, B. (Eds.), Policy Dynamics. University of Chicago Press, pp. 37–56.

Béland, D., 2016. Kingdon Reconsidered: ideas, Interests and Institutions in Comparative Policy Analysis. Journal of Comparative Policy Analysis: Research and Practice 18 (3), 228–242. https://doi.org/10.1080/13876988.2015.1029770.

Béland, D., Howlett, M., 2016. The Role and Impact of the Multiple-Streams Approach in Comparative Policy Analysis. Journal of Comparative Policy Analysis: Research and Practice 18 (3), 221–227. https://doi.org/10.1080/13876988.2016.1174410.

Ben Letaifa, S., 2015. How to strategize smart cities: revealing the SMART model. J Bus Res 68 (7), 1414–1419. https://doi.org/10.1016/j.jbusres.2015.01.024.

Bibri, S.E., Krogstie, J., 2017. Smart sustainable cities of the future: an extensive interdisciplinary literature review. In: Sustainable Cities and Society, 31. Elsevier Ltd, pp. 183–212. https://doi.org/10.1016/j.scs.2017.02.016.

Bibri, S.E., Krogstie, J., 2020. The emerging data–driven Smart City and its innovative applied solutions for sustainability: the cases of London and Barcelona. Energy Informatics 3 (1), 1–42. https://doi.org/10.1186/s42162-020-00108-6.

Bird, S., Loper, E., Klein, E., 2009. Natural Language Processing With Python. O'Reilly Media Inc.. https://www.nltk.org/

Blei, D.M., Lafferty, J.D., 2006. Dynamic Topic Models. In: Proceedings of the 23 Rd International Conference on Machine Learning.

Blei, D.M., Ng, A.Y., Edu, J.B., 2003. Latent Dirichlet Allocation Michael I. Jordan. Journal of Machine Learning Research 3.

Burstein, P., 1991. Policy Domains: organization, Culture, and Policy Outcomes. Annu Rev Sociol 17 (1), 327–350. https://doi.org/10.1146/annurev.so.17.080191.001551.

Caragliu, A., Del Bo, C, 2012. Smartness and European urban performance: assessing the local impacts of smart urban attributes. Innovation: The European Journal of Social Science Research 25 (2), 97–113. https://doi.org/10.1080/13511610.2012.660323.

Caragliu, A., Del Bo, C, 2020. Do smart city policies work? In: Daniotti, B., Gianinetto, M., Della Torre, S. (Eds.), Digital Transformation of the Design, Construction and Management Processes of the Built Environment. Springer, pp. 149–159. https://doi.org/10.1007/978-3-030-33570-0_14.

Caragliu, A., del Bo, C., Nijkamp, P., 2011. Smart cities in Europe. Journal of Urban Technology 18 (2), 65–82. https://doi.org/10.1080/10630732.2011.601117.

Carter, E., Adam, P., Tsakis, D., Shaw, S., Watson, R., Ryan, P., 2020. Enhancing pedestrian mobility in Smart Cities using Big Data. Journal of Management Analytics 7 (2), 173–188. https://doi.org/10.1080/23270012.2020.1741039.

City of London, 2013. Smart London Plan. https://www.london.gov.uk/sites/default/files/smart_london_plan.pdf.

City of Melbourne, 2020. Melbourne As a Smart City. n.d.. Retrieved July 30from. https://www.melbourne.vic.gov.au/about-melbourne/melbourne-profile/smart-city/Pages/smart-city.aspx.

City of Melbourne, 2014. A Knowledge City Strategy: Strengthening Melbourne's Knowledge Sector Through Collaboration.

City of Melbourne, 2016, April 18. IBM Smarter Cities Challenge converges On Melbourne. City of Melbourne. https://www.melbourne.vic.gov.au/news-and-media/Pages/ibm-smarter-cities-challenge-converges-on-melbourne.aspx.

Dameri, R.P., Benevolo, C., Veglianti, E., Li, Y., 2019. Understanding smart cities as a glocal strategy: a comparison between Italy and China. Technol Forecast Soc Change 142, 26–41. https://doi.org/10.1016/j.techfore.2018.07.025.

Dayeen, F.R., Sharma, A.S., Derrible, S., 2020. A text mining analysis of the climate change literature in industrial ecology. J Ind Ecol 24 (2), 276–284. https://doi.org/10.1111/jiec.12998.

De Guimarães, J.C.F., Severo, E.A., Felix Júnior, L.A., Da Costa, W.P.L.B., Salmoria, F.T., 2020. Governance and quality of life in smart cities: towards sustainable development goals. J Clean Prod 253, 119926. https://doi.org/10.1016/j.jclepro.2019.119926.

Desdemoustier, J., Crutzen, N., Giffinger, R., 2019. Municipalities' understanding of the Smart City concept: an exploratory analysis in Belgium. Technol Forecast Soc Change 142, 129–141. https://doi.org/10.1016/j.techfore.2018.10.029.

Desouza, K.C., Hunter, M., Jacob, B., Yigitcanlar, T., 2020. Pathways to the Making of Prosperous Smart Cities: an Exploratory Study on the Best Practice. Journal of Urban Technology 27 (3), 3–32. https://doi.org/10.1080/10630732.2020.1807251.

Dowling, R., McGuirk, P., Gillon, C., 2019. Strategic or Piecemeal? Smart City Initiatives in Sydney and Melbourne. *Urban Policy and Research*, 37 (4), 429–441. https://doi.org/10.1080/08111146.2019.1674647.

Eden Strategy Institute, ONG&ONG Pte Ltd, 2018. Top 50 Smart City Governments. https://static1.squarespace.com/static/5b3c517fec4eb767a04e73ff/t/5b513c57aa4a99f62d168e60/1532050650562/Eden-OXD_Top+50+Smart+City+Governments.pdf.

Estevez, E., Lopes, N., Janowski, T., 2016. Smart Sustainable Cities: Reconnaissance Study. https://collections.unu.edu/view/UNU:5825#.XekJhrnR7Js.mendeley.

Giffinger, R., Fertner, C., Kramar, H., Meijers, E., Rudolf Giffinger, M., Christian Fertner, D.-.I., Hans Kramar are, D.-.I., 2007. City-ranking of European Medium-Sized Cities.

Gil-Garcia, J.R., Pardo, T.A., Nam, T., 2015. What makes a city smart? Identifying core components and proposing an integrative and comprehensive conceptualization. Information Polity 20 (1), 61–87. https://doi.org/10.3233/IP-150354.

Greater London Authority, 2018. Smarter London Together. https://www.london.gov.uk/sites/default/files/smarter_london_together_v1.66_-_published.pdf.

Haarstad, H., Wathne, M.W., 2019. Are smart city projects catalyzing urban energy sustainability? Energy Policy 129, 918–925. https://doi.org/10.1016/j.enpol.2019.03.001.

Howlett, M., 1998. Predictable and Unpredictable Policy Windows: institutional and Exogenous Correlates of Canadian Federal Agenda-Setting. Canadian Journal of Political Science 31 (3), 495–524.

Howlett, M., McConnell, A., Perl, A., 2017. Moving Policy Theory Forward: connecting Multiple Stream and Advocacy Coalition Frameworks to Policy Cycle Models of Analysis. Australian Journal of Public Administration 76 (1), 65–79. https://doi.org/10.1111/1467-8500.12191.

IESE Business School, 2019. IESE Cities in Motion Index. https://doi.org/10.15581/018.ST-509.

IMD, 2019. Smart City Index. https://www.imd.org/research-knowledge/reports/imd-smart-city-index-2019/.

Joss, S., Sengers, F., Schraven, D., Caprotti, F., Dayot, Y., 2019. The Smart City as Global Discourse: storylines and Critical Junctures across 27 Cities. Journal of Urban Technology 26 (1), 3–34. https://doi.org/10.1080/10630732.2018.1558387.

Kingdon, J., 1984. Agendas, Alternatives and Public Policies. Little, Brown and Company.

Kingdon, J., 1993. How Do Issues Get on Public Policy Agendas? In: Wilson, W. (Ed.), Sociology and the Public Agenda. SAGE Publications.

Komninos, N., 2011. Intelligent cities: variable geometries of spatial intelligence. Intelligent Buildings International 3 (3), 172–188. https://doi.org/10.1080/17508975.2011.579339.

Lazaroiu, G.C., Roscia, M., 2012. Definition methodology for the smart cities model. Energy 47 (1), 326–332. https://doi.org/10.1016/J.ENERGY.2012.09.028.

Leorke, D., Wyatt, D., 2018. Public Libraries in the Smart City. Palgrave Macmillan.

Magro, E., Wilson, J.R., 2019. Policy-mix evaluation: governance challenges from new place-based innovation policies. Res Policy 48 (10), 103612. https://doi.org/10.1016/j.respol.2018.06.010.

May, P.J., Sapotichne, J., Workman, S., 2006. Policy coherence and policy domains. Policy Studies Journal 34 (3), 381–403. https://doi.org/10.1111/j.1541-0072.2006.00178.x.

Mora, L., Deakin, M., Reid, A., Angelidou, M., 2019. How to Overcome the Dichotomous Nature of Smart City Research: proposed Methodology and Results of a Pilot Study.

Journal of Urban Technology 26 (2), 89–128. https://doi.org/10.1080/10630732.2018.1525265.
Nam, T., Pardo, T.A., 2011. Conceptualizing Smart City with Dimensions of Technology, People, and Institutions. In: The Proceedings of the 12th Annual International Conference on Digital Government Research. www.unfpa.org.
Neirotti, P., De Marco, A., Cagliano, A.C., Mangano, G., Scorrano, F., 2014. Current trends in smart city initiatives: some stylised facts. Cities 38, 25–36. https://doi.org/10.1016/j.cities.2013.12.010.
Nicolas, C., Kim, J., Chi, S., 2020. Quantifying the dynamic effects of smart city development enablers using structural equation modeling. Sustainable Cities and Society 53, 101916. https://doi.org/10.1016/j.scs.2019.101916.
Nicolas, C., Kim, J., Chi, S., 2021. Natural language processing-based characterization of top-down communication in smart cities for enhancing citizen alignment. Sustainable Cities and Society 66, 102674. https://doi.org/10.1016/j.scs.2020.102674.
Normann, H.E., 2015. The role of politics in sustainable transitions: the rise and decline of offshore wind in Norway. Environmental Innovation and Societal Transitions 15, 180–193. https://doi.org/10.1016/j.eist.2014.11.002.
Nunez-Mir, G.C., Iannone, B.V., Pijanowski, B.C., Kong, N., Fei, S., 2016. Automated content analysis: addressing the big literature challenge in ecology and evolution. Methods in Ecology and Evolution 7 (11), 1262–1272. https://doi.org/10.1111/2041-210X.12602.
Rawat, P., Morris, J.C., 2016. Kingdon's "Streams" Model at Thirty: still Relevant in the 21st Century? Politics & Policy 44 (4), 608–638. https://doi.org/10.1111/polp.12168.
Řehůřek, R., Sojka, P., 2010. Software Framework for Topic Modelling with Large Corpora. In: Proceedings of the LREC 2010 Workshop on New Challenges for NLP Frameworks. ELRA, pp. 45–50. http://is.muni.cz/publication/884893/en.
Ridde, V., 2009. Policy Implementation in an African State: an extension of Kingdon's Multiple-Streams Approach. Public Adm 87 (4), 938–954. https://doi.org/10.1111/j.1467-9299.2009.01792.x.
Robinson, S.E., Eller, W.S., 2010. Participation in Policy Streams: testing the Separation of Problems and Solutions in Subnational Policy Systems. Policy Studies Journal 38 (2), 199–216. https://doi.org/10.1111/j.1541-0072.2010.00358.x.
Sabatier, P.A., 1988. An advocacy coalition framework of policy change and the role of policy-oriented learning therein. Policy Sci 21.
Sievert, C., Shirley, K.E., 2014. LDAvis: a method for visualizing and interpreting topics. In: Proceedings of the Workshop on Interactive Language Learning, Visualization, and Interfaces, pp. 63–70.
Smigiel, C., 2019. Urban political strategies in times of crisis: a multiscalar perspective on smart cities in Italy. Eur. Urban Reg. Stud. 26 (4), 336–348. https://doi.org/10.1177/0969776418792049.
Tang, Z., Jayakar, K., Feng, X., Zhang, H., Peng, R.X., 2019. Identifying smart city archetypes from the bottom up: a content analysis of municipal plans. Telecomm Policy. https://doi.org/10.1016/j.telpol.2019.101834.
Vanolo, A., 2014. Smartmentality: the Smart City as Disciplinary Strategy. Urban Stud. 51 (5), 883–898. https://doi.org/10.1177/0042098013494427.
Wathne, M.W., Haarstad, H., 2020. The smart city as mobile policy: insights on contemporary urbanism. Geoforum 108, 130–138. https://doi.org/10.1016/j.geoforum.2019.12.003.
Willems, J., Van den Bergh, J., Viaene, S., 2017. Smart City Projects and Citizen Participation: the Case of London. Public Sector Management in a Globalized World. Springer Fachmedien Wiesbaden, pp. 249–266. https://doi.org/10.1007/978-3-658-16112-5_12.
Yigitcanlar, T., 2018. Smart City Policies Revisited: considerations for a Truly Smart and Sustainable Urbanism Practice. World Technopolis Rev. 7, 97–112. http://web.2ver.com/HOME/data/download/soitmc/Reading1.pdf.
Yigitcanlar, T., Foth, M., Kamruzzaman, M., 2019a. Towards Post-Anthropocentric Cities: reconceptualizing Smart Cities to Evade Urban Ecocide. J. Urban Technol. 26 (2), 147–152. https://doi.org/10.1080/10630732.2018.1524249.
Yigitcanlar, T., Han, H., Kamruzzaman, M., Ioppolo, G., Sabatini-Marques, J., 2019b. The making of smart cities: are Songdo, Masdar, Amsterdam, San Francisco and Brisbane the best we could build? Land use policy 88, 104187. https://doi.org/10.1016/j.landusepol.2019.104187.
Yigitcanlar, T., Kankanamge, N., Butler, L., Vella, K., Desouza, K., 2020. Smart Cities Down Under: Performance of Australian Local Government Areas. https://eprints.qut.edu.au/136873/1/Smart_Cities_Down_Under_2020_Report.pdf.
Yigitcanlar, T., Kankanamge, N., Vella, K., 2021. How Are Smart City Concepts and Technologies Perceived and Utilized? A Systematic Geo-Twitter Analysis of Smart Cities in Australia. J. Urban Technol. 28 (1–2), 135–154. https://doi.org/10.1080/10630732.2020.1753483.
Zvolska, L., Lehner, M., Voytenko Palgan, Y., Mont, O., Plepys, A., 2019. Urban sharing in smart cities: the cases of Berlin and London. Local Environ. 24 (7), 628–645. https://doi.org/10.1080/13549839.2018.1463978.

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