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Lessons From Municipal Election Candidates' Social Media Communications

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To cite this article: Albert Tonghoon Han, Lucie Laurian & Jim Dewald (2021) Plans Versus Political Priorities, Journal of the American Planning Association, 87:2, 211-227, DOI: 10.1080/01944363.2020.1831401



To link to this article: <https://doi.org/10.1080/01944363.2020.1831401>

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ABSTRACT

Problem, research strategy, and findings: Local elected officials play a leadership role in setting plan directions and can jeopardize implementation if they are not committed to plan goals. In this research, we apply topic modeling, semantic networks, and sentiment analyses to Calgary's (Canada) plans and candidates' social media communications in the 2017 Calgary municipal election to assess alignments or divergences between plans' and candidates' priorities. Though the mayor, ward representatives, incumbents, and challengers prioritized different topics, we find overall support for transit infrastructure, development, and improving the downtown and the municipal tax base. However, candidates showed little interest in environmental issues, growth management, and regional cooperation, which are important plan goals that may not be addressed. The methodology has limitations: Using social media posts underrepresents the views of some candidates; text data processing may miss metaphorical phrases; elected officials' priorities during campaigns may not determine their actual votes once in office; and this cross-sectional analysis does not capture the ever-changing relations between officials' priorities, plan-making, and implementation.

Takeaway for practice: Candidates focused mainly on transit and taxes to the detriment of regional and environmental issues (energy, watershed, and growth management), revealing the incoming municipal administration's priorities and its potential blind spots. Planners may use this methodology to analyze large text data from both online and offline sources, understand local implementation barriers, explain shifts in municipal policy directions, and engage elected officials to build support for important plan components.

Keywords: content analysis, elections, plans, social media, text mining

What Social Media Campaign Communications Might Tell Us About Planning Prospects

Planning practitioners understand the important role of committed elected representatives to turn municipal plans into realities. This is particularly relevant for efforts to enhance community quality of life or advocate for disenfranchised populations because these goals are seldom promoted by narrow development or NIMBY interests (Grooms & Frimpong Boamah, 2018).

Plan implementation depends on complex factors, including financial and sociopolitical resources, collaborative networks of actors, and effective processes and institutional arrangements. Among the many actors involved in implementing plans, elected leaders have an important role to play. Though they do not write local plans, they set policy directions; vote for budgets; approve and amend plans, policies, and rezoning applications; and set general directions for the next generation of plans. Municipal leadership changes with electoral cycles: Plan-making is iterative, and plan

implementation is incremental. These multiple temporalities can lead to synergies or contradictions between plan objectives and strategies and elected officials' interests and priorities. Although consistencies between plan goals and elected officials' priorities are not sufficient to secure implementation, inconsistencies can derail implementation, such as with unfunded mandates, insufficient budgets, or shifting policy agendas, potentially leaving important planning challenges unresolved (e.g., Hudson et al., 2019; Laurian et al., 2004, 2017).

Given elected officials' key role for plan implementation, it is essential to understand their priorities and the degree to which they align with or diverge from plans' visions and goals. However, beyond the vastly inadequate party affiliation or left/right ideology, planning scholars have no direct way to assess elected officials' substantial priorities or support/opposition for plans or plan components. To our knowledge, there is little research contrasting decision makers' and plans' priorities. Candidates and elected officials use social media platforms to share their views with constituents, especially during electoral campaigns, when they lay out their values, priorities, and agenda. Social media

communications may not reflect candidates' true priorities, but they provide the electorate with a sense of what candidates value, oppose, and support, such as affordable housing, transit, and greenfield development. Although this presents an opportunity to explore elected officials' priorities systematically, there is a dearth of research about the place of planning-related topics in the social media campaign communications of candidates for local office.

We seek to answer two related exploratory research questions: Can social media campaign communications be used to contrast elected officials' planning priorities and the objectives of municipal plans? If so, what would such an analysis reveal about the positions of various candidates (at-large and district representatives, incumbents, and challengers) vis-à-vis planning goals?

Using the October 2017 Calgary (Canada) municipal election, we demonstrate how emerging data sources and methodologies can be used to explore the planning priorities of candidates for local office and contrast them with the goals and objectives of local municipal plans. We show how this systematic content analysis of social media and plan text data sheds light on important areas of concordance and discordance between the priorities of plans and the priorities of candidates and elected officials.

Although we do not assess the impact of such concordances and discordances on plan implementation, the analysis can contribute to practitioners' and researchers' understandings of local plan implementation gaps. For instance, sprawl may continue because councilmembers do not prioritize densification, and council budget allocations may fund or defund planning programs. The implications of this analysis are that 1) commonly available campaign social media communications can be "mined" to identify elected officials' inclinations to support or hinder specific plan goals; 2) planning academics and practitioners can use this information to identify whether at-large and district representatives, new or re-elected councilmembers, support or hinder specific planning objectives; and 3) practitioners may use this knowledge to proactively engage with candidates to build support for important plan components.

Social Media, Local Elections, and Urban Planning

Social Media and Local Elections

Candidates for public office communicate with their constituents and peers using interpersonal relations, traditional news media, party politics where relevant, and, increasingly, online and social media platforms (Bruns et al., 2015).¹ Social media communications affect local election results, the composition of municipal

councils, and thus local policy formation and planning activities. Given the importance of social media for electoral outcomes, studies of social media usage by politicians tend to focus on election periods (Karlsen, 2011; Larsson & Svensson, 2014). Most U.S. studies about the impact of social media usage on elections focus on presidential elections (Chung & Mustafaraj, 2011; Grover et al., 2019; Williams & Gulati, 2008; Winsvold, 2007). The emerging literature on social media usage in municipal elections shows that candidates' social media activity and online followers have strong and significant impacts on election results (e.g., Hagar, 2015; Lappas et al., 2016; Lev-On, 2018; Lin, 2017; Raynauld & Greenberg, 2014; Zhang, 2018).

Candidates for local office communicate on social media during campaigns to present and frame themselves, communicate their platforms and views on specific issues, appear authentic and connect with potential voters, influence traditional media coverage, and publicize campaign events (Ellison & Hardey, 2014; Enjolras et al., 2013; Karlsen & Skogerbø, 2015; Orkibi, 2015). The ease of doing so presents a direct advantage for candidates with limited resources (Bekafigo et al., 2013; Buente, 2015; Gibson & McAllister, 2015). Although candidates can use social media to facilitate two-way conversations with their followers, most use these platforms as a one-way broadcasting medium, most likely to avoid poorly worded statements "going viral" and reducing their election prospects (Baxter & Marcella, 2012, 2013; Carlson et al., 2014; Hagar, 2014; Seggaard & Nielsen, 2013; Small, 2010, 2012; Spurlock, 2013; Stefan, 2017).

Candidates use social media to mobilize and stimulate action. Social media usage increases campaign contributions, especially in political systems that favor large numbers of small contributions (Chaaban et al., 2016; Walchuk, 2012). Social media also promotes discussion, signing petitions, participation in rallies, and voting (Stetka & Mazak, 2014). Candidates with active social media accounts and large numbers of followers and who are mentioned in tweets tend to generate higher voter turnout and win elections (DiGrazia et al., 2013; Dumitrica, 2014; Spierings & Jacobs, 2014; Tumasjan et al., 2010; Williams & Gulati, 2008). Given the strong relationships between social media activity and election outcomes, political scientists use social media data to forecast election results, assess politicians' approval ratings, and analyze citizens' political preferences (Gloor et al., 2009; O'Connor et al., 2010; Sang & Bos, 2012).

Social Media, Urban Planning, and Elected Officials' Priorities

Social media tools are already used in planning practice and research (Evans-Cowley & Griffin, 2012;

Evans-Cowley & Hollander, 2010; Kleinhans et al., 2015; Schweitzer, 2014). They can capture public sentiments and serve as multiway communication systems for public participation and consultation. Residents, interest groups, and elected officials use social media to learn about each other's priorities, influence public sentiment and traditional media coverage, and draw public attention to planning matters.²

During municipal campaigns, candidates for mayoral and council positions can reveal their general ideological leanings by discussing their views on national issues, such as approval or opposition to the president in office, immigration, or abortion. However, candidates for municipal office tend to run on locally relevant platforms. They express their views, values, and priorities on local issues and discuss what they would do to improve the municipality once in office. Some of these views are likely to touch on planning-related topics, such as local governance, taxes, municipal budgets, affordable housing, traffic, parking, transit, bike lanes, etc. They may not explicitly refer to comprehensive plans or land use regulations, but instead use common language to campaign on local planning issues relevant to their electorate.

Once in office, elected officials are typically more interested in the changes they can make soon than in implementing plans adopted years, if not decades, earlier. Balancing plan implementation with new council priorities involves a dense, complex, and dynamic network of stakeholders (e.g., elected officials, planners, city managers, private developers, interest groups, and local, regional, and supralocal agencies).

The factors that influence plan and policy adoption and implementation have been researched in depth, highlighting the importance of financial and human resources, institutional structures, and cultures, as well as the importance of a committed elected leadership (Brown, 2008; Francis & Feiock, 2011; Hudson et al., 2019; Krause, 2011; Laurian et al., 2004, 2017; Svara et al., 2013; Wang et al., 2012; Woodruff & Stults, 2016). Elected officials play a key role in planning decisions and in advancing plan goals by setting general policy directions, prioritizing municipal activities through budgeting, cultivating relationships with private and nonprofit actors, and voting to approve and amend plans, projects, and rezoning applications.

Although insufficient per se, elected officials' commitment to solving planning problems has major impacts on planning decisions and outcomes. Conversely, their lack of commitment can be a significant barrier to plan implementation when conflicting priorities are pursued, such as support for low-density development, fewer regulations, or less spending on transit. Plans have long shelf lives: Parts of plans may not be relevant years after plan adoption, and new issues emerge over time. Although plan goals and

elected officials' priorities cannot all be expected to match, the extent to which elected officials' priorities converge or diverge from plans at any given time can help understand the dynamics of plan implementation or the causes of implementation gaps.

In sum, candidates for public office use social media during electoral campaigns to shape local narratives, articulate their priorities, and express support for or opposition to salient planning strategies. Tracking the consistency between the priorities of plans and elected officials could thus help explain which plan elements are most and least likely to be foregrounded and implemented. Despite the growing number of studies on social media use in local elections and in planning, we find no analysis of the connections between municipal election and planning priorities or the extent to which the contents of elected officials' social media posts may diverge or align with existing plans.

At-Large Mayor Versus District Representatives, Incumbents Versus Challengers: Different Planning Priorities and Positions?

Salient municipal issues vary over time, space, and social groups. Different candidates can be expected to have different priorities and different ways to engage planning topics in their campaign communications. At-large candidates, which can include mayoral and/or council candidates, typically focus on citywide issues. District or ward representatives are more likely to focus on district-specific issues to appeal to their narrower electoral base.³ Citywide issues may include general governance concerns, such as decision-making processes, transparency, government spending, and taxation, and substantive issues, such as economic development, disaster preparedness, traffic congestion, and housing affordability. District-scale issues can include inequities across neighborhoods, historic preservation, housing affordability, or specific transit routes.

Incumbents in municipal elections have the comparative advantages of name recognition, sociopolitical resources, track records, and experience (Benedetto, 2014; Moore et al., 2017; Stanwick, 2000). The incumbency advantage tends to be stronger in local elections than in national/federal elections, especially in nonpartisan local elections (Benedetto, 2014; Freier, 2015; Kang et al., 2018; Krashinsky & Milne, 1985; Kushner et al., 1997; Trounstone, 2011). Whereas incumbents can tout their accomplishments, nonincumbent challengers often resort to negative campaigning to win votes (Benoit, 2001; Evans et al., 2014, 2017; Lau & Pomper, 2002). Therefore, the social media campaign communications of incumbents and challengers may diverge, with incumbents expressing positive views about their

claimed accomplishments and challengers criticizing contested planning topics, processes, or projects.

Given the importance of elected officials' support for plan implementation and the availability of social media campaign communication content, we seek to answer the following questions: Can social media campaign data reveal consistencies/inconsistencies between elected officials' planning priorities and the objectives of comprehensive plans? If so, what would such an analysis reveal about the positions of various candidates vis-à-vis planning goals? In particular, could it reveal meaningful alignments or divergences between the priorities of local plans and candidates? Could it reveal differences between candidates; that is, at-large and district-based incumbents and challengers?

Methodology: Accessing the Priorities of Candidates and Elected Officials Through Campaign Social Media Data, and Contrasting Them With Local Plans

Voters turn to social media communications to identify candidates' positions before elections, and researchers can access the same information in real time or post hoc. Strategic social media data mining can shed light on the alignment or disconnect between the priorities of candidates, including those elected to office, and the priorities of local plans. We use text mining to systematically analyze the contents of candidates' social media postings in the Calgary 2017 municipal election to identify their priorities and compare them with those of the local comprehensive and transportation plans. We use topic modeling, semantic network analysis, and sentiment analysis. Because these are innovative methodologies in planning, we use expert input to supplement the methodology and community input to groundtruth our results. We include detailed descriptions of the modeling processes in the [Technical Appendix](#).

Case Study: Calgary's 2017 Municipal Election and Social Media Campaign Communications

Calgary has a mayor-council government system, with nonpartisan municipal elections held every 4 years to elect an at-large mayor and 14 councilors representing each city ward. Wards 4, 7, 8, 9, and 11 cover the inner-city portion of the city. The remaining nine wards cover the suburban edge areas (see [Technical Appendix Figure A3](#)). In the October 16, 2017, municipal elections, 10 candidates competed for the mayoral position and 70 candidates competed for the 14 city council seats. All incumbents were re-elected, including Mayor Naheed Nenshi. Four new city councilors were elected

from wards with no incumbents (Wards 3, 5, 6, and 11). The candidates used a variety of campaign platforms, including personal websites, Facebook, Twitter, and YouTube, to discuss their agendas. For this study, we collected Facebook and Twitter posts from the 76 registered candidates who had disclosed their social media accounts for campaign purposes. The collected data include 6,122 tweets and 5,703 Facebook feeds from the city council candidates and 1,091 tweets and 1,012 Facebook feeds from the mayoral candidates (see the [Technical Appendix](#) for details on variations across candidates' posting counts).

Identifying Planning Topics and Keywords

We first identified the planning topics and keywords that best represent Calgary's planning issues and serve as a parameter for the analysis. Development in Calgary is guided by two major planning documents: the Municipal Development Plan (MDP) and its subsidiary Calgary Transportation Plan (CTP). Adopted in 2009, the MDP addresses citywide planning challenges structured around 11 principles regarding housing opportunities, sense of place and community, walkable environments, accessibility, transportation options, open space and environmental protection, land use mix, infill redevelopment, compact development, and green infrastructure and buildings (The City of Calgary, 2009b). The CTP focuses on challenges associated with automobile-oriented land use patterns and transportation infrastructure (The City of Calgary, 2009a).

We used topic modeling to identify relevant plan keywords. Topic modeling is a machine learning-based natural language processing technique that considers each document as a mixture of latent topics and each topic as a mixture of keywords (Silge & Robinson, 2017). Latent Dirichlet allocation is a commonly used topic modeling method to identify latent topics and their associated groupings of words. For instance, the words *parking*, *transit*, *mobility*, *pedestrian*, *walking*, *bike*, *street*, *route*, *network*, *access*, and *travel* all contribute to a single latent topic: *transportation*. Each keyword has a distinct probability of appearing under each topic. We performed this latent Dirichlet allocation analysis on the aggregated MDP and CTP documents, from which we identified 20 topics consisting of keywords with a high probability of occurrence. We confirmed that these topics were consistent with the comprehensive plan's 11 principles ([Table 1](#)).

To verify whether the high-probability keywords identified by the topic modeling adequately reflect planning priorities, we convened a focus group of local experts.⁴ It was important to verify the keywords selection because the 2009 MDP and CTP cannot capture the challenges that emerged between 2009 and 2017.

Table 1. Selecting keywords from plans using topic modeling and focus group.

Themes	Plans	Focus group, authors	
	Plan guiding principles	Keywords from topic modeling of plans	
		Final keywords based on plans, focus group, and authors	
Housing and community	Create a range of housing opportunities and choices Foster distinctive, attractive communities with a strong sense of place	Housing	Housing affordability, ^a secondary suites, ^a property values ^a
		Community, neighborhood, residential development	Community development, ^a community association ^a
		Centre City, Downtown	Centre City (includes Beltline and Downtown neighborhoods)
Transportation	Create walkable environments	Pedestrian, walking	Pedestrian
	Provide a variety of transportation options	Connectivity, transit network, transit service, transit center, transit-oriented development	Transit, LRT, ^a Green Line, ^a Red Line, ^a bus ^a
	Provide safe, effective, affordable, and efficient transportation services, ensure accessibility for all		
Connect people, goods, and services	Road, streets, connectivity, regional	Ring Road, ^a traffic, ^a parking, ^a regional	
Environment	Preserve open space, agricultural land, natural beauty, and critical natural areas	Parks, natural areas	Natural areas
	Use green infrastructure and buildings	Water, stormwater management, building energy	Watershed, ^a stormwater, flood, ^a energy efficiency, ^a renewable energy ^a
Land use and development	Mix land uses	Growth, change, infrastructure, low-rise development, residential density	Building height, ^a density, ^a infrastructure, ^a development, ^a growth management, ^a sprawl, ^a smart growth, ^a regional ^a
	Strategically direct and manage redevelopment opportunities within existing areas		
	Support compact development		
Economic development/capital improvement finance	Not in the plans	Taxes, ^a impact fees, ^a property values, ^a energy industry ^a	

Note: a. From focus group input and authors. LRT = light rail transit.
Source: The City of Calgary, 2009a, 2009b, topic modeling results.

For example, planning for the light rail transit (LRT) Green Line began after the adoption of the plans. Secondary suites (i.e., accessory dwelling units) emerged as a key planning tool in recent years to densify and diversify the inner-city housing stock. Furthermore, verifying the keyword selection was important because candidates may use less formal terminology in their campaign communications than plans. We replaced jargon and technical terms with common terms (e.g., *transit network* became *transit*), merged words with similar meaning (*downtown* and *Beltline neighborhoods* became *Centre City* because both areas are part of the Centre City), separated words with distinctive meanings (e.g., *community development* and *development*), and deleted

ambiguous terms (e.g., *corridor* could apply to transportation or wildlife). Although the plans are silent on infrastructure costs, capital improvement finance, taxes, and economic development, the focus group highlighted these topics as very important keywords. The final 34 keywords constitute the parameters for the subsequent content analysis (see Table 1).

Comparing Plans' and Candidates' Priorities and Attitudes

Next, we compared the planning priorities of plans and candidates. We first assessed the priority, or centrality, of all 34 planning keywords in plans and candidates'

aggregated social media postings. Each text document (pages in plans, social media postings) is a network of words. All words are nodes, operating in the context of a vast semantic (i.e., meaningful) network of other words. A keyword is a priority if it is central, or influential, in this network; that is, if it is surrounded by many other nodes that are themselves central, rather than at the edge of the network. The centrality of each word is measured as its eigenvector centrality score (ECS), a relative score ranging from 0 to 1 assigned to every word in the network. ECSs are used to rank keywords by their relative importance (Carley, 1993; Danowski, 1993, 1982; Doerfel & Barnett, 1999; Jang & Barnett, 1994; Rice & Danowski, 1993). Thus, priorities are assessed as the centrality or salience of keywords, not through word frequency counts (see the [Technical Appendix](#) for more details).⁵

The centrality of a word is not sufficient to assess a plan's or a candidate's priorities. Prioritizing *taxes* per se does not reveal whether candidates oppose tax spending or support increasing the municipal tax base. Similarly, those who prioritize *light rail transit* could support or oppose it. We thus conducted a sentiment analysis for all 34 keywords in all plans and candidates' postings. Sentiment analysis is based on lexicon markers of positive or negative attitudes, such as *good, great, love, support* and *bad, poor, hate, unfair, against*. We used the opinion lexicon dictionary developed by Liu et al. (2005). We calculated the sentiment score for each social media post by subtracting the number of positive words from the number of negative words in each post and normalized it by dividing by the total number of sentiment words in each post. To identify candidates' average sentiment on a subject keyword, we calculated the mean value of the sentiment scores for all posts containing the keyword (scores range from -1 to 1, with negative scores indicating negative sentiments). For the plan sentiment analysis, we calculated the sentiment score for each topic normalized by the number of sentiment words in each plan subsections (e.g., 2.1. A prosperous economy; 2.2. Shaping a more compact urban form). We did not report ECSs less than 0.0001 because very low scores indicate low-priority keywords.

ECS and sentiment scores need to be interpreted jointly. For instance, in [Table 3](#), incumbent councilors prioritize Green Line and Centre City (ECS ranks 1 and 2, respectively) and express positive sentiments toward these words (scores: 0.550 and 0.479). Later in this article, we use actual social media posts to illustrate the findings and provide more nuanced interpretations.

Groundtruthing the Methodology

Finally, because this is an innovative approach in planning, we validated the results with local experts and

community members at two events held in Calgary after the elections on October 24, 2017. At each event, invited panelists and participants discussed our findings. The first event targeted developers, who often have drastically different perspectives on planning than the general public. About 100 industry stakeholders participated. About 50 participants attended the second public event, which included community members and city planners. The discussions centered on taxes, fiscal transparency and efficiency, transportation infrastructure financing, and participants' hope for more mixed modal transportation and equitable access to transit services. Overall, both events confirmed that our findings correctly capture candidates' planning priorities, as expressed during the electoral campaign (see the [Technical Appendix](#) for details).

Limitations

This methodology presents several limitations. First, the quality of social media data depends on the quantity, contents, and specific phrasing in users' postings. The data do not represent the views of candidates who are less active on social media, and candidates may remain silent on key planning issues. The number of social media postings varies widely among candidates. Thus, the analysis underrepresents the opinions of candidates who preferred other modes of communication, such as personal websites and offline meetings. In addition, the text data processing depends on computer coding designed to recognize patterns in users' text inputs. The analysis may have missed misspelled words, synonyms, metaphorical phrases, and miscategorized words with plural meanings. Another caveat of semantic network analysis is that the keywords appearing in meaningless proximity to each other (e.g., lists) could get similar centrality scores as those appearing with other keywords in meaningful statements. Although we did not find this to be an issue when we examined a random sample of 50 posts (10 for each of the top five keywords), this remains a possibility.

Second, we do not assess the impact of candidates and elected officials' priorities on actual council votes or decisions, nor do we assess the likelihood of the candidates' stance on specific planning goals or projects changing once in office. Finally, we take Calgary's MDP and CTP as static references. Understanding that planning issues change over time, we used the expert focus group to add currently relevant topics. However, campaign dynamics and events could have affected the importance of some topics expressed on social media. Moreover, plans are evolving entities that are revised over time. Our analysis does not account for the dynamic and ever-changing nature of plan-making and plan implementation.

Findings: Plans and Elected Officials' Priorities

In this study we present and test a new methodology to explore potential convergences and divergences between the priorities of plans and candidates for local office. Topic modeling accurately extracted planning keywords from plans. The focus group confirmed that the keywords indeed capture crucial issues, while also adding topics that emerged in the decade since the adoption of the plans. The semantic network analysis accurately identified the central planning priorities in plans and candidates' social media communications, and the sentiment analysis revealed meaningful trends in candidates' positive and negative attitudes toward each planning priority. We validated the study results through our analysis of rich discussions at two public meetings.

Regarding the substantive results of the study, we first compare the plan priorities with the priorities of candidates and elected officials. We then discuss how planning priorities converge and diverge between the at-large mayor and district representative councilors and between incumbents and challengers.

The Gap: Plan Priorities Versus Candidates' and Elected Officials' Priorities

PLAN PRIORITIES

The MDP covers a wide range of planning issues, including development, Centre City, community development, housing affordability, density, secondary suites, transit, stormwater, flooding, etc. As expected, the CTP emphasizes transportation topics: transit, infrastructure, bus, parking, traffic, light rail, Ring Road, etc. (see CTP ranking in Table 2). Both plans emphasize transit, development, infrastructure, Centre City, and regional cooperation. Both plans mention LRT but none mentioned Red Line (built in 1981). This is perhaps due to the comprehensive nature of the plans, which set broad goals and objectives rather than discuss specific transit service. Interestingly, sprawl, property values, and taxes are not salient topics in the plans. Both are silent about economic development and public finance, which may be discussed in other municipal policy and budgetary documents. Yet property values are relevant for housing affordability, and taxes are highly associated with infrastructure financing. The plans' lack of prioritization of taxes is striking given how salient the keyword was to all candidates running for office. The plans' lack of priority given to sprawl is also remarkable because the focus group saw it as one of the most pressing local and regional challenges. Perhaps the plans consider sprawl a regional rather than a municipal issue, or perhaps they avoided this loaded term in favor of the more positive term *density*.

The 34 planning keywords are generally framed in positive terms in both plans, which tend to express planning goals, objectives, and strategies as positive directions for future improvements. One exception was the keyword *impact fee* in the CTP, which indicates that CTP discussed impact fee (including levy and development charges) as a policy solution to Calgary's transportation challenges.

CANDIDATES' AND ELECTED OFFICIALS' PRIORITIES

We find few substantial differences in priorities between nonelected and elected city council candidates. Both groups prioritize taxes. Taxes are the top issue for all candidates except for incumbents, but even the incumbents put taxes high among their priorities (priority 6). Sentiments toward taxes are positive (e.g., increasing the city's tax revenues, good management of taxpayer's money), except for one of the newly elected councilors (Ward 11) who ran on platforms for lowering taxes. Beyond taxes, most candidates prioritize infrastructure, development, transit (bus, Green Line, LRT), and Centre City. In this sense, references to planning issues in campaign communications are homogenous across candidates (Table 3).

The meaningful differences between those who were elected and those who were not are that the elected mayor put a much higher priority on housing affordability and Green Line than other candidates, the nonelected mayoral challengers prioritized property values more than other candidates, and the nonelected council candidates prioritized community associations and secondary suites more than other candidates. "Underdog" candidates may have identified community associations to engage grassroots stakeholders in their campaigns. Secondary suites were a high priority for nonelected councilors (priority 5) but were a lower priority for elected councilors (priority 15) and not a priority at all in Mayor Nenshi's campaign. This is surprising given that under his leadership, the City of Calgary has facilitated secondary suite (i.e., accessory dwelling units) additions to single-family homes in the inner city to promote densification. Rather than his lack of commitment, NIMBY opposition by some residents may explain Mayor Nenshi's silence on secondary suites and density (Thomas, 2018). Instead, he may have chosen to reframe these topics under the more general theme of housing affordability, his priority 4 (see Technical Appendix Table A3 for the findings on the nonelected candidates).

GAPS BETWEEN PLANS' AND ELECTED OFFICIALS' PRIORITIES

Because elected officials are those who set policy directions and approve developments, infrastructure projects, and budgets after the elections, we contrast the

Table 2. Semantic network and sentiment analysis of plans.

Keywords	MDP			CTP		
	Eigenvector centrality	Normalized sentiment		Eigenvector centrality	Normalized sentiment	
	Ranking	Score	Score	Ranking	Score	Score
Housing and community						
Centre City	5	0.184	0.68	10	0.038	0.57
Community association	20	0.009	1.00			
Community development	23	0.004	0.87			
Housing affordability	14	0.022	0.78			
Secondary suites	26	0.001	0.46			
Property value						
Transportation						
Bus	12	0.029	0.66	5	0.081	0.58
Green Line						
LRT	16	0.014	0.60	9	0.043	0.55
Parking	7	0.110	0.67	7	0.074	0.43
Pedestrian	3	0.211	0.73	8	0.056	0.67
Red Line						
Ring Road				14	0.003	0.28
Traffic	13	0.027	0.49	6	0.078	0.43
Transit	1	0.493	0.73	1	1.000	0.52
Environment						
Energy efficiency	22	0.005	0.83			
Flooding	11	0.036	0.36	16	0.002	0.35
Forest	19	0.011	0.47	13	0.006	0.25
Natural areas	15	0.022	0.66	18	0.001	0.50
Open space	6	0.147	0.66	21	0.001	0.80
Renewable energy	21	0.008	0.78	22	0.001	1.00
Stormwater	10	0.051	0.40	12	0.009	0.40
Watershed	17	0.012	0.48	15	0.003	0.35
Land use and development						
Building height	24	0.003	0.60			
Density	4	0.185	0.64	11	0.017	0.35
Development	2	0.447	0.66	4	0.093	0.52
Growth management	18	0.011	0.47	17	0.002	0.30
Smart growth	27	0.001	1.00	20	0.001	0.80
Regional	8	0.105	0.70	3	0.112	0.61
Sprawl						
Economic development and capital improvement						
Energy industry	25	0.002	0.72			
Infrastructure	9	0.101	0.54	2	0.161	0.52
Impact fees				19	0.001	-0.20
Taxes						

Notes: We did not report eigenvector centrality scores below 0.0001 because very low scores indicate low-priority keywords. LRT = light rail transit; MDP = municipal development plan; CTP = Calgary Transportation plan. Negative sentiment scores are bolded.

plans and priorities of elected officials rather than all candidates.

We find some consistencies and divergences between the prioritization of planning issues in the plans and in elected officials' discourses. The elected mayor and councilors discussed topics that are important in the plans, such as development; infrastructure; housing affordability; secondary suites; transportation topics such as LRT, parking, traffic, and transit; and environmental concerns, especially flooding. They emphasized the newly planned LRT Green Line, which was not discussed in the plans but was identified as a key planning issue by the focus group. The elected mayor placed greater emphasis on housing affordability (rank 4) and flood risks (rank 5) than the plans (respectively ranked 14 and 11 in the MDP). The elected councilors placed a higher emphasis on the ward-specific issues like bus, LRT, and community associations than the plans.

Several plan topics related to the environment and land use were not prioritized by those elected to office, including natural areas, open space, energy efficiency, renewable energy, watershed, density, growth management, and building height. Sprawl was mentioned by a few inner-city incumbent councilors but missing in all other candidates' discourses. Regional cooperation was also largely missing from campaign communications (only mentioned by one incumbent suburban councilmember but not by the mayor or the rest of the councilmembers). Density, which is closely related to these land use issues, was not a priority for elected representatives. Finally, community development, an important topic in the MDP, was prioritized only by the mayor but by no other candidate.

Overall, candidates showed a general lack of engagement with environmental issues, growth management, and regional cooperation. Although they discussed flooding, elected officials did not frame it within the context of stormwater management or regional watershed planning. Similarly, sprawl and smart growth were priorities for some incumbent councilors but not for the mayor or the newly elected councilors. None of the candidates prioritized density, building height, and growth management, perhaps because these terms may trigger NIMBY-type responses. Those gaps in the areas of environmental protection, renewable energies, sprawl, and growth management may be indicative of planning goals and objectives that may not be addressed by the incoming administration. On the other hand, it is possible that candidates care about environmental issues and growth management but focused their campaign communications on their electorate's priorities "here and now," rather than on more regional and long-term visions.

AT-LARGE MAYOR VERSUS WARD-BASED REPRESENTATIVES: DIFFERENT PLANNING PRIORITIES

In Calgary, the mayor is elected at-large, and all councilpersons are elected by ward. The top 10 planning priorities of Mayor Nenshi's campaign communications included taxes, Green Line, development, housing affordability, flooding, transit, infrastructure, traffic, LRT, and community development. Although the unelected challengers for the mayor's office prioritized similar issues (e.g., taxes, flooding, development, LRT, infrastructure), they also prioritized Centre City, property value, renewable energy, energy industry, and community associations (see [Technical Appendix Table A3](#)). We further discuss the differences between the incumbent mayor and his challengers in the next section. Elected councilors, whether incumbents or newly elected, whether representing inner-city or suburban wards, also prioritized taxes, transit, Green Line, LRT, traffic, and development. All elected officials thus seem to agree in their emphasis on transit, infrastructure, and development.

However, there are also important differences between the at-large mayor and ward representatives. The mayor discussed broad municipal issues, including housing affordability, flooding, and community development. The mayor's fourth and fifth priorities (housing affordability and flooding) ranked 16th and 13th, respectively, in councilors' aggregated semantic networks (see [Table 3](#)). Planning for flood recovery and mitigation became a citywide matter after Calgary's 2013 great flood, which affected the downtown and 32 neighborhoods across the city. At the time of the 2017 municipal elections, the median housing cost in Calgary was CAD\$473,000, a high price driven by the shale oil boom (Calgary Real Estate Board, 2017). Housing affordability is a general municipal issue that affects low-income residents throughout the city. It was a high priority for the mayor (rank 4) and Ward 5 councilor, whose constituents include high percentages of immigrants and low-income households (rank 4) but a much lower priority for all other candidates. Only two other councilors (Ward 7, rank 11; Ward 8, rank 15) mentioned the issue at all during their campaigns (see [Technical Appendix Tables A2-1 and A2-2](#)).

Unlike the mayor, the elected ward councilors prioritized bus service, Centre City, the Ring Road, and community associations, presumably because these were relevant to their districts. Their discussions of transit networks revolved around specific transit lines located in their respective wards. Bus service, the Ring Road, and community associations (councilors' 2nd, 9th, and 8th priorities, respectively) were not mentioned at all by the mayor. The councilors' fifth priority, Centre City (including downtown and Beltline), ranked only

Table 4. Social media quote samples (positive sentiment).

Elected official	Keyword (sentiment score)	Social media quotes
Mayor incumbent since 2010	Tax, transit, Green Line (0.368)	This was an extraordinarily busy session for Council. We built affordable housing, invested in transit across the city, built more roads and interchanges than ever before, and received the single largest capital investment in our history from the federal and provincial governments that will allow us to start on the Green Line . Notably, we did all of that while freezing property tax rates and giving businesses significant tax relief. ... Thank you for your love of Calgary. Let's move forward. Together.
	Green Line, LRT (1.000)	Today is a big, big day for Calgary! I joined Premier Rachel Notley as she announced the provincial government's share (\$1.53 billion) to build the Green Line LRT . As the largest public infrastructure project in our history, the Green Line will transform our city. This is an investment in the quality of life for all Calgarians, an investment that will also create jobs and encourage economic and community development
Ward 6 newly elected (challenger)	Green Line (1.000)	The provincial government committed to one-third of the Green Line costs (\$1.53 billion over 8 years for Stage One). This is a great day for Calgary and long awaited. But I will continue to fight to make sure that the entire project is completed as promised, with the additional extension into the northern communities.
Ward 7 incumbent since 2001	Tax (0.714)	In the past, Downtown accounted for 40% of non-residential taxes and 25% of citywide employment. Near 30% office vacancy affects businesses and residents across Calgary. The rainy-day fund and a comprehensive strategy are not only needed to boost our Downtown but Calgary overall. A strong Downtown is a strong Calgary.
	Transit (0.833)	Calgary is in the running to attract Amazon's recently announced HQ2, a second headquarters that could bring \$5 b in investment and 50,000 new full-time jobs. ... Amazon is specifically looking for walkable and bike-friendly communities, high-quality transit , and vibrant amenity-rich locations. These are the exact things that I fight for and will enable Calgary to successfully attract new jobs.
Ward 8 incumbent since 2013	Tax, infrastructure (0.666)	What that meant to me was committing to ending the sprawl subsidy that saw our inner-city tax dollars funding infrastructure in the suburbs and leading a charge to reinvest that money back into Ward 8 neighbourhoods.

Note: The quotes are selected to include top-five priority keywords, have high absolute values for sentiment scores, and stem from different candidates.

and councilors expressed more negative sentiments than elected incumbents (Technical Appendix Table A3). This confirms challengers' tendency to adopt more negative campaigning strategies than incumbents.

Conclusions: Using Electoral Social Media Data to Assess Elected Officials' Commitment to Planning Goals

In this study we assess the priorities and commitments of candidates in mayoral and council elections, as captured by their social media communication discourses during the Calgary 2017 municipal election, against local plans' and planning priorities, as identified by plan

contents and expert planners. We demonstrate how we can successfully use digitized plans and social media communications data, along with topic modeling, semantic network, and sentiment analyses, to uncover important patterns in the priorities of candidates for office and their commitments to planning issues.

Our main place-based empirical findings are the following:

1. Candidates focused mainly on specific transit projects and their fiscal impacts rather than on big-picture, complex, and contentious planning topics such as regional planning, renewable energy, watershed management, density, and growth management, all highlighted in the plans. This may be due

Table 5. Social media quote samples (negative sentiment).

Elected official	Keyword (sentiment score)	Social media quotes
Ward 4 incumbent since 2013	Tax, transit (−0.500)	People pay taxes for transit , for roads, for parks ... not an “art” installation on a highway. The Blue Ring on 96 Avenue has a companion now for the biggest symbol of tax dollars being wasted.
Ward 11 newly elected (challenger)	Tax (−0.500)	As taxpayers and ratepayers, Calgarian families and small businesses are the ones who pay for this needless and duplicated work. ... The Southwest BRT debacle shines a line on some of the worst issues at City Hall; entitlement, overspending, and secret meetings. We should stop wasting money on this project which will hurt rather than help.
	Transit, LRT, infrastructure (−0.500)	There is still time to stop the Southwest BRT before construction begins in March 2018. I will immediately move to cancel this project, and have the money used on transit infrastructure warranted by ridership, like an LRT extension to the Airport. ...
Ward 7 nonelected candidate (challenger)	Green Line, LRT, transit, tax (−0.714)	I talked about my plan to get Calgary back to work! I said when asked about what you do about public transit “ridership is down because downtown is 1/3 empty and people don’t have jobs. We need to get people back to work to get ridership up. ...” I also said, “We need to get the City’s priorities straight, we need to understand the difference between wants & needs, sometimes we have to say no, no to billions on the green line LRT with decreased ridership, no to putting taxpayer’s money into a new arena and no to spending millions on ridiculous art from NY!” ... I also talked about holding the line on business and property taxes and making the city do more with less.
Nonelected mayoral candidate (challenger)	Tax (−0.600)	We knew this recession was coming and was going to hit downtown Calgary the hardest. As highlighted in today’s <i>Calgary Herald</i> article, the tax burden imposed under current city leadership has crippled already hurting businesses and emptied our downtown core. How is this common sense? How can this possibly create an environment that fosters good economic growth? I said it when I launched and I’ll say it again until I become mayor, we need to stop forcing Calgary businesses to shoulder the burden of this leadership’s financial mismanagement. Full stop.

Note: The quotes are selected to include top-five priority keywords, have high absolute values for sentiment scores, and stem from different candidates.

- to a general preference for conflict avoidance and for focusing on issues that are salient on voters’ minds. It could also reveal a lack of commitment to environmental issues and regional growth management efforts, which in turn could explain Calgary’s continued regional sprawl.
- The re-elected at-large mayor talked mostly in positive terms about broad planning topics, including taxes, development, Green Line, housing affordability, flooding, transit, and infrastructure. He highlighted recent municipal accomplishments and was among the only candidates talking about citywide flood mitigation and housing affordability issues. Ward representatives, as expected, focused on issues specific to their districts, such as specific transit lines.
 - Incumbents highlighted their achievements with positive and optimistic sentiments and challengers expressed more critical views on key issues, especially infrastructure and taxes. This is consistent with existing studies on municipal elections and campaign strategies. Although all incumbents won their seats, many challengers who adopted negative campaigning strategies failed to get elected.

The implications of this study for planning practice and research are fourfold:

 - The methodology we developed to identify and contrast the priorities of plans and candidates for local office is effective and efficient. Automated textual analysis using topic modeling, semantic

network, and sentiment analyses identifies meaningful patterns and contrasts from large and complex plans and social media text data.

2. The study reveals important dynamics that would not be readily visible otherwise. In Calgary, the lack of prioritization of environmental issues, regional planning, and growth management may explain the city's difficulty in reducing sprawl. Whereas incumbents, including the mayor, tout their planning-relevant accomplishments, especially in the area of transit infrastructure, challengers use planning topics in negative campaigning. Thus, in the public eye, planning might appear politicized rather than as a mechanism to promote the public interest. If so, trust in the local government may be at risk of eroding, which could create further difficulties in years to come.
3. This analysis is replicable in municipalities that have plans and candidates who use social media when campaigning. If information about existing planning goals and candidates' planning priorities could be publicized in real time, ideally during election campaigns, voters could gauge the likelihood of future action on the planning issues they care about. Voters, the local media, incumbents, and perhaps even planners could challenge candidates to propose positive planning visions and platforms.
4. This analysis provides a new tool for researchers studying the dynamics of plan implementation. To the extent that campaign communications reveal candidates' priorities, strategies discussed positively during the campaign are more likely to be implemented than those without elected officials' support. Having a tool to directly assess elected officials' priorities and their shifting priorities with each electoral cycle will be invaluable for advancing research on the factors that affect policymaking and plan implementation.

Further research is needed to track elected officials' social media communications once they are in office (they may change their perspective and priorities) and assess whether social media posts before and after the elections correlate with votes and planning decisions. This would be especially interesting in the case of candidates who run on largely anti-planning platforms. Once in office, do they develop an understanding of the need to plan for and invest in the city? Or do they retain their positions and impede implementation? It will also be interesting to compare candidates' rhetoric and campaign social media communications in cities with at-large versus district/ward-

based elections, because it is likely that planning-related postings would vary by legislature type.

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SUPPLEMENTAL MATERIAL

Supplemental data for this article can be found on the publisher's website.

NOTES

1. Obama's 2008 and 2012 presidential campaigns are often referenced as the first successful use of social media to mobilize campaign volunteers, donors, and voters (e.g., Bode et al., 2014; Larsson & Skogerbø, 2018).
2. Municipalities are active on social media, especially on Facebook, YouTube, and Twitter (e.g., Lev-On & Steinfeld, 2016; Silva et al., 2019; Winsvold, 2007). Our focus here is on candidates running for municipal office.
3. Because a great majority of municipal elections in the United States and Canada are nonpartisan, we do not discuss here the role of candidates' party affiliation (Schaffner et al., 2001).
4. The focus group included three local planners and three developers who deal with local planning issues on a day-to-day basis, a journalist who writes about local socioeconomic and political issues, a representative of a nonprofit organization focusing on regional planning, and two academics knowledgeable about Calgary's planning efforts.
5. Though word frequency counts can be used for text analysis, semantic network analysis considers not only the frequency but also the semantic context of word occurrence. For instance, "I love Transit" and "Transit is essential to provide affordable access to Downtown" both include the word *transit* once, but the latter would be scored higher due to its association with affordability, access, and downtown. This approach thus frames each keyword in the context of meanings provided by other elements in the discourse (Carley & Palmquist, 1992; Diesner & Carley, 2011; van Atteveldt, 2008; Yang & González-Bailón, 2016).

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