The relationship between knowledge and community engagement in local urban forest governance: A case study examining the role of resident association members in Mississauga, Canada

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ABSTRACT

Urban forests, integral to a city's critical infrastructure, are traditionally under the mandate of local governments, yet in reality, the decision-making for their conservation is influenced by a myriad of factors operating at the neighbourhood level. In some neighbourhoods, decisions are heavily influenced by formal Resident Associations (RAs). Using a case study approach, in-depth interviews were conducted with selected engaged and committed RA members in Mississauga, Canada to determine: 1) What is the role of urban forest knowledge in motivating people to engage with their local community group, *i.e.*, how does knowledge play a role in developing a critical consciousness that leads to action? 2) How does an individual's knowledge shape strategies used by the community group? and 3) How can we characterize the knowledge of community group leaders in terms of urban forest governance? Our study shows that knowledge is embodied in all roles that RA executive members take on and that it is key in motivating their engagement. The critical role of 'knowing 'was also clear in the ability of RAs to develop and establish local-level strategies that help conserve urban forests. Based on our research, it is clear that RAs and local governments (individually and/or collectively) can enhance the knowledge of residents at the neighbourhood level to improve engagement. We recommend that RA members engage *via* an ongoing collaborative knowledge building process to become better equipped at confronting urban forest management practices and impacting urban forest governance.

1. Introduction

Urban forest benefits range across ecological, health and well-being, and socio-economic contributions and are all highly valued by society (Sivarajah et al., 2020; Conway et al., 2019; Nesbitt et al., 2017; Li, 2010; Kim and Wells, 2005; McPhearson et al., 1997; Ulrich, 1981). However, residents value urban forests for a much broader range of services than those managed solely by the municipality (Peckham et al., 2013). Knowing and understanding the range of these services, either formally or informally, impels some individuals to engage with municipal decision-makers and influence the management of these forests (Ordóñez and Duinker, 2013; Shakeel and Conway, 2014; Ernstson et al., 2010). When urban forests and individual trees are valued at the neighbourhood level (Janse and Konijnendijk, 2007; Borgström et al.,

2006), it often leads to communities working together for their protection (Papastavrou, 2019; Fors et al., 2018; Cusack, 2011). In so doing, individuals or communities become more directly involved in planting activities on public and private land, as well as involved in more sophisticated planning and policy issues (Nesbitt et al., 2017; Shakeel and Conway, 2014; Beckley et al., 2008; Ottitsch and Krott, 2005; Van Herzele et al., 2005; Perkins et al., 2004). Place identity and attachment (Buta et al., 2014; Halpenny, 2010; Hull et al., 1994), attitudes towards environmental responsibility (Clark and Agyeman, 2011), and gated communities (Walks, 2006; Nelson, 2005) are all areas that have been studied in relation to community engagement and governance. Unfortunately, few have examined how local-level knowledge or data from community-based monitoring by citizen scientists (Lawrence et al., 2011; Roetman and Daniels, 2011; Janse and Konijnendijk, 2007)

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becomes incorporated into urban forest management through this engagement.

Here, we investigate the role of resident knowledge through initiatives in urban forest governance. Municipal official plans and by-laws governing urban forestry do not always embody sufficient or sustainable management practices to ensure the long-term protection of key urban forest benefits (City of Abbotsford, 2019; Peckham et al., 2013; District of Saanich, 2010; Knuth, 2005). Furthermore, residents have few opportunities to engage in long-lasting or meaningful ways with the municipal decision-making process, although cities often initiate information sessions in developing plans, and less frequently, provide opportunities for brief deputations at city councils (Friedman, 2015). In Canada, despite clear public concern about the impacts of urban development on green infrastructure and valuation (Ordóñez and Duinker, 2014; Zhang et al., 2007; Environics, 2001; Dwyer et al., 1991), there is little provincial or national support for urban forestry programs involving the community in policy or legislation, in sharp contrast to the USA or Europe (Rosen, 2019; Konijnendijk et al., 2005).

Citizen participation and partnerships have been infrequently studied in the management of urban forests (Sheppard et al., 2017; Ostoic and van den Bosch, 2015; Lawrence et al., 2011), and this has resulted in a poor understanding as to how knowledge is incorporated into urban forest governance. Several studies have examined the concept of urban forestry and how it is understood by managers (van der Jagt and Lawrence, 2018; Mclean and Jensen, 2004), but only Lawrence et al. (2011) have provided a framework that amalgamates the various components influencing urban forest governance (*i.e.,* the public, civil and biotic actors; the existing management and legal processes; and the government structure). Recent research on the impact of local governance in forestry has tended to focus on: 1) local knowledge in the consultation process (Robson and Parkins, 2010; Robson and Kant, 2009); 2) the management of knowledge given different ways of knowing (WOK) (Van Buuren, 2009); 3) the production of knowledge (Campbell et al., 2016); or 4) the appropriateness of public *versus* expert knowledge (Hong, 2015). In social capital research, knowledge is seen as 'communities of knowledge' where community knowledge contributes to activities within a community and/or provides information for decision-makers (McCall, 2002; Lesser and Prusak, 2000; Putnam, 1994). As Putnam et al. (1993) stated in their seminal work with Italian communities, this type of knowledge is more likely to be shared when there is trust amongst a group of networking people.

Understanding what compels citizens to engage in urban forest governance and what role knowledge plays in this process allows both municipalities and those who engage to be more specific when implementing community programs. Specifically, the lessons learned from residents actively involved in Resident Associations (RAs) or as executives in Resident Associations (RAEMs) can shed light on how to make important and relevant knowledge more accessible to the community, increasing their capacity to provide input and engage in community issues.

For the most part, public participation means increased public engagement with what could be considered 'good governance' (Graham et al., 2003). Good governance includes principles that characterize the relationship and decision-making process between the state and the public, namely, legitimacy, voice, direction, performance, accountability, and fairness (Graham et al., 2003). The participation of people in a consensus-based process builds legitimacy, while transparency allows information and knowledge to be accessed by the public (Keping, 2018; Stoney and Elgersma, 2007; Graham et al., 2003). Investment in public engagement can create valuable outcomes in terms of non-monetary values (Andersson et al., 2011). Several studies suggest that there can be purposeful roles for residents who want to be included in local decision-making (Stoney and Elgersma, 2007; Graham et al., 2003). Putnam (1994) goes as far to say that the advantage of social capital in civic engagement does not only improve governance, but also is a *"precondition for economic development"*. Existing research explores

issues such as health care and education in terms of social capital investment with very little information on urban forest governance or the process of implementing public participation in urban forest governance (Lawrence et al., 2011).

Research that addresses access to public participation in urban forests is growing across the developed world (Conway et al., 2011; Landry and Chakraborty, 2009; Carreiro and Zipperer, 2008; Heynen, 2003), however gaps remain in terms of citizen-based urban forest governance, including: 1) appropriate communication of science and civic problems to the public; 2) increasing awareness and knowledge of citizens; 3) opportunities for citizens to engage in monitoring; 4) volunteer or free labour; and 5) venues for participation in decision-making (Conway et al., 2011; Rosol, 2010; Wolf and Kruger, 2010; Carreiro and Zipperer, 2008; Konijnendijk, 2003).

Community participation in urban forest governance is not homogeneous, and not all residents participate from all neighbourhoods, highlighting the need to better understand how local engagement affects the management and conservation of urban forests in different neighbourhoods (Conway et al., 2011; Carreiro and Zipperer, 2008; Heynen, 2003; Carr and Halvorsen, 2001). As such, there is a need to focus on how knowledge influences the experiences and abilities of RAs to affect urban forest goverance and more importantly, how knowledge may be a function of the socio-economic and political capacity of these members.

Knowledge can be defined as, *"facts, information, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject[…]a thirst for knowledge"* (Lexico, 2020). However, it can also have a broader meaning that includes understanding, comprehension, expertise, skill, capability, and mastery, awareness or familiarity gained by experience (Lexico, 2020). Words such as consciousness, realization, recognition, and appreciation are also frequently mentioned in relation to knowledge. In the current study, we define 'knowledge' as the information and understanding that interview participants express about urban forests based on through their awareness, comprehension, and appreciation of its benefits. Past studies examining power dynamics (Foucault 1977) or the imbalance of knowledge and power (Hall, 1992) consider knowledge in specific contexts not readily applied to our research. Here, we consider the role of knowledge in urban forest governance as it applies to education (Freire, 1970). Freire's work on adult literacy in Brazil addressed how individuals can become empowered to participate in municipal processes through a raised consciousness of their role in society. His observations showed that adults who advanced their own literacy tended to extend this knowledge to a broader critical consciousness, which in turn led them, *"to perceive social, political, and economic contradictions, and to take action against the oppressive elements of reality."* (Freire, 1970). This concept of critical consciousness depicts the state of mind that can be achieved by residents at the neighbourhood level, which can then motivate them to engage in urban forest issues. Such residents may engage even to the point where they are willing to address the contradictions seen in terms of urban forest governance. By examining narratives of active RAEMs in this context, we aim to provide a framework for knowledge and engagement with local decision-makers and RA membership.

While public participation keeps residents engaged with their government, in turn, the local government benefits from hearing from the community in terms of gaining new perspectives and information to; i) make decisions that meet the public's needs; ii) provide their citizens with information regarding their programs; and iv) allowing them to interact and engage with each other (Asah and Blahna, 2012; Lyndsay and King, 2007; Janse and Konijnendijk, 2007). Uneven public participation across different neighbourhoods can lead to imbalance in the planning and decision-making for greenspaces that impact not only climate change adaptation measures and environmental protection, but also community improvement, concern for social conditions, empowerment in decision-making processes, and lack of confidence in elected officials' platforms (Heynen et al., 2006; Heynen, 2003; Balgram and

Dragicevic, 2005; Vogler, 2003).

RAs are one type of community group formed based on members having a common geographic connection, as well as having a common interest in the well-being of their neighbourhood (Conway et al., 2011). Generally, their power comes from being organized, directly connected to the locality they belong to, and having the ability to build long-term connections with government representatives, as well as with the civil servants who service their areas (Molin and van den Bosch, 2014).

Neighbourhoods with resident groups or RAs are better able to influence local government on issues affecting the environment or urban forests than those who are less well organized (Molin and van den Bosch, 2014; Conway et al., 2011). Based on the demographics of neighbourhood membership and political knowledge, these neighbourhoods are more likely to be privileged than those without official RAs, and thus, tend to draw more attention to their causes (Duncan and Duncan, 2004). This concept of privilege arises from studies in gated communities and system biases for communities with business leaders, where those who have existing political networks tend to have a disproportionate influence on urban decision-making processes (Duncan and Duncan, 2004; Vogel, 1992). Similarly, organized RAs seem better able to engage in and add leverage to the decision-making process by having better political knowledge of the system.

Our research aims to use the case study approach to derive a theoretical framework (Eisenhardt, 1989) around the role of RAEM knowledge in urban forest governance. The key questions addressed are: 1) What is the role of urban forest knowledge in motivating people to engage with their local community group, *i.e.,* how does knowledge play a role in developing a critical consciousness that leads to action? 2) How does an individual's knowledge shape strategies used by the community group? and 3) How can we characterize the knowledge of community group leaders' in terms of urban forest governance? These questions are examined through a case study of RAs in the City of Mississauga (Ontario, Canada).

2. Methods

The study was conducted in the City of Mississauga, the 6th largest city in Canada, with a population of ~722,000, a land area of 292.4 square km, and a population density of 2,468 people/square km (Statistics Canada, 2011). Mississauga, located in the Carolinian forest ecosystem of central Canada, has approximately 15 % canopy cover comprised of a range of temperate tree species across different land uses. The City of Mississauga has grown rapidly over the past 40 years and possesses several key factors important to the current study: 1) existing Resident Associations (RAs); 2) by-laws developed for private and street tree protection that can be enforced through the City's By-law department; and 3) a well-established forestry department with several active urban forest programs. In addition, the City has over 50 community groups (including RAs) covering a range of establishment times and levels of engagement.

Both active street tree planting and tree management programs take place in Mississauga, with over 2.1 million planted trees on private and

public lands. The City's 'Urban Forest Management and Natural Heritage and Urban Forestry Strategic Plans' all identify the need to include the community through education and guidance for implementing proposed community-based actions (City of Mississauga, 2015).

An extensive web search was used to initially identify 50 community groups in the City of Mississauga. In the end, only nine RAs reflecting the range of neighbourhood variation across the City were selected for use in the study with respect to: 1) tree canopy cover; 2) socio-economic profile of the residents; 3) age of the RA; 4) location and type of RA; 5) activity level; and 6) geographic location. The attributes characteristic of the community and RA groups in the City of Mississauga were disseminated using Statistics Canada Data and then classified to three settings, low, medium, and high (Table 1).

Several qualitative methods were used to collect data including; i) 31 semi-structured interviews with 15 RA executive members, ii) 16 additional interviews with non-RA residents (10), City Councillors (3), forestry management staff (2), conservation authorities (1), iii) observations from gatherings at municipal and regional consultations, iv) personal communications with urban forestry practitioners; and v) through review of RA websites.

Categories of questions posed to these interviewees addressed: 1) RA membership to profile RAs and their members (age, membership, issues of priority, *etc.*); 2) opportunities available for participation in decision-making related to urban forests (individuals and at the community level); 3) urban forest activities/issues considered; 4) experience of RA participation in decision-making; and 5) strategies used to influence decision-making at the local neighbourhood urban forest level. Based on their responses, RAEMs were then asked to share their strategies for success in conserving urban forests on public and private lands (neighbourhood private properties). Other non-executive and non-RA member neighbourhood residents were also interviewed using snowball sampling where interviewees suggested fellow associates who were most involved in urban forest issues. The non-RAEM interviews provided an understanding of the issues addressed by other stakeholders at the neighbourhood level. The perceptions of these decision-makers and managers provided either support, clarification or illustrated contrasting points of views with the RAEMs.

The methodological design and all tools to interview human participants were approved by the Ethics Review Board at the university of the first author. Interviews were reviewed and coded in NVivo 10 based on the key objectives of the research questions and new themes as they were revealed. The analysis was completed using a mixture of coding and simple text searches. In NVivo, searches were completed using exact meanings, as well as related meanings. In some cases, this resulted in many outputs and these were sorted before being analyzed and regrouped. The final grouping was supplemented by notes related to the narratives that were taken at the time of the interviews.

All responses of the participants were anonymized and cited using: 1) 'RA1 to RA9', for those respondents who were either RAEMs or belonged to a RA; 2) 'II' for an independent individual who did not belong to a RA; 3) 'C' for City Councillors; and 4) 'M' for City of Mississauga staff. '*Interviews* 2012' was used to code for general behavioural observations or

Table 1
Population and neighbourhood characteristics of Resident Associations (RAs) in the City of Mississauga, Ontario used for the case study analysis. (Statistics Canada, 2016).

Resident Association	Population density	Dwelling	Age of neighbourhood	RA age	Income range	Canopy cover
Gordon Woods	Low	House	Old	40	Low	High
Lisgar Resident Assoc.	Low/medium	House	New	22	Medium	Low
Whiteoaks Lorne Park	Low/medium	Houses	Old	50	Low/medium	High
Malton	Medium	Mixed	Mixed	6	Medium	Low
Lakeview	Medium/high	Mixed	Mixed	20	Medium	Medium
Credit Reserve Association	Medium	Houses	Old	25	Medium	High
Tecumseh Area Ratepayers Assoc.	Low	Houses	Mixed	48	Medium/high	High
Lorne Park Estates	Low	Houses	Old	70+	Medium	High
Cranberry Cove RA	Low	Mixed	Old	29	Medium	Medium

viewpoints generally expressed by participants and/or derived from interviewee narratives.

3. Results

Key themes related to the role of knowledge emerged from coding the participants' narratives; these were broken down and regrouped for analysis according to subthemes. Table 2 synthesizes text queries of the transcribed narratives using NVivo.

Six key knowledge categories emerged in this study: 1) knowledge and RA contribution to the process; 2) knowing the problems; 3) neighbourhood knowledge of urban forest vulnerability and visceral, emotive responses 4) knowing and adapting to strategies affecting decision-making; 5) who is the one knowing?; and 6) knowing about knowing.

The impending loss of the urban forest or concern for its conservation appeared to be important in motivating residents to approach their local governments for remediation or to voice their objection to unsustainable development (Interviews 2012). RA*s* served as a vehicle to integrate social capital and allow for citizen knowledge, skill, and time to be applied in the management of urban forests. At the neighbourhood level, urban forests also seemed to hold significant value for the citizenry. Residents identified with and experienced place attachment (Buta et al., 2014; Halpenny, 2010; Hull et al., 1994) with the urban forests in their neighbourhood to such an extent that they spent time in it and/or involved themselves in matters of its conservation; this in turn led them to engage in urban forest governance. Some residents often advocated for the conservation and management of their local urban forest, largely through interaction with both managers and local government. Actively engaged RAEMs also used the organizational structure of their RA to; i) liaise between the neighbourhood residents and the decision-makers, ii) gain knowledge of the governance process, and iii) find ways to share and act upon their knowledge. Through sharing information, they were also able to bring their neighbours together. One executive member in a multicultural community explained how they engaged with the community and created venues for outreach to share information:

"*I think it's just the sense of community and the sense of outreach that we have been able to bring, which [is]for me as well. That's why I do the tree-planting and stuff. You get to meet people from all walks[...]from all parts of the world[...]It's this hodgepodge of communities that we have here, and they come out and tell you their stories*" (RA1).

Those RA's whose members were able to consider future scenarios were even more useful to their community and decision-makers, becoming equipped to make inputs in terms of adaptation and mitigation as well as provide on-the-ground monitoring for urban forest managers. RAs clearly shared labour and they networked amongst their neighbours on behalf of society and government (Interviews 2012). Some RAs sat on advisory groups or were invited to provide input to Councillors about resident concerns regarding the urban forest (RA1, RA2, RA4). Many were also concerned that only the objectives and agendas of active residents were brought to the attention of decision-makers or within the consultative processes (RA1, RA2, RA4, RA7, RA9).

Residents often expressed their knowledge about the weaknesses of the decision-making process and expressed their disappointment with a bureaucratic system that seemed rife with personal objectives (RA1, RA9, II1, II2, II3). They criticized decision-makers for not always listening to their concerns and felt that decision-makers were focused on the overall objective of pleasing people rather than addressing any specific environmental issue (RA1, RA3, RA4, II2). Residents also thought the governance structure allowed for inconsistent interactions, and attributed this possibly to the subjectivity of individual decision-makers or staff, not just general City policy (RA1, RA4, RA9). A few participants complained that when there were turnovers in City staff or management objectives, the dynamics of the existing relationships with

Table 2

Knowledge themes derived from participant interviews carried out with Resident Association (RA) Executive Members (RAEMs) from the City of Mississauga in 2012–2013, using NVivo text query.

Theme	Explanation	Interview example/survey result
Knowing what they want from neighbourhood greenspaces	RA executive members wanted to see more greenspace in their neighbourhoods, especially in Mississauga. Those that are serious about conserving and managing the urban forest try to improve their urban forest knowledge. They tend to join and promote activities that will enhance their knowledge.	From the survey portion of the interview, almost all the participants wanted to see either more canopy cover or a healthier canopy cover in their neighbourhoods and all wanted to see more canopy cover in Mississauga.
Urban forestry knowledge	Upon the realization that they need to be able to detect issues about the trees in their neighbourhoods, they are motivated by their understanding that their forest may be vulnerable to natural stressors such as insect damage, planning changes or development; that they are motivated to engage in forest conservation. They can identify the risk and impacts of disturbance (climate change) affecting their neighbourhood.	"*And we had to fight quite hard for City of Mississauga and local councillor to protect it and keep it public, as opposed to selling it off to a private*" (RA 1). "*But in places for instance where there are some [trees] that[...] didn't come back after the winter. Maybe if the city could be more proactive and replace some of those quicker, rather than wait to see if the other four die, in the next ten years, that would be very helpful*" (RA 1).
Resident association (RA) roles	Knowing the roles of the various RA executive members also helps define the tasks and responsibilities undertaken, as well as helps the decision-makers recognize the individuals who are able to represent their neighbours.	"*They don't speak to us as a group. It heels back and forth between [the president], or sometimes we will have a vice president on our committee who will take on a portfolio, so he or she may be dealing with the planner at the time, and emails will go back and forth, and we tend to get copied on a lot of the stuff [...]*" (RA 2). "*[They]are very high functioning individuals. So, if there is an issue, they don't have any shyness about picking up the phone and calling whoever needs to [...]*" (RA 1). "*[...] where the chainsaws were going, and a neighbor, because he knows that I am on the committee, he called me immediately and he was just distressed that this is happening and asked me, 'what can you do about it?'*" (RA 2). "*The city prefers to have association presenting their position rather than individuals. I think I would guess most of the cases are the associations present more rationally less emotionally.*" (RA 6).
Decision-maker roles	Knowing the process of governance helps with approaching the	"*It depends on the issue [...] we tend to try to follow the chain of command at the*

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Table 2 (*continued*)

Theme	Explanation	Interview example/survey result
	appropriate person with the Neighbourhood Urban Forest (NUF) issues at hand. Sometimes this process can be burdensome due to process or due to internal prescribed objectives.	*city"* (RA 1, RA 2, RA 9). *I joined as a member, but fairly quickly became involved, until I found out it was more […] The goal of the real gardeners and the communities […] the board of the Garden Council was completely taken over.* (RA 3).

decision-makers were altered, especially when the individuals with whom they normally interacted were gone. For example, as one member from RA2 pointed out:

"[…]well there have been some staff changes. And I think now, there is probably less information forthcoming for whatever reason, the information seems to be held very close now. For example, what's transpired in a particular file to find out where we are at right now, what is the property owner thinking, does he want to comply, is he working with the city to get somewhere, they are just not really commenting." (RA2)

Several times, participants indicated managers and decision-makers saw the conservationist approach as 'naïve' or 'idealistic' and that RAEMs, or those defending trees, did not really understand the complexities of government decision-making. This attitude, seen to be directed towards them from City decision-makers both in the public sphere and during individual interactions, frequently resulted in individuals holding back and not expressing their true position (R1, R2, R4). All participants were keenly aware that when they were perceived as such, they had to work much harder to bring their issues to the table (Interviews 2012).

From the personal interviews it was apparent that the health and well-being of the urban forest and its components were of serious concern to RAEMs. Their testimonies carried tones of urgency for urban forests. Participants' reactions to trees being removed elicited a visceral response, so strong that in one case an interviewee stated, *"[…]the trees came down. So, as I said, I do not know what was going on in his mind, but it was an absolute travesty. It is heartbreaking, it is sickening."* (RA2). Interviewee emotions were expressed through words and emotions that ranged from having tears in their eyes to quavering voices due to sadness or even rage when recalling loss of trees or events (Interviews 2012). Thus, many individuals within the community seemed to act on their foresight, emotion, and perhaps an intuition that the path taken by society is unsustainable (Interviews 2012) with respect to urban forest conservation.

In their efforts to make change, RAs developed an understanding of the factors that impacted their neighbourhood forest. RAEMs self-assessed the role their knowledge played in the existing strategies to influence decision-makers and shed light on their journeys, from their acquiring knowledge to incorporating their information into action. Engaged residents increased their community's social capital *via* the engagement process and they provided ideas that generated action (RA1, RA2, RA3, RA4, RA8, RA9, II1, II2, II3). RAEMs or engaged members shared these intentions with their fellow RAEMs and approached their Councillors with questions and suggestions (RA1, RA2, RA3, RA4, RA6, RA8, RA9). They also negotiated outcomes related to their neighbourhood forest and were aware that having more individuals supporting a neighbourhood cause would more likely result in action. As one participant pointed out:

"Well, I was aware of the fact I was representing eight hundred households that pay a lot of property tax. And most of the households contained smart, motivated people. So, for them to go to city hall and make their

views heard and get some action, it would be difficult for council to ignore it. So, I was representing a fairly high power, high influence people" (RA8).

The following interviewee identified how her neighbourhood's concern to ensure the naturalization of a degraded area transformed the community, ultimately leading to the organization of a RA:

"The people were like, no, that's just not going to happen. We need to come up with some more natural ways to do that. So that's how this whole organization called RA got started. […]then with the help of motivated councillors and stuff they did, they've made it into an award-winning pond. […] I guess that's how it started, like, 'Why don't we just do a tree planting and beautify up?' So, then they started down the pond and started going up the creek bed[…]" (RA9).

In this way, the community gained support from their Councillors to convert the area into an award-winning pond within a treed area and this increased their own knowledge, as well as those around them, about the most effective processes and strategies. It seems that a homogeneous dissemination of shared knowledge to an entire neighbourhood may be equally important as that more selective and directed towards those in need of it. One RAEM of 12 years, having worked with other RA's *via* an umbrella network called Miranet, stated that when negotiating with decision-makers, RA's made sure that they did not appear to be asking for too much and re-evaluated their needs in order to be perceived as reasonable:

"It took a lot of time and a span of time and putting together something that we felt the city could buy into. And it is important that we are able to articulate all of our points without going overboard because one of our concerns is that we as a community[…]are just seen as Nimby's in someone's backyard, but that is really not the case, and I think we are really privileged to be here and we are just trying to preserve and protect what we have. So, coming back to the tree by-law we put our list of our wish list forward without being too greedy" (RA2).

Apart from ensuring that requests are reasonable, other participants also relayed how they do create attention for themselves by using more aggressive approaches without destroying the relationship with decision-makers. "We can't go and sever all ties[…]Somebody has to play good cop bad cop" (RA1).

They indicated that such information was also measured and delivered in a manner to promote a desired response (not to say that the information they wanted to impart was false but rather strategized according to their perceptions of the audience). Thus, who gained knowledge and who had an opportunity to increase awareness was also biased and did not necessarily represent everyone's agendas (RA3, RA5, RA6).

We found that the knowledge assimilation process was abstract, unique, as well as communal and 'uniforming.' By joining an RA, members discovered like-minded individuals with similar objectives that validated their concerns and led to concerted action (RA2, RA3, RA5), *"So when I became involved in these initiatives the issue of neighbourhood forests was very important. And I wasn't the only one who thought so; there were a lot of people who felt the same way"* (RA2).

The process of building knowledge followed a sequence of activities that incorporated three critical aspects namely; timing, interactions where knowledge was shared, and the management of knowledge. Alongside these components, it was clear that there were ethical issues of values, transparency, validity, capacity, value judgement, inclusion, and representation. Interviewees all referred to these factors as important when dealing with their neighbourhood and Councillors.

Analysis of the participants' narratives revealed themes that identified awareness of what they already knew and what they still needed to know (Table 2). Themes emerged as participants narrated how they engaged with other RA members and decision-makers, as well as from

direct answers to questions about urban forest canopy cover and the criteria for successful engagement.

Another important facet of knowing that was identified from the interviews was issue of whose knowledge was relevant. Our results showed that targeting people who felt RAs were relevant was critical (RA1, RA2, RA8), along with getting information to the most accommodating or co-operative decision-makers, persons-of-influence or department. All were key to ensuring that something would be done about an impending issue:

"*I think that they [neighbourhood community] came to it not really knowing what [our] Residents' Association did, and then through the tree planting, I think it's just the sense of community and the sense of outreach that we have been able to bring […]*" (RA1).

Most participants did not speak about the power of the people they dealt with as much as they did about how knowledge of governance and community affairs were able to influence change (RA1, RA2, RA4, RA7, RA8, RA9). Decision-makers also felt that those who sat on RA Boards were easier to work with than residents since they were more knowledgeable and pro-active, however, there was still a sense that the complexity of implementation with respect to time was not fully understood:

"*There are still policies that have to be [abided by…] some people just do not understand that things can't be done just like that (snaps fingers). There's policies and procedures, by-laws and all those things that have to be taken into effect*" (C2).

Knowledge appeared to be shared between decision-makers and RA members, as well as from these groups to peers outside the groups (RA1, RA2, RA3, RA4). Interviewed Councillors said they found it useful to share information in order to build capacity with their Constituents in a top-down sharing approach, stating that this resulted in better communication and more progressive interactions and discussions (C1, C2, C3). They also found that communicating information about up-coming development, information sessions, and public meetings were important for contributing to residents' knowledge of community change in a number of key ways. First, planning sessions briefed residents on neighbourhood plans and developments (C1, C2, C3). Second, Councillors were able to inform residents as to whom they should contact for various urban forestry and related issues (C1, C2, C3). Finally, Councillors found that this allowed them to ask and answer questions related to RA interests, whether they were scheduled to attend a RA's Annual General Meeting (AGM's) or by demand.

RAEMs self-reported that their actions in the RA reflected their personal awareness, as well as the awareness of their groups. They spoke about doing things as a result of their knowledge and justified why they did something because of what they knew. The interviewee testaments showed that their actions were grounded in knowledge and that this gave weight and justification for their behaviour. RAEMs were relatively self-evaluative about their knowledge, with some participants comparing their knowledge to others, *i.e.*, sometimes relaying they knew less or more than fellow members or experts. They also recognized that there were areas of knowing that needed to be improved, whether as an individual, a group or a society.

"*Policy. For sure. It's basic policy at the very start of it. They've got to know the ecological services provided by trees, they have to have Canadian trees, or at least trees for climate change and they come from Carolina or Washington or whatever*" (II1).

In one case, although the resident felt strongly about policy and its ability to be used to conserve the urban forest and existing biodiversity, they also realized that in order to have effective policy, there needed to be an underlying level of understanding as to the 'services provided by trees' (II1, RA1, RA2, RA3, RA6). Another respondent displayed a clear realization that knowing the value of trees was not just personal but also

critical to understanding climate change mitigation.

"*So urban forests for me, they add value, they add beauty. They can mitigate the bad part of climate change that we're experiencing. They add shade cover when we need it […]*" (RA1).

Many RA members displayed a strong sense of human agency. Interview analysis suggests that RAs understood the potential impact of their actions and often acted with this understanding. Along with motivation, they exhibited confidence to employ various strategies that might change the status quo; *i.e.,* when they described their willingness to take action, it was derived from their conviction of knowledge. The level of RAEM reflexivity was clearly high as they appeared to be willing to sacrifice energy, time, and sometimes their reputation, to be labelled as a tree hugger (since this can sometimes seen to be negative). RAEMs also possessed characteristics that enabled them, either as a group or as individuals, to strategize, adjust their behaviour or take on roles that suited their skills in working towards a common goal. In other words, they were clearly aware that engaging in goal-directed action, whereby the human agent has control over their actions, would maximize their ability to both act and influence outcomes.

4. Discussion

It is well understood that factors of place, place attachment, motivation to engage, need to influence decision-making, strategic planning, gaining power or rallying others for a cause come from a core understanding or knowledge of one's place or neighbourhood and the features within it (Halpenny, 2010; Whitmarsh and O'Neill, 2010; Hull et al., 1994). Our results from this case study on Resident Associations in the City of Mississauga show that knowledge is the fundamental basis of any of these concepts or phenomena in nature-based engagement.

The environment is well known to motivate people to action (Asah and Blahna, 2012; Whitmarsh and O'Neill, 2010), however the relationship between the types of motivators and a person's sustained involvement is also influenced by deeper socio-psychological factors (Asah and Blahna, 2012; Whitmarsh and O'Neill, 2010). Our study suggests that the knowledge individuals have about their local neighbourhood forest can motivate them to continue their involvement in urban forest governance. Frequently, we found participants raised concerns over issues in their urban forest, ranging from specific insect infestations, ice storm damage, disease, and disturbance to much broader impacts of development, climate change, and overall lack of planning (Interviews, 2012). Thus, it seems that an understanding of scale is necessary to grasp key issues starting at the local level that then lead to larger scales (Armitage et al., 2012).

Residents were concerned about the sustainability of their environment without necessarily using that exact term. In fact, the term 'sustainability' was rarely referred to, even among RAs who often used different words to describe the potential loss of their neighbourhood urban forest and the thoughts they had on its welfare. Without explicitly using sustainable, they alluded to current practices as being unsustainable (Duinker et al., 2015). Participants appeared to take action by devising strategies that used a natural feedback and adaptive approach (Steenberg et al., 2019; Mincey et al., 2013; Armitage et al., 2012; Ernstson et al., 2010; Ostrom et al., 1999). It appears that Resident Associations have the potential community base for municipalities to cultivate participation in greater urban forest governance (Molin and van den Bosch, 2014; Graham et al., 2003).

4.1. Incorporating urban forest knowledge and practices

The summarized knowledge themes from our study can be used to start building a framework including residents in urban forest governance (Fig. 1). The component to incorporate knowledge described here is key since knowledge of urban forests is a first step to engagement and
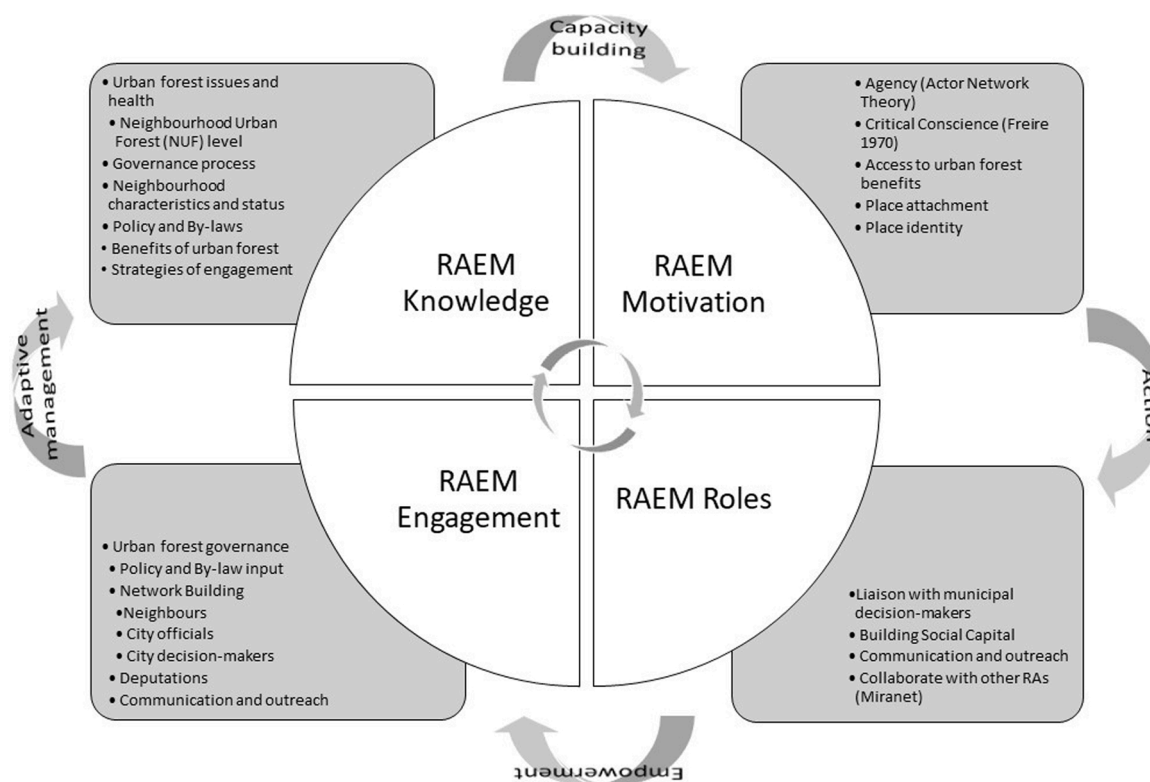
Fig. 1. Theoretical framework depicting the role of Resident Association Executive Member (RAEM) knowledge in urban forest governance from the City of Mississauga case study conducted in 2012–2013.

also serves to motivate residents. RAEMs interviewed were interested in educating their neighbourhood constituents about trees and their benefits, how to care for them, and about the by-laws and policies that govern urban trees. Furthermore, RAEMs, forest managers, and decision-makers all exhibited a high level of confidence in their existing knowledge that urban forests had important values for themselves and their community.

4.2. Community connection to urban forests and urban forest governance

Connection to and understanding of nature grows when people associate their neighbourhood with culture, history, trees, forest communities, and the fauna and flora that share their space. Shared stories by people build a collective understanding of neighbourhood urban forest values. Many RAEMs said they successfully engaged people through tree-planting activities, knowledge-sharing booths at outdoor community events, stewardship and restoration projects, and outdoor workshops. Specific participant observations showed that nature walks, gardening clubs, tree inventory and monitoring events, citizen science projects, and community gardening were all additional methods that could help build community knowledge. These events cultivate social capital, trust, and networks (Roetman and Daniels, 2011; Putnam et al., 1993). Urban forest governance is depicted by various by-laws and policies, as well as by the actors involved in the decision-making process that impact urban forests (van der Jagt and Lawrence, 2018; Ordóñez and Duinker, 2015; Lawrence et al., 2011). Our results demonstrate that RAEM's understanding of the governance process is developed as their community involvement increases. Residents and Councillors interviewed said it was useful to their engagement process to understand existing by-laws. For example, several RAs participated in the amendment of Mississauga's Private Tree By-Law.

Knowledge is important in motivating residents so that they take on active roles for their neighbourhood based on what they know about filling the gaps (Freire, 1970). Eventually, those who initiate or join

community groups, such as RA Executive Committees, do so of their own volition and become engaged citizens motivated by a cause that is clearly important to them. Knowledge of urban forest issues and the gaps in governance thus develops the Freirean concept of critical consciousness in RAEMs leading to action; in our study, this usually began with knowing a little about an issue that needed changing. For example, when a potential RA candidate did not see issues in the urban forest being rectified by the existing governance structure, they found ways through the RA to influence their local decision-makers. In the journey of an RAEM to engage others, we found evidence that a single, consistent catalyst could start the entire engagement process. Residents that had knowledge of both risk and vulnerability facing the urban forest, in tandem with the knowledge of process and negotiation that encouraged them to have agency, led them to establish a relationship with decision-makers in order to achieve a collaborative approach to neighbourhood conservation issues.

From the input of RAEMs and Council Members interviewed here, knowing the inter-relational process of engagement (be it attending Council meetings, making deputations, contacting Council members or attending open houses) enabled them to voice their concerns and share the knowledge they had with Councillors. While the components of municipal governance are available on the City's website the information is not presented as an implementable process of engagement for any individual or group. Teaching a community about the process of engagement at the local level instead of simply holding information sessions and public meetings enables communities to move from being appeased to a more sophisticated level of engagement (Arnstein, 1969).

4.3. Developing clearly defined community roles

Both RAs and institutions should discuss the various roles that need to be developed for urban forest governance (Wolf, 2011; Balgram and Dragicevic, 2005; Cornwall and Gaventa, 2001). These roles require not only a knowledge base, but also community and institutional support

and recognition. Here, we found RAEMs built and solidified the value of their roles through consistently networking and performing specific duties. For a community group to understand the roles that need to be developed, a lessons-learned approach is recommended (Lawrence et al., 2011). In this manner, municipalities can work with those who have achieved relationships and networks such as RAEMs.

Finally, knowing how the local urban forest contributes to the social capital of a neighbourhood is significant. Because residents who are willing to engage work on their knowledge level to better equip themselves when they are involved in urban forest issues, it is important for a municipality and its partners to share how these processes work. There is also a need to ensure that these processes are inclusive and do not exclude opportunities beyond only the privileged (Duncan and Duncan, 2004; Heynen et al., 2006; Walks, 2007; Putnam, 1993). By not knowing or understanding the processes that underpin good urban forest governance means that some neighbourhoods cannot participate. Attention must be given to vulnerable areas and marginalized groups to correct this imbalance.

5. Conclusion

Our case study into the role of knowledge in urban forest governance has identified three key issues. First, knowledge embodies all the roles that RA Executive Members take on. Second, knowledge is important to motivate engagement. And finally, knowing is critical to developing and establishing engagement strategies. Based on this, it is clear that RAs, community groups, and local-level government (individually and/or collaboratively) can enhance the knowledge of residents at the neighbourhood level to improve engagement.

Interviewees in our study were concerned with neighbourhood-level issues and the participation of their membership. Their roles shaped their strategies and they usually engaged their fellow neighbours rather than venturing into other neighbourhoods or city-wide; issues were sometimes even street specific. Of those who advocated for city-wide issues, most were not affiliated with a neighbourhood association. There were some interactions between them that were collaborative, such as Miranet as an umbrella group of community groups (Miranet, 2012), however, this engagement was mainly for those activities that addressed local issues.

Best practices can be developed for urban forest governance activities from the interviewees' experiences explored here. We recommend specific actionable items that a municipality can take on through their community engagement offices or their outreach or forestry departments. A municipality and other relevant organizations can provide information to municipal residents about urban forests and urban forest management practices through community-based activities and events to enhance their participation in governance. It is important to note however, that initiatives to increase engagement will need to address knowledge building in the community at the neighbourhood level. The areas of knowledge key to increasing engagement are: i) characteristics of the local urban forest, ii) creating connections through activities in the neighbourhood forests, iii) clarification and teaching about local by-laws, iv) demonstrating the processes and identifying who to engage with locally, and v) recognizing the roles that engaged or potential candidates can hold. Thus, a municipality working with partners to improve engagement at the neighbourhood level can supplement existing passion and knowledge with additional information. The municipality can provide access to information regarding local history, abiotic and biotic components, and practices to integrate nature into everyday life. Also, through activities such as more neighbourhood-level nature walks, municipal staff can work with local not-for-profit groups to build the social capital of their constituents.

The feelings residents have about their existing connections and motivations can be used to help. New people develop an attachment to their local place. Organizations can work with RAEMs to access constituents and identify their needs, and municipalities or groups seeking improved engagement can create workshops to showcase and understand the various aspects of governance. Attending workshops on tree-related by-laws will help residents understand what processes govern trees and urban forests more generally. In turn, this can enhance the relationship between decision-makers and residents by strengthening the foundation for engagement when it comes to governance issues. When residents move from the simple process of having to abide by-laws to a deeper understanding of the issues and governance, they can become more involved in developing democratically achieved by-laws and policies.

To further encourage engagement, it may also be necessary for the municipality or existing RAs to offer explanations about the processes for engagement to the community at large so that they are better equipped to communicate with Council, relevant managers, and/or forestry staff. Opportunities for cities and residents to discuss the process would identify any gaps that exist in knowledge about the governance of the urban forest. RAEMs is a viable pre-existing group to begin the municipal and community exchange on existing governance processes.

The roles we found RAEMs embraced in the City of Mississauga ranged from simple objectives to complex responsibilities, such as assisting their Councillor in community events, being the communication point person, coordinating community activities, education outreach, liaising with the Councillor's office for *ad hoc* situations, liaising with City departments, and mediating community issues. In addition, RAEMs focused on building their knowledge to establish stewardship practices, promote environmental education, and respond to climate change impacts. One Councillor indicated RAs might essentially act as a quasi-council! RAEMs maintained a level of organization in RAs that allowed these roles to be consistent, reliable, and functional (Molin and van den Bosch, 2014). Thus, not only the organized, but strategic and issue-oriented RA's tended to gain prominence in the decision-making and governance process. Consensus among RAs and decision-makers was that the degree to which a RA had political sway depended on their knowledge and ability to establish a relationship with City decision-makers. Once these relationships were established, the networks created also acted as a motivation to continue work in the governance process. Those who stopped or felt jaded in engagement either dropped off due to breakdowns in either knowledge sharing, transparency or a sense that their voice could not influence urban forest governance. Involved RAs tended to be those within their associations that capitalized on their skill sets. Both RAEMs and decision-makers saw knowledge acquisition as fundamental to influencing the decision-making process as it built social capital and strengthened human agency. In addition, from the decision-maker's viewpoint, knowledgeable and understanding RAEMs were the easiest to communicate with as they built a mutual understanding of each other's positions.

Future work should focus on creating similar measurable parameters for different jurisdictions, including the degree to which groups vary across RAs with respect to discussion, production, evaluation, and dissemination of knowledge. As well, it would be important to know how RAs assign importance to knowledge and to gain insight into how they implement their knowledge. Finally, it will be critical to explore how knowledge is perceived among RA members and the degree of conformity of ideas and values amongst the membership and neighbourhood more broadly.

CRediT authorship contribution statement

Sadia Butt: Conceptualization, Methodology, Writing - review & editing. **Sandy M. Smith:** Supervision, Writing - review & editing. **Faisal Moola:** Supervision, Writing - review & editing. **Tenley M. Conway:** Supervision, Writing - review & editing.

Declaration of Competing Interest

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ufug.2021.127054.

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