Exploring the Preferred Knowledge Mobilization Formats to Enact Climate Action Among Canadian Municipal Staff

by

Karlyn Dion

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Author’s declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Canadian municipalities are central to climate action, but often face capacity, resource, and knowledge barriers that limit implementation. This study examines which knowledge mobilization formats are preferred among Canadian municipal staff to determine how to best enact climate change by integrating survey data with semi-structured interview data. Results show a strong preference for collaborative, people-centred formats, such as peer-to-peer discussions, coaching, and interactive webinars, alongside practical, implementation-ready tools including templates, worksheets, guidebooks, and repositories. Capacity constraints significantly shaped feasibility, with staff favouring flexible, low-burden formats that fit limited time and capacity. Several previously undocumented formats emerged, including concierge-style support, monthly calls, and resource-sharing networks, extending current knowledge mobilization literature. Statistical analyses revealed no meaningful differences across municipality sizes, suggesting broadly shared learning needs. These findings highlight the importance of hybrid models, community-specific tailoring, and sustained human support in strengthening municipal climate capacity and offer new directions for researchers and practitioners designing knowledge mobilization strategies.

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Chapter 1: Introduction

1.1 Background and problem statement

As climate change accelerates, municipalities stand on the front lines, tasked with translating global urgency into local action (Cappell et al., 2022). While there may be relevant knowledge available, the success of municipal climate initiatives relies on how that knowledge is shared, understood and applied (Robinson & Gore, 2005). In this context, knowledge mobilization (KMb) becomes more than a buzzword; it is a critical bridge between research, climate communication, policy, and practice (Marquardt & Medeiros, 2025). Understanding how municipal staff in Canada prefer to receive and engage with climate-related knowledge is essential for designing effective training, and piloting programs, and ultimately, enabling meaningful mitigation efforts.

Effective knowledge mobilization requires applying various skills such as stakeholder engagement, clear language writing skills, communications, design, social media engagement, event planning and facilitation, and evaluation (Research Impact Canada & University of Guelph, 2025). As stakeholder engagement is pertinent in climate change knowledge mobilization, effective stakeholder engagement requires a comprehensive approach that includes ongoing communication, listening, and collaboration (Sedmak, 2021). This can also be seen as knowledge mobilization, which can be seen as the process of sharing academic research in an accessible way to non-academic audiences by using various training tools to create positive change. This process is not to be confused with knowledge translation, which is defined as a dynamic and iterative process that includes the synthesis, dissemination, exchange and application of knowledge (Straus et al., 2009).

This means that knowledge mobilization can include the use of knowledge translation to meet its goal of making research results accessible and useful to those who can apply them in practice or policy (University of Ottawa, 2025). Prioritizing knowledge mobilization principles within research requires: ensuring the right questions are asked at the right time, increasing access to and use of research knowledge, helping identify and mitigate the research's potential negative impacts, creating a measurable pathway towards research outcomes and future societal benefits, and increasing awareness of the research topic (University of Western Ontario, 2025). The knowledge mobilization process involves activities that create and use research in practical ways, enabling research to be used in a real-life setting (Diabetes Action Canada, 2025). Using the preferred knowledge mobilization format, can help municipalities understand or learn how they can achieve their climate reduction goals. Especially, with the demand from municipal workers to learn how to manage their climate strategies, but lack they resources to do so (Peverill, 2021).

In the realm of climate action, some may think that environmental education is what this research may be referring to; however, both have their own distinctions. Environmental education is a process that allows individuals to explore environmental issues and engage in problem-solving on environmental topics (US EPA, 2012). This can be used as a tool for knowledge mobilization, as it will use the knowledge from the environmental education sessions and get it into the hands of those who can use it to enact the desired change. While it may sound similar, the major difference between two concepts is that environmental education is focused on fostering understanding of environmental issues (US EPA, 2012), while knowledge mobilization translates knowledge into action and impact (Carleton University, 2014). The Municipal Net-Zero Action Research Partnership (N-ZAP) will be putting knowledge mobilization into practice

by conducting an 8-month cohort program to support the application of knowledge from climate-related resources provided by N-ZAP. Through this program, the pilot communities will select one of the available resources (Climate budgeting guide, Partnerships guide, Climate risk financial disclosure guide, or Climate analysis tool) and will attend eight intensive trainings and peer learning sessions in a cohort designed to go deep into the application of the content. Going in-depth with these climate guidebooks/tools will equip participants with the knowledge and skills to successfully implement climate plans in their communities (University of Waterloo, 2025). The mobilization of these resources will support climate action through local governments, who have direct and indirect control over 52% of Canada's greenhouse gas emissions that happen within their municipalities (Torrie et al., 2015).

Regardless of what has been discussed, there is a lack on empirical research of knowledge mobilization preferences among municipal staff. While there is research regarding the importance of using knowledge mobilization to enable action (Nguyen et al., 2017), there is very limited research regarding preferred knowledge mobilizations formats. Determining the preferred KMb formats of municipal staff can have a great impact on decision-making and learning about climate information for municipal policies. Despite the subjectivity of the preferred KMb formats to each person, understanding trends allows for tailored and adaptable strategies where municipalities can learn from each other's experiences and adapt to fit their specific circumstances (Employment Hero Team, 2021).

Not knowing relevant information can halt progress in climate action plans, as knowledge sharing, especially with stakeholders, can help overcome different barriers to climate action, such as a lack of common perception or control over options (Cloutier et al., 2015). While 52.3%

of surveyed Canadian municipalities (MacDonald et al., 2024) have or are in the process of adopting a GHG climate reduction target, no municipality has reached or been close to becoming net-zero emissions (Hughes, 2024). All things considered, research exploring which formats are preferred by municipal staff in Canada is needed to help municipalities progress towards net-zero emissions, but also to allow researchers to understand the municipal climate action context.

1.2 Research question and objectives

1.2.1 Research question

The following research question has been developed to guide this study.

(1) What are the preferred knowledge mobilization formats among municipal staff in Canada for enabling climate action?

1.2.2 General objective

Explore the preferred knowledge mobilization formats among Canadian municipalities to identify formats that support decision-making and implementation in climate action.

1.2.3 Specific objectives

⇒ Analyze common patterns and trends from responses of municipal staff going through the N-ZAP piloting program.

⇒ Provide evidence-based recommendations on how to better tailor knowledge mobilization to the realities of municipal staff.

1.3 Contribution to research

This research will help Canadian municipal networks know how best to build capacity within municipalities to achieve their net-zero goals. Additionally, it will help determine what knowledge mobilization formats are perceived as most effective for enabling climate action. Not

only will this contribute to the practical side of knowledge mobilization, but it will also help grow the literature on knowledge mobilization. This research will aid in expanding on the literature on knowledge mobilization on what training support is needed to most effectively enact climate action in a municipal context. Overall, this research would benefit stakeholders, such as the Federation of Canadian Municipalities, to achieve their purpose of delivering tools that help municipalities tackle local challenges (Federation of Canadian Municipalities, 2024a).

1.4 Thesis outline

This thesis includes six chapters: The introduction (Chapter 1) is followed by a literature review (Chapter 2) that offers a comprehensive overview of prior studies, information, and current conclusions on knowledge mobilization that are relevant for a climate action context. It also highlights gaps in the literature that are addressed through this thesis. The methodology chapter (Chapter 3) outlines the research design and data analysis process. Next, the results chapter (Chapter 4) summarizes the empirical findings, while the discussion chapter (Chapter 5) explores the implications of the findings based on the literature and provides the answers to the study questions. In the conclusion (Chapter 6), the entire thesis is summarized. This chapter also outlines the study's contributions, its limitations and potential future research directions.

Chapter 2: Literature review

The purpose of this literature review is to illustrate what knowledge is currently available about Canadian municipal climate action, knowledge mobilization formats and their connection. Knowledge mobilization refers to strategies for making research accessible and actionable for non-academic audiences, such as municipal staff. This literature review provides details surrounding knowledge mobilization in a municipal climate action context and prevents duplication of effort. This highlights research gaps, understanding of the current state and contributes to the advancement of knowledge in this field. It first reviews Canada's journey to net-zero emissions up until now and what it takes to achieve its end goal. Next, it explores organizational learning, a common learning style in municipalities, as well as the benefits of using evidence-informed decision making (EIDM) in policymaking. Lastly, the literature review discusses knowledge mobilization formats and how they can be used to enact action through municipalities.

2.1 Knowledge mobilization for climate action and the role of municipalities

This section discusses how Canadian municipalities are currently positioned in climate governance. As of 2023, 81.86% of Canadians live in an urban area (cities and towns) (Trading Economics, 2025). Their high concentration of people, government, business, infrastructure, and economic resources makes them vulnerable to the growing risks of global warming (Climate Atlas of Canada, 2025). Seeing as urban areas are on the frontline of climate change, it is not a surprise that 650 Canadian municipalities have declared a climate emergency (MacDonald et al., 2024). While around 58.6% of the Canadian population (through municipalities) have implemented a climate action plan (Torrie, 2015), it was found that they have limited resources,

knowledge or staff capacity to efficiently implement the necessary actions (Clean Air Partnership, 2024). This demonstrates the emphasis on the use of knowledge mobilization to help municipalities overcome barriers to climate action.

Bridging the gap between climate change research and practical action requires more than simply the translation of evidence into policy (Mulopo et al., 2025). Mobilizing knowledge through inclusive, cross-sectoral, and community-engaged processes is needed (Mulopo et al., 2025). In the Environment and Climate Change Canada (2025) report, it was found that a strong need for a national, interdisciplinary, urban research mobilization network was echoed across sectors, groups, and regions in meetings and post-meeting surveys. Scientific capacity must be utilized to bring evidence where it is most needed to guide action (Environment and Climate Change Canada, 2024), which in this context is in the hands of the municipalities.

Municipalities control or influence over 52% of GHG emissions through many local systems, transportation, buildings, and waste, making them key actors in climate action (Federation of Canadian Municipalities, 2024b; Linton et al., 2022). In the context of Ontario, municipal climate adaptation plans tend to be strong in features relating to information base, goals and objectives, policies, public participation, and organization and presentation (Donoghue & Katz-Rosene, 2023). Despite these strengths, municipalities tend to have weak implementation and interorganizational coordination (Donoghue & Katz-Rosene, 2023); all things that can be improved through effective knowledge sharing and trust (Chen et al., 2014). Seeing as the Canadian Constitution only identifies two sovereign orders of government, national and provincial (Gore, 2010). This means that there are issues regarding finance and autonomy when it comes to decision-making in a municipality (Gore, 2010). All this goes to show that it is

complex to create a comprehensive and detailed overview of emission reduction opportunities for municipalities.

2.1.1 Barriers to climate action

While municipalities may have the ability to put knowledge into action, in an interview in Metro Vancouver, there were several areas of needed support to effectively advocate for climate action (Mitchell & Graham, 2020). To help bridge the gap between climate science and practice, the support of credible boundary organizations[1] is needed, as well as funding, legislation and research from higher levels of government (Mitchell & Graham, 2020). Lastly, support from academic and industry associations helps articulate underlying principles and assumptions (Mitchell & Graham, 2020). Support in these areas can ultimately help municipal workers increase knowledge exchange between themselves and benefit from climate change action at the local level. This is why learning the preferred knowledge mobilization formats among municipal staff can help researchers better understand how to effectively distribute information.

Furthermore, three additional barriers also contribute to a lack of local climate action, such as not recognizing the global problem of climate change as a matter of local concern (depending on location), a lack of understanding and public misconceptions of climate change, and the absence of staff and politicians' training due to the previous barrier (Robinson & Gore, 2005). However, in the same study by Robinson and Gore (2005), it was also mentioned that by participating in domestic and international networks, municipal workers were influenced to implement climate action. Networks where membership obligations are slack but the opportunities for knowledge exchange and learning were high; ultimately influenced them towards climate action (Peverill,

[1] A boundary organization is defined by (Mitchell & Graham, 2020) as intermediary organizations that connect science to practice.

2021). This emphasizes that municipal workers are willing to learn what it takes to meet their climate targets but may lack resources or time to help. This is why having a network where they can participate leisurely and exchange knowledge is very beneficial for them. As well as understanding what mobilization format works better to effectively share the information. Achieving net zero requires coordination and action across every level of society, from international efforts to local initiatives (Net Zero Climate, 2025).

Overall, municipal workers are in a position where they lack the resources or knowledge to promptly work towards net-zero emissions. To solidify their stance, a focus on reducing emissions within their administrative boundaries and on stakeholder engagement within their decision-making process is necessary (Guyadeen et al., 2019; Seto et al., 2021). As well as determining which knowledge mobilization method they would prefer to use to be educated on this matter.

2.2 Learning styles

2.2.1 Organizational learning

While organizations can learn through various approaches, inadequate learning processes can result in misleading implications (Basten & Haamann, 2018). For this reason, especially in a municipal context, it is important to practice organizational learning as it helps with the creation, retention and transfer of knowledge within the organization (Andreev, 2024). More specifically, organizational learning is a process where an organization improves over time through gaining experience and using that to create knowledge, which will then be shared within the organization (Andreev, 2024). Organizational learning was proven to improve government policy-making capacity through effective policy translation between cities engaged in knowledge sharing (Moodley, 2023).

2.2.1.1 Evidence-informed decision making (EIDM)

While the learning techniques of a municipality are important in the decision-making process, the way evidence is used is equally important. Evidence is found to help determine whether a policy will achieve its objectives, the projected outcomes, and how much implementation would cost (Newman et al., 2017). Evidence-informed decision-making (EIDM) involves identifying, appraising, and mobilizing the best available evidence into the decision-making process for policies (National Collaborating Centre for Methods and Tools, 2009; World Health Organization, 2022).

In the context of municipal government, it would be beneficial to implement EIDM into the decision-making process for climate action policies. However, EIDM may be something that requires training for the municipal staff; this is where determining their preferred training formats can become useful to ensure effective understanding. Despite the evident benefits of implementing EIDM, there are barriers to translating evidence into policymaking. There are three reasons for the minimal impact of evidence on policy: challenges with adopting research evidence that is open to different interpretation; political manipulation, such as selective use of evidence; and cultural differences between academics and policy-makers (Mahani et al., 2024).

Since municipal workers come from multiple different academic backgrounds, working alone or in a team setting (Federation of Canadian Municipalities, 2021), certain evidence may be harder to interpret for certain people. Also, as some municipalities may have other priorities or views that do not align with climate change (Robinson & Gore, 2005). Depending on the staff in charge, selective evidence may be used in favour of their view. Lastly, similarly to the first barrier, staff may come from different backgrounds, meaning they might not understand the language from the relevant evidence to implement climate action.

On that note, this highlights that knowledge mobilization can help diminish the EIDM barriers for municipal policies. Being able to communicate research, or in other words evidence, to people who may not have the same background knowledge, is an important piece of knowledge mobilization (Cornelius-Hernandez & Clarke, 2024). It was also found that perceptions of research can differ between researchers and policymakers, and addressing this gap is a key goal of knowledge mobilization research (Dam et al., 2023). Addressing this gap will help increase the relevance and effectiveness of research-based evidence alongside building individual and organizational capacity (Dam et al., 2023). With this being said, there is a need to identify effective and sustainable knowledge mobilization formats to enhance capacity for organizations to operate in an evidence-informed way (Dobbins et al., 2018).

2.2.2 Individual learning

While understanding the way that organizations learn is important, it is also crucial to understand how individual adults learn as well. Specifically, this will help to understand how the preferred knowledge mobilization formats function in the mind of a municipal worker for enabling climate action. As learning is based on experience, also known as experiential learning, it is viewed as an integral part of how humans learn, grow, and develop (Manolis et al., 2013). In 1984, David Kolb, a social psychologist and adult educator, published the Experimental

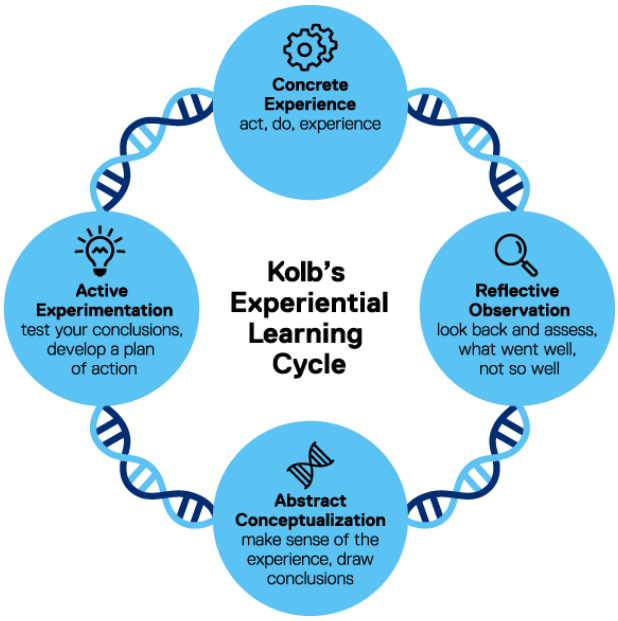


Figure 1: Kolb's Experimental Learning Cycle adapted from from (Toronto Metropolitan University, 2025).

Learning Theory, which posits that learning is a 4-stage process (Toronto Metropolitan University, 2025).

The first stage is *Concrete experience (CE)* which is individuals learning through adaptability and open mindedness rather than systematic approach to the situation or problem; *Reflective observation (RO)* is where students learn from their experiences by articulating why and how they occurred (reflect, observe and critically examine); *Abstract conceptualization (AC)* relates the observations and reflections made during the RO stage by using logic and ideas as opposed to feelings to understand situations and problems; and *Active experimentation (AE)* is when students test the theories to make predictions about reality (Akella, 2010). In simpler terms, effective learning is when a person (CE) has a concrete experience followed by (RO) observation of and reflection on that experience which leads to (AC) the formation of abstracts concepts and generalization, which then (AE) is used to test a hypothesis in future situations (McLeod, 2025). Examining adult learning allows us to see that improving teaching-learning, requires the application of active involvement of the learner by allowing debate and challenge of ideas using the audience response system technique (Prakash et al., 2019).

Additionally, learners do not always use the entire learning cycle stages equally; they usually concentrate on one or two stages (Akella, 2010). This implies that everyone has different learning styles, which is the consistent way in which a learner responds to or interacts with stimuli in the learning context (Manolis et al., 2013). The different categories of adult learners are: (1) self-directed learners, who plan, conduct, and assess their own learning; (2) goal-oriented learners on enrolling in a course, usually knowing which goal they want to attain; (3) activity-oriented learners who learn more readily with various activities; and (4) learning-oriented learners who need to see a reason for learning something and has to be applicable to their work

or lifestyle to be of value to them (Prakash et al., 2019). Depending on the learning style of the individual, the way they absorb the knowledge they are being taught will vary. Hence, it is important to determine the preferred knowledge mobilization formats of municipal staff. Knowing this will allow us to better enact climate action within Canadian municipalities.

2.3 Knowledge mobilization and environmental policy

2.3.1 What is knowledge mobilization?

As stakeholder engagement is pertinent in climate change plan-making, effective stakeholder engagement requires a comprehensive approach that includes ongoing communication, listening, and collaboration (Sedmak, 2021). This can also be seen as a form of knowledge mobilization, which is the process of making academic research accessible to non-academic audiences (The University of Winnipeg, 2025). This process can include knowledge synthesis, dissemination, transfer, exchange, and co-creation or co-production by researchers and knowledge users (Social Sciences and Humanities Research Council, 2012). Knowledge mobilization requires applying various skills such as stakeholder engagement, clear language writing skills, communications, design, social media engagement, event planning and facilitation, and evaluation (Research Impact Canada & University of Guelph, 2025). All in all, knowledge mobilization is the process of turning evidence into action to maximize impact (University of Calgary, 2025). This means using certain strategies to enact change in this process to enact change.

In a municipal context, using knowledge mobilization can help municipal staff understand or learn how they can achieve their climate reduction goals. Especially, with the demand from municipal workers to learn how to manage their climate strategies, but there is a lack of resources to do so. Knowledge mobilization studies have found that social and

professional relationships are critical for translating climate science into municipal action (Andrachuk et al., 2021). Through interpersonal relationships, knowledge is moved around the domain of science and action, which allows decision-makers to draw on personal experience, discussion with colleagues and experts, etc., to make informed decisions (Andrachuk et al., 2021). Organizational learning, which is the ability of an organization to learn collectively by applying new knowledge to the policy process in policy implementation, can improve government policy-making capacity (Moodley, 2023). While there are many ways to demonstrate knowledge mobilization, the most beneficial one depends on what you are trying to mobilize.

2.3.2 Knowledge mobilization training formats

The purpose of knowledge mobilization is to get the right knowledge to the right people to positively influence decision-making. Using different knowledge mobilization training formats, such as webinars, facilitated peer-to-peer meetings, workshops, and study tours has been found to identify trends in the barriers and opportunities faced by municipalities in a climate change context (Peverill, 2021).

Knowledge mobilization includes activities related to the production and use of research results, such as knowledge synthesis, dissemination, transfer, exchange, and co-creation or co-production (Social Sciences and Humanities Research Council, 2012). These activities can help to spread knowledge across any organization, or in this case, the municipality. Knowledge synthesis is the contextualizing and integration of research within the larger body of knowledge on a specific topic (Canadian Institutes of Health Research, 2012). Knowledge dissemination is identifying the appropriate audience for the research findings and then tailoring the message to the audience when sharing the results (Canadian Institutes of Health Research, 2012).

Knowledge transfer is when individuals share knowledge, skills, recommendations and ideas through the organization (Abinbuhaybeha, 2023). Knowledge exchange is an interaction between knowledge users and researchers resulting in mutual learning (Canadian Institutes of Health Research, 2012). Knowledge co-creation or co-production is the collaboration between multiple disciplines and cultures to generate knowledge (Esmail et al., 2023). Choosing the most effective format is an important step in successful knowledge mobilization. These formats differ in accessibility, cost, and engagement level, which can influence how effectively municipal staff learn and apply climate strategies.

2.3.2.1 Case studies

Case studies can be beneficial in deepening the understanding of a real-life context. A case study refers to a strategy or design for conducting empirical inquiry that investigates a contemporary phenomenon within its real-life context (Chopard & Przybylski, 2021). Using case studies as a method can also identify new or omitted variables and hypotheses, examining intervening variables in individual cases, developing historical explanations of particular cases, and many more (Bennett, 2004).

2.3.2.2 Peer-to-peer discussion

Peer learning is seen as students learning with and from each other in a group setting, with no implied authority to any individual (Keerthirathne, 2020). This format allows the students to take responsibility for their own learning (Assinder, 1991). This benefits the students by promoting critical thinking, motivation, collaborative and communicative skills (Stigmar, 2016).

2.3.2.3 Coaching

While the rest of the formats may be straightforward, coaching is dependent on the person's teaching style and can come from multiple learning experiences (Stodter & Cushion,

2019). Despite this, an advantage of coaching is that it provides an individualized and focused session on the needs of the student (Mercer et al., 2018).

2.3.2.4 In-person session

While the various formats that we are discussing can be held in-person, in this context, an in-person session refers to any learning session held in an in-person environment rather than virtual. A study found that the benefits of an in-person session include increased concentration, decreased distractions, increased sense of commitment, social encounter, etc. (Shlomo & Rosenberg-Kima, 2025).

2.3.2.5 Asynchronous micro-credential

An asynchronous micro-credential is a short, flexible training program often delivered online, with input from industry to support career advancement and development (University of Waterloo & Renison Continuing Education, 2025). Micro-credentials are relevant to learners of all stages of life and allows people to reskill, upskill or acquire new skills (Nguyen Thi Ngoc Ha et al., 2024).

2.3.2.6 Conference/symposium/presentations

Using conferences for information sharing can be valuable depending on the target audience and the information you are sharing. Additionally, conferences allow people with shared interests and goals to meet face-to-face to share experiential stories, research findings, educational materials and future visions (De Vries & Pieters, 2007). This serves both professional and social purposes when sharing knowledge between people, which can lead to professional growth and industry insights (Niear, 2023).

For example, the Federation of Canadian Municipalities host a Sustainable Communities Conference that provides the opportunity to network with partners, peers and municipal representatives while also providing attendees with actionable solutions towards a more resilient

and sustainable future (Federation of Canadian Municipalities, 2025). Symposiums have similar advantages but tend to be smaller and more focused on certain topics. For presentations, some potential benefits include greater student interaction and participation and increased interest in learning (Girard et al., 2011).

2.3.2.7 Plain-language summaries

Plain language summaries are, as the name suggests, summaries that are written in a way that a non-specialist audience would understand (Cheung, 2018). Everyone does not have the same knowledge to be able to understand certain concepts or words used in an academic article, even when you think you've explained it in simple terms. Therefore, the best way to avoid any misunderstandings is to write your research in a way that the public can understand. Using plain language summaries can also improve public engagement with scientific research (Taylor & Francis Author Services, 2025), making it easier for anyone to use this information and progress toward solutions.

2.3.2.8 Workshops/webinars/trainings

Workshops provide the opportunity to bring real examples to work on and provide practical knowledge, skills, and tools to the participants (Research Impact Canada & University of Guelph, 2025). Additionally, workshops offer immediate feedback, and participants can benefit from skill enhancement by networking with like-minded people (DigitalDefynd, 2024). This will ultimately leave room for high participation and can encourage people to ask questions or give insights because of the engaging environment.

A webinar is a presentation, seminar, lecture or workshop broadcast over the internet (Zoumenou et al., 2015). They have increasingly over the years become a common method to deliver education in a situation where the learners are not able to gather at one site (Guanci, 2010). Training in this context is referred to as acquiring the necessary job-specific skills for a

certain role, ultimately working towards changes in behaviour (Masadeh, 2012). This is usually used because employees are sometimes required or can benefit from seeking continuous updates and enriching their knowledge and skills to perform effectively (L. K. Chan & Hodgson, 2011).

2.3.2.9 Toolkits/guidebooks/worksheet

Toolkits are like the name suggests, a kit of tools designed to support the understanding, application and sharing of specific knowledge (Thoele et al., 2020). Toolkits may include a combination of items such as written material (tip sheets, guidelines, etc.) and audio-visual materials (CDs and DVDs) (Barac et al., 2014). This method of knowledge sharing can be used to facilitate practice change and can include resources for guideline implementation, informing policy, practitioner training and providing quality audit materials (Yamada et al., 2015). This method encourages self-paced learning for specific skills and gives immediate access to resources while also being cost-effective compared to other knowledge mobilization formats, like conferences.

As toolkits can include multiple materials, one of them could be a guidebook. Guidebooks provide information on various topics and help employees improve their skills to become more proficient in a specific job or task (Suliya et al., 2023). Another material that can be found in a toolkit but also used on its own as a knowledge mobilization training format, is a worksheet. A worksheet is a printed instructional material used to help students gain knowledge, skills and values by providing helpful comments about specific objectives and enabling engagement through active learning (Kaymakci, 2012). See Table 1 for the different types of knowledge mobilization formats discussed throughout the literature.

Knowledge Mobilization Formats	Definitions
Case studies	Investigates real-life contexts to deepen understanding and identify new variables or hypotheses.
Peer-to-peer discussion	Students learn collaboratively without hierarchy, fostering critical thinking and communication skills.
Coaching	Individualized sessions tailored to learner needs, offering focused guidance and support.
In-person sessions	Face-to-face learning that enhances concentration, commitment, and social interaction.
Asynchronous micro-credential	Short, flexible online programs for reskilling or upskilling, often industry informed.
Conferences/Symposium/Presentations	Facilitates knowledge sharing and networking, promoting professional growth and collaboration.
Plain language summaries	Simplifies complex research for non-specialist audiences, improving accessibility and engagement.
Workshop/Webinars/Trainings	Practical, interactive sessions (online or in-person) for skill development and knowledge application.
Toolkits/Guidebooks/Worksheet	Self-paced resources providing practical tools and guidance for learning and practice change.

Table 1: Different kinds of knowledge mobilization formats discussed in the literature review

All in all, the discussed training formats are not mutually exclusive, as there are other methods that can be used to train people. The selected format should be based on the context of what is being taught and the audience.

2.3.3 Best knowledge mobilization training practices for municipalities

As established, the most effective knowledge mobilization is determined by the chosen audience. In this case, this section will look at how to best implement knowledge mobilization for municipalities. As discussed above, effective knowledge mobilization requires effective stakeholder engagement. Additionally, effective knowledge-sharing requires a balance of both implicit and explicit knowledge types and needs to facilitate different knowledge-sharing formats

(Elkhidir et al., 2022). Nothing can be deemed the most effective or the best without a scale to measure it with. This is why continuously assessing the effectiveness of the chosen knowledge mobilization strategy is needed and being willing to alter or adapt based on feedback and changes.

2.3.4 Kirkpatrick evaluation model

To move research into action, an understanding of the relationships, networks, and stakeholders/audience is needed in the final stages of knowledge mobilization (Briggs et al., 2025). To properly evaluate the efficacy of knowledge mobilization training programs, the Kirkpatrick evaluation method can be a key strategy. It consists of four levels: Reaction, learning, behaviour and results (Kirkpatrick, 1959). The first level measures if the learner have found the training relevant to their role; the second level focuses on if the learner has acquired the knowledge, skills, and confidence that the training is focused on; the third level measures behavioural changes after learning and showcases if the learners are applying what they have learned in their position; and the last level focuses on if the targeted outcomes was achieved from the training program (Kirkpatrick, 1959). While the timeline of this study does not align with all the levels of the evaluation model, this research will use results from the first two levels to evaluate the preferred knowledge mobilization formats among Canadian municipal staff in the piloting program.

2.3.5 How the preferred training method can benefit municipal staff

Knowledge mobilization does not consist only of translating knowledge and hoping the trainees understand the content easily. It is also important to understand which training method is preferred among staff, because using more engaging or preferred methods allows the trainees to build relationships, allows flexibility, stay engaged, and can offer a more hands-on experience

(CPS HR Consulting, 2024). The need for effective employee training and development systems was found to achieve improved employee performance and improved delivery of services to the communities (Mpofu & Hlatywayo, 2015). In this research context, it would be the improved delivery of climate action plans within the municipality. Lastly, a study that developed knowledge mobilization formats and evaluated the effectiveness based on reach, usefulness, partnerships and practice changes found that effective formats raised awareness of various urban stakeholders and provided relevant information and guidance for urban planning practices (Labbé et al., 2020). All in all, determining the preferred training method of Canadian municipal staff is beneficial to efficiently translate climate knowledge.

To conclude, despite around 58.6% of the Canadian population being covered by a climate action plan, municipalities still lack resources, knowledge and staff capacity to implement effective climate action. The literature discussed above, it displayed what knowledge is currently available regarding Canadian municipal climate action and the barriers they face with climate action. Discussing this provides a better understanding of the current Canadian municipal climate action context and the role they play. Additionally, organizational learning was discussed to better understand the context of municipalities when training. Lastly, the literature review discussed the different knowledge mobilization formats and how using the preferred knowledge mobilization formats of municipal staff can be beneficial.

Chapter 3: Methodology

The following chapter discusses the approach that was taken for this research study. This study utilized an explanatory sequential mixed-methods design (Creswell & Creswell, 2023) to explore the reasoning behind the preferred knowledge mobilization methods of Canadian municipal workers. Additionally, this helped to understand contextual factors influencing knowledge mobilization for climate action.

The chapter starts with an overview of the research design, sampling strategy and the research's role. Followed by data collection and analysis methods, and ending with trustworthiness, validity, and limitations.

3.1 Research approach and design

This research was part of a larger project, called Municipal Net-Zero Action Research Partnership (N-ZAP), with the goal to support Canadian municipalities in monitoring, measuring, and achieving their GHG mitigation goals (University of Waterloo, 2026). When collecting data using a mixed method approach, it could be seen as gathering both quantitative and qualitative data and then combining them (Creswell & Creswell, 2023). The mixed-method approach was a result of needing to explain the quantitative results in more detail using the qualitative data (Creswell & Creswell, 2023). This allowed the researcher to learn more about the problem being studied, as insights from a mixed-method approach go beyond simply learning about each individual result; learning comes from the combination of the two datasets (Creswell & Creswell, 2023). Additionally, it was beneficial as collecting qualitative data provided evidence to back up the numbers from the quantitative data (Creswell & Creswell, 2023). Using this approach was useful because it developed a complete understanding of changes needed to better tailor knowledge to the realities of municipal staff.

As part of the N-ZAP project, four separate cohort programs were created to pilot different N-ZAP resources to provide the municipalities with the necessary information needed to enact climate action. There were two paths for piloting: either joining the cohort or doing a self-paced approach. For this reason, a pre-survey (see Appendix A) was conducted before piloting for each cohort and self-paced group from the pilot communities. The questions were focused on the pilot community's readiness and capacity to mobilize the N-ZAP resource they chose to pilot. The survey also explored questions related to climate action, including those not specific to the N-ZAP resource, but also the municipality's climate efforts and how N-ZAP could better support them in the pilot process. Halfway through the cohort program, interviews (see Appendix B) were conducted to gain additional insight into how trainings were going and on enablers and barriers to effective knowledge mobilization.

An explanatory sequential mixed methods design was used to explain the quantitative results with the qualitative data by connecting the two datasets (Creswell & Creswell, 2023). This method design worked in two steps; the first step was to attain the quantitative results through the pre-survey which, gave results that could be further expanded on. Which is where step two followed, and the qualitative data from the interviews was used to build on the pre-survey data. This means that, after data collection for each dataset, a separate analysis of the quantitative and qualitative data was done, and the results were interpreted to determine how the qualitative data explained the quantitative results.

3.2 Sampling strategy

The target population in this research was Canadian municipalities, more specifically, those that signed up to be an N-ZAP pilot community. They were also the population that this research aimed to help with its findings. The N-ZAP team was responsible for the recruitment of

the pilot communities and conducted the 8-month cohort session with those who were interested, or a self-paced option. The cohort and self-paced program was where the quantitative and qualitative data was pulled from. The recruitment method was online through N-ZAP's website and promotions, and through the launch webinar of one of the resource guidebooks. The municipalities completed a form to express interest in becoming a pilot community. After submitting the form, the N-ZAP team reached out to the city's representative with more information, along with the pre-survey. The data from this thesis focused on two resources, climate budgeting and community partnership.

Voluntary sampling was the selected method because real scenarios were studied, meaning municipalities that were interested in getting involved were needed (Moss et al., 2025). Forcing municipalities to become involved was also not a feasible method.

3.4 Researcher's role

While I did not have experience conducting workshops, I had experience leading activity-based tutorials. I had also conducted interviews in past research projects regarding talking to thrift store managers. Additionally, growing up in Canada put me in a position where I could understand context-specific concerns or issues addressed by the municipalities. I had also worked in multiple Canadian municipalities, and while each municipality had different procedures, it gave me an understanding of how municipal workers go about decision-making. In addition, I attended a francophone elementary and secondary school, while speaking English outside of school, making me fluent in French and English. This allowed me to understand most of the slang and terminology from French, mostly spoken in Canada.

My undergraduate degree was in environmental studies, which provided me with the background knowledge necessary to discuss climate change topics. Within my degree, I was able

to do multiple co-op placements where I physically learned the different sectors within the environmental world. This included the environmental sector within the municipal world, as mentioned above. Working in a setting where I had to inform the public about climate change during one of my placements, and received pushback, until I related the issue to their personal life is something that drove my passion for wanting to dive deeper into knowledge mobilization. Seeing how once people understand something and the impact it has in their everyday lives, which pushes them to want to make a difference, made me realize how important knowledge mobilization is.

With this experience, I knew which questions in the interview could be avoided, or I had better insight into certain knowledge mobilization formats that would or would not work. Overall, these experiences, as well as guidance from my committee, ensured that I could successfully conduct this research.

3.5 Data collection

An ethics approval was obtained from the University of Waterloo to ensure the safety and welfare of participants were adequately protected (see Appendix C). This application included a letter of recruitment, written in email format, to communities interested in learning more about climate action. Once they expressed their interest, an email was sent to them including a link to the pre-survey. The pre-survey also included information from the project and a consent form section. Midway through the cohort program, another email was sent to ask if communities were interested in doing an interview. Those who expressed interest were provided a consent letter and then were scheduled an interview date. After the interview, a letter of appreciation was sent to the participant.

3.5.1 Quantitative

As mentioned above, the quantitative data was collected from the pre-survey distributed through the N-ZAP program. The pre-survey was focused on the pilot community's readiness and capacity to mobilize the N-ZAP resource they chose to pilot. Additionally, the survey explored questions related to the municipal representative's baseline knowledge and understanding and preferred learning formats and collaboration opportunities. More specifically, the questions from Section 3: Preferred Learning Formats and Collaboration Opportunities and Section 4: Additional Insights in the pre-survey questions (see Appendix A) were used.

3.5.2 Qualitative

Halfway through the cohort program, semi-structured interviews (see Appendix B) were conducted to gain additional insight into how piloting for the self-paced communities was going. As well as the municipal representative's preferred way of getting information to enable climate action. Additionally, the interviews were recorded and transcribed.

3.6 Data analysis

This study utilized an explanatory mixed-methods design; there were a few different types of analysis used, one for each data type. The pre-survey responses were collected first, and descriptive statistics was used to analyze the data. More specifically, an ungrouped frequency distribution of each answer in the Likert scale questions in the 'Preferred Learning Formats & Collaboration Opportunities' part of the survey was used. Ungrouped frequency distributions were used to show categorical data and display the pattern of frequencies of a variable (Turney, 2022). This helped to visualize patterns from the survey results. Next, a Kruskal-Wallis H-test was conducted on each Likert scale question to determine whether different types of municipalities prefer different training formats (Y. Chan & Walmsley, 1997). Then, a cluster

analysis was conducted on the Likert-scale data to determine if there were natural groupings of municipalities that share similar training preferences (Landau & Ster, 2010). The last test conducted on the Likert-scale data was an ordinal logistic regression to determine if population size predicts the likelihood of agreeing with a training format (Parry, 2024). Lastly, a thematic analysis, using the Gioia method, was conducted on the open-ended questions in the pre-survey to identify any patterns (Gioia et al., 2013).

To analyze the interview transcript, the Braun and Clarke (2006) approach was used, and a thematic analysis was done using a deductive approach, and followed by an inductive approach. The Braun and Clarke (2006) approach offered a flexible and structured framework that was used to explore participants' experiences and generate nuanced insights without requiring advanced theoretical knowledge. The interview questions were open-ended and helped expand on the questions asked in the pre-survey. The deductive approach meant that a predefined code was set based on the patterns found in the data. An inductive approach starts with research and establishing a theory, then investigation and observation to determine a generalized theory (Kim, 2021). Starting with the deductive approach, the theory was provided, and the inductive approach was used to observe and investigate any new themes or patterns that were found in the data after establishing a theory.

3.7 Reliability and validity

To ensure the reliability of the research, member checking of the survey and interview questions was done by Working Group 5 of N-ZAP. This means the interviews were recorded, and a transcript of the interview sessions was made to send the summary of each municipality's interview to them. To address transferability, the researcher provided detailed descriptions of the research context, participants, and findings. This allowed others to determine if the findings

could be applied to similar contexts. To assess the validity of the research, the relationship to other variables (Hill et al., 2022) was considered, as data was observed from testing.

For dependability, an audit trail was left, meaning detailed records of all research activities, including data collection, analysis, and decision-making processes, were kept (McLeod, 2025). This allowed others to follow the research steps and verify the consistency of the findings. Additionally, triangulation was followed by using mixed-methods to cross-check and validate the findings and it provided a comprehensive view of determining what needed to be or what could be done to improve knowledge mobilization within the municipal climate action. Lastly, to address confirmability, reflexibility was implemented, which meant the researcher reflected on their own biases and how they could influence the research (Jamieson et al., 2023). To do this, documentation of the researcher's reflections and decisions throughout the research process was done to demonstrate transparency (Turner, 2020).

3.8 Limitations

A limitation of the selected recruitment method was that the same municipalities might not have heard about the piloting program if they did not look it up online, or if they did not attend the webinars or hear about it some other way. Therefore, this method was not able to reach municipalities that may have been interested but not aware of the opportunity to join. Lastly, given that municipalities volunteered to join this research, a selection bias presented itself since the population sample had skewed insights (Pragmatic Editorial Team, 2025). Since the participants volunteered to join the piloting program, their insights leaned towards wanting to enact climate action.

The time constraint was an issue as there were about eight months allocated to data collection, and all the information for the project could not possibly be completed. Additionally,

the research question could be seen as subjective and depending on the resources of the municipality, they may not be able to access their preferred knowledge mobilization format. This was why this study looked to determine their preferred knowledge mobilization format and how they could be used to our advantage to enact climate action. The study's focus on municipalities may have limited the usefulness of the findings for other organizations with a different level of interest. Another limitation was that the pilot communities willingly volunteered to participate in this project, which means they had some prior knowledge that they wanted to expand on or at least some interest. This means that most of the responses and discussions might have been skewed towards being positive and engaging. Although there was little that could be done to minimize the limitations, it was important to acknowledge these points for the research.

Chapter 4: Results

This chapter presents the empirical results from the pre-survey and mid-point interview data from the Municipal Net-Zero Action Research Partnership (N-ZAP). Section 4.1 begins by presenting the quantitative data analysis, which showcases the results from the pre-survey sections regarding preferred learning formats (multiple choice and Likert scale questions) and additional information (open-ended questions). Section 4.2 presents the qualitative data analysis, showcasing the results from the interviews taken during the mid-point of the pilot project. The interview data were analyzed using the Braune & Clarke analysis. The findings from the data collection process are presented in tables and are summarized.

4.1 Quantitative approach (pre-survey)

As stated in the methods section, the main quantitative analyses were descriptive stats, Kruskal-Wallis, Cluster analysis, and Ordinal logistic regression with the purpose of analyzing the multiple-choice questions and Likert scale data.

4.1.1 Multiple-choice questions

The complete sample of municipalities in this thesis comprises of 27 municipalities. Out of the 27 municipalities, seven were small municipalities consisting of a population of less than 30,000. 12 out of 27 municipalities were from a medium-sized municipality with a population of more than 30,000 but less than 99,000. Then, eight out of 27 municipalities consisted of a population of 100,000 or more. Table 2 shows the responses from each municipality size from the pre-survey asking which knowledge mobilization (KMb) training formats are most effective for them, with the option to select multiple.

A visual representation of the results is shown in Figure 2 using a bar chart with the results displayed in percentage. 86% of the small municipality representatives selected peer-to-

peer discussions, coaching, webinars, and in-person sessions as their top choice. With only 43% of representatives selecting worksheets, making it the least selected format among small municipalities. 92% of the medium-sized municipality representatives selected peer-to-peer discussions as their top choice, and only 42% of the municipality representatives selected community of practice and asynchronous micro-credentialing making it the least selected format. One of the representatives also submitted in the 'other' category and stated that an "online training where they went over content as a group and then split off to work on a shared small group assignment that advanced information on communities" was effective and an excellent use of time. 100% of the large municipality representatives selected peer-to-peer discussion as their top choice, with only 13% of the representatives selecting asynchronous micro-credentialing making it the least selected format.

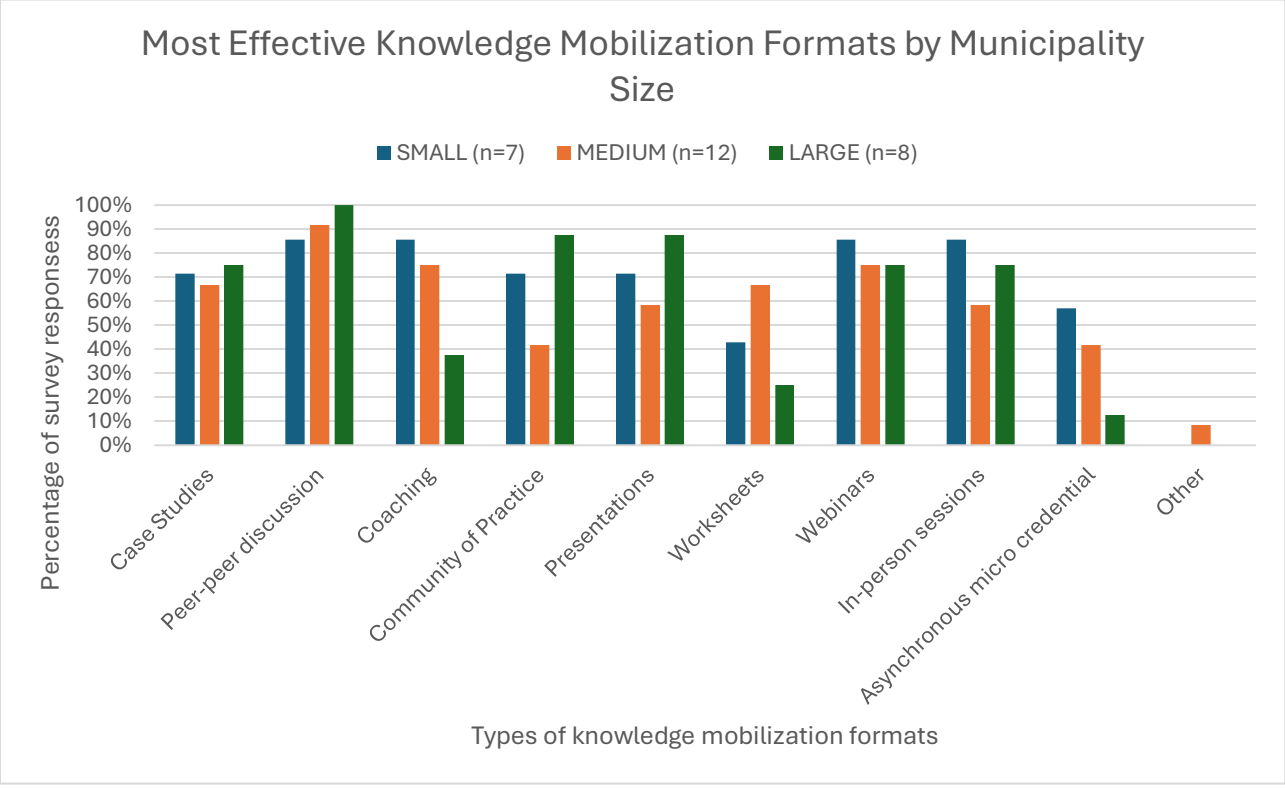


Figure 2: Visual representation of the results from the Municipal Net-Zero Action Research Partnership's pilot program pre-survey, comparing the responses of small, medium and large municipalities when asked which type of knowledge mobilization training format(s) are most effective for them.

TYPES OF KNOWLEDGE MOBILIZATION TRAINING FORMATS										
MUNICIPAL SIZE	Case Studies	Peer-to-peer discussion	Coaching	Community of Practice	Presentations	Worksheets	Webinars	In-person sessions	Asynchronous micro-credential	Other
Small (n=7)	5	6	6	5	5	3	6	6	4	0
Medium (n=12)	8	11	9	5	7	8	9	7	5	1
Large (n=8)	6	8	3	7	7	2	6	6	1	0
Total (n=27)	**19**	**25**	**18**	**17**	**19**	**13**	**21**	**19**	**10**	**1**

Table 2: Results from the Municipal Net-Zero Action Research Partnership's pilot program pre-survey, asking which type of knowledge mobilization training format(s) are most effective for them. Responses were separated by municipal size in this table.

Figure 3 displays the results from the survey for all municipalities; each municipality was able to select more than one answer. Overall, peer-to-peer discussion was found to be the preferred format for all municipalities that responded to the pre-survey, with webinars being a close second. While the asynchronous micro-credential was the least selected, worksheets followed closely at the bottom.

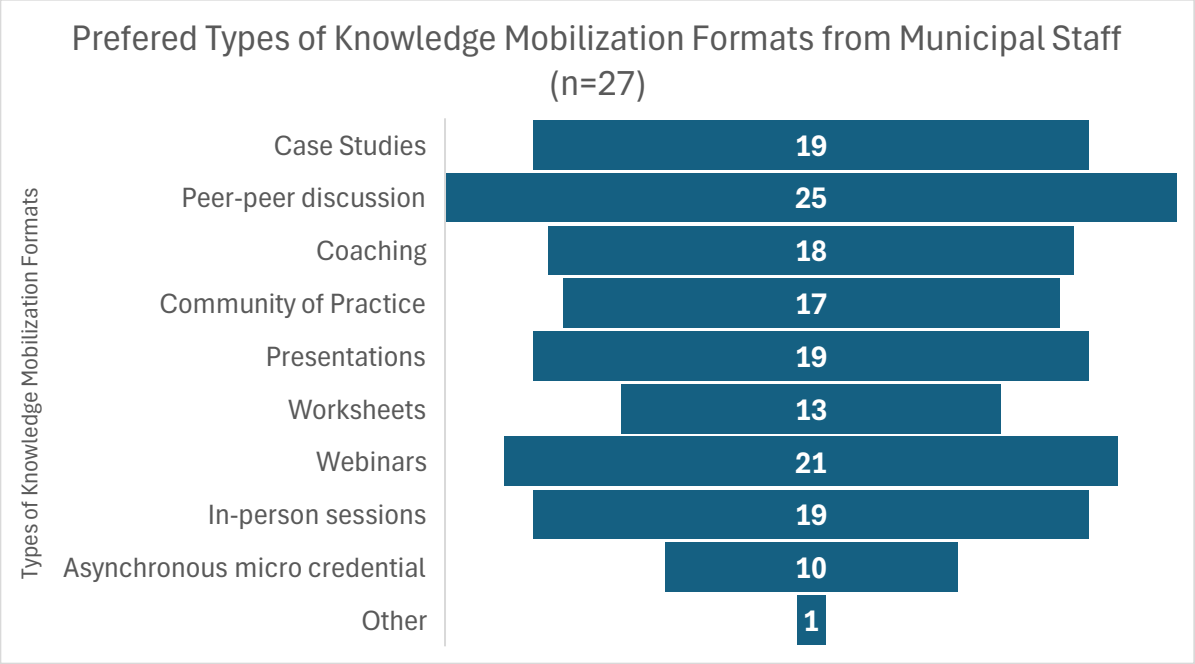


Figure 3: Visual representation of results from the Municipal Net-Zero Action Research Partnership's pilot program pre-survey, asking which type of knowledge mobilization training format(s) are most effective for them.

4.1.2 Likert scale questions

4.1.2.1 Frequency count

In the pre-survey, the municipality representatives were asked a series of Likert-scale questions regarding their preferred learning methods and collaborations. The scale ranged from strongly disagree, disagree, neutral, agree, to strongly agree. In Figure 4, the first question regarding whether micro-credentials are a valuable way to demonstrate their participation in training on climate action was in the 'Agree' section (37%). The second question, whether the representative is interested in regional or national collaboration opportunities to align community efforts with climate approaches, was mostly in the 'Strongly Agree' section (48%). The third question, finding out if having access to a centralized repository of best practices and templates would be beneficial, was in the 'Strongly Agree' section (56%). The fourth question regarding whether the municipal representatives would find it useful to participate in a mentorship or advisory program with climate policy reporting experts fell largely in the 'Agree' option (44%). The fifth question, finding out if peer-to-peer learning and networking with other municipal leaders would be valuable for knowledge sharing, fell in the 'Strongly Agree' section (48%). Finally, the last question regarding whether the municipal representatives would prefer hands-on workshops over online self-paced learning modules was mostly in the 'Agree' section (44%).

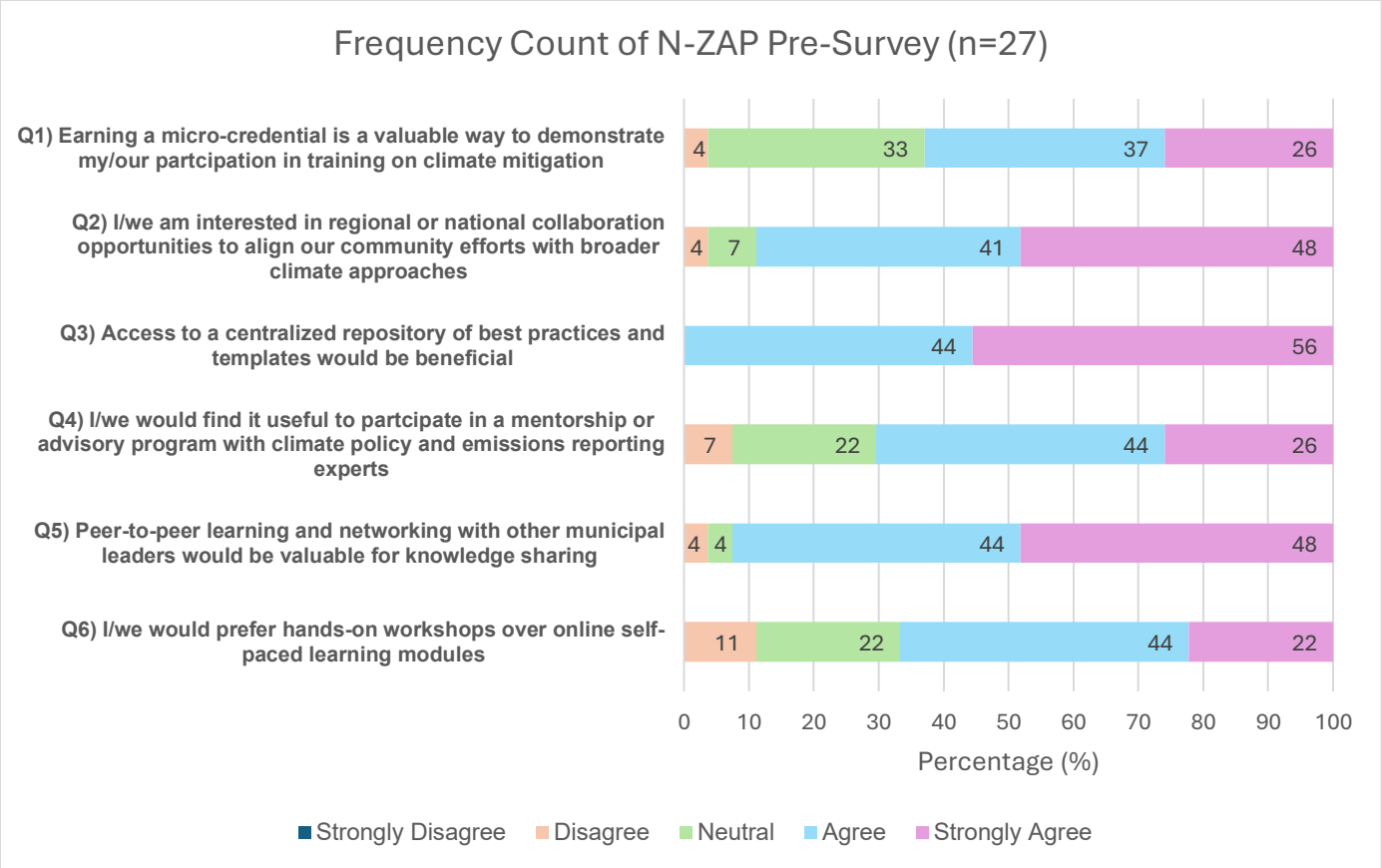


Figure 4: Frequency count of the Likert scale questions from the Municipal Net-Zero Action Research Partnership's pilot program pre-survey in Section 3.

4.1.2.2 Cluster analysis

Using RStudio, a cluster analysis was done on the Likert scale responses from the pre-survey. This was done to determine if there are natural groups of municipalities that share similar training preferences. To conduct the test, each Likert scale question was simplified to a different knowledge mobilization format of focus. The first question is Workshops; the second question is Peer-to-peer; the third question is Mentorship; the fourth question is repository; the fifth question is collaboration; and the last question is micro-credential. The Likert-scale questions were simplified to a different knowledge mobilization format of focus (e.g. Q1=Workshops, Q2=Peer-to-Peer, etc.). The responses for each question were quantified and averaged, with 1 being Strongly Disagree and 5 being Strongly Agree.

Three clusters were then formed through this process (Table 3). Municipalities that ended up in Cluster 1 were found to be moderately engaged and people-focused learners; municipalities in Cluster 2 are high engagement and all-format enthusiasts; lastly, municipalities in Cluster 3 are low engagement and resource-only learners. The average response for question 2 (peer-to-peer) in Cluster 1 is 4.42, while question 6 (micro-credential) is the lowest ranked, meaning this cluster values networking and peer learning. The average response for question 4 (repository) in Cluster 2 is 5, and all the other questions were highly ranked as well, with question 1 (workshop) being the lowest ranked at 3.92, meaning that everyone in that cluster is content to use each format. The average response for question 3 (mentorship) in Cluster 3 is 2.33, with question 4 (repository) being ranked 5, meaning this cluster is not interested in mentorship and rather resource-based formats.

	Q1	Q2	Q3	Q4	Q5	Q6
CLUSTER 1	3.92	4.42	3.75	4	4.33	3.67
CLUSTER 2	3.92	4.67	4.42	5	4.75	4.17
CLUSTER 3	2.67	3	2.33	5	2.67	3.33

Table 3: Average of Likert-scale questions for cluster analysis. Each number in the table is the average Likert score for that question among all municipalities in that cluster.

The hierarchical clustering of the training format preferences graph (Figure 5) showcases how different or similar the clusters are from each other based on the Likert scale preferences. Each number at the bottom represents one municipality, and the branches show how they get grouped. The vertical axis ("Height") represents dissimilarity, so low heights are very similar municipalities, while high heights are very different municipalities. For example, if two municipalities have almost identical answers across questions 1 through 6, they merge at a very low height. However, if two municipalities have very different answers, they only merge higher up.

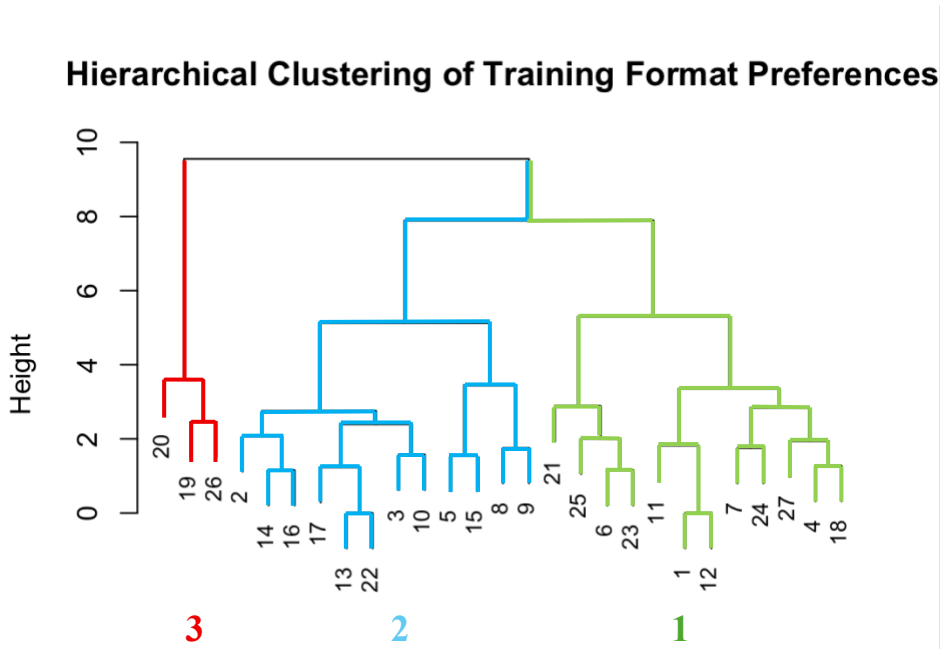


Figure 5: Hierarchical clustering of training format preferences that showcases the grouping of how different each cluster is from the others

4.1.2.3 Kruskal-Wallis test

Another test performed on the Likert-scale data was the Kruskal-Wallis test, which examines whether different-sized municipalities prefer different formats. The test was conducted for each Likert scale question, and five of the six variables showed no statistically significant differences across groups:

- **Question 1**: H=0.04, p=0.979
- **Question 2:** H=3.40, p=0.183
- **Question 3**: H=0.11, p=0.945
- **Question 4**: H=1.74, p=0.419
- **Question 6:** H=1.18, p=0.553

These results indicate that, for most indicators, population size was not associated with differences in municipal scores. However, one variable demonstrated a statistically significant difference across population size groups:

- **Question 5**: H=6.65, p=0.036

To identify which groups differed, Dunn post hoc tests with Bonferroni correction were performed. Although the unadjusted p-values suggested differences between large vs. medium (p=0.019) and large vs. small (p=0.032), these comparisons were not statistically significant after adjustment (adjusted p=0.0567 and p=0.0633, respectively). The comparison between medium vs. small was not significant (p=0.932). An effect size analysis indicated a large magnitude of difference across groups (η_H^2 =0.194), suggesting that population size explains a meaningful proportion of variability in Rank, even though no individual pairwise comparison reached significance after correction.

4.1.2.4 Ordinal logistic regression

To assess if population size predicts the likelihood of agreeing with a training format, an ordinal logistic regression was also conducted for each question. The proportional odds assumption was satisfied for all models.

In Question 1, the model was not statistically significant**,** indicating that population size did not meaningfully predict differences in Likert-scale responses for this item. Neither medium-sized municipalities (β = −0.089, SE = 0.839, t = −0.11) nor small municipalities (β = −0.191, SE = 0.929, t = −0.21) differed significantly from large municipalities in their odds of selecting higher response categories. Model fit indices (Residual Deviance = 68.70; AIC = 80.70) further suggest that population size was not a strong predictor for this question.

For Question 2, the ordinal logistic regression model was also not statistically significant. Medium municipalities (β = −1.669, SE = 1.009, t = −1.65) and small municipalities (β = −1.712, SE = 1.080, t = −1.59) did not differ significantly from large municipalities in their odds of

selecting higher response categories. Model fit values (Residual Deviance = 47.94; AIC = 59.94) similarly suggest weak predictive value.

The model for Question 3 showed no significant effect of municipal size. Medium municipalities (β = −0.301, SE = 0.864, t = −0.35) and small municipalities (β = −0.185, SE = 0.950, t = −0.20) again did not differ significantly from large municipalities. Model fit statistics (Residual Deviance = 66.70; AIC = 78.70) indicate limited explanatory power.

Municipal size did not significantly predict responses to Question 4. Medium municipalities (β = −0.847, SE = 0.936, t = −0.91) and small municipalities (β = 0.405, SE = 1.111, t = 0.37) showed no significant differences relative to large municipalities. Although the model had a lower deviance (Residual Deviance = 35.26; AIC = 47.26), the coefficients remained non-significant, indicating no meaningful association.

For Question 5, both medium (β = −2.730, SE = 1.223, t = −2.23) and small municipalities (β = −2.773, SE = 1.302, t = −2.13) approached conventional significance thresholds, meaning that large municipalities rate collaboration higher than the other municipality size groups. However, the model fit values (Residual Deviance = 47.79; AIC = 59.79) again indicate limited predictive value.

The ordinal logistic regression for Question 6 showed no significant differences across municipal sizes. Medium municipalities (β = −0.378, SE = 0.833, t = −0.45) and small municipalities (β = 0.634, SE = 0.967, t = 0.66) did not differ significantly from large municipalities. Model fit indices (Residual Deviance = 63.85; AIC = 75.85) suggest that population size was not a meaningful predictor for this item.

Across five of the Likert-scale questions, none of the ordinal logistic regression models showed statistically significant effects of municipal population size, except question five. Overall, this indicates that respondents from small, medium, and large municipalities expressed similar levels of agreement across all items, except collaboration.

4.1.3 Open-ended questions

A thematic analysis was conducted using the Gioia method, an approach that balances the conflicting need to develop new concepts inductively (Magnani & Gioia, 2023). This method was used for each question in the section regarding additional information. The responses from the first question, "Why do you prefer these training formats?" that was posed to municipal representatives, were sectioned into different concepts for the '1st order concepts' section. The '2nd Order Themes' were then condensed into themes based on the previous concepts. From the developed data structure, four main reasons why participants prefer one training format over the others. More specifically, they overall prefer a method that contributes to the following: Learning Engagement and Knowledge, Motivation and Accountability Structures Development, Practical Relevance, and Operational Feasibility

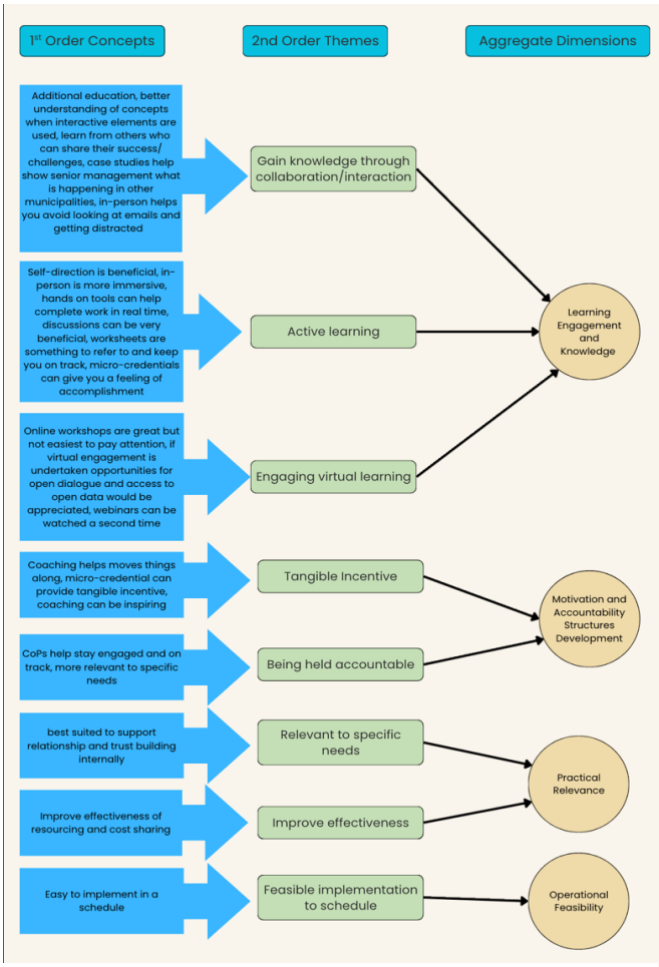


Figure 6: Gioia data structure for Question 1, "Why do you prefer these training formats?" in N-ZAP pre-survey

(see Figure 6). Then the aggregate dimensions of the 2nd order themes include Gain knowledge through collaboration/interaction, Active learning, Engaging virtual learning, Tangible incentive, Being held accountable, Relevant to specific needs, Improve effectiveness, and Feasible implementation to schedule.

Similar to above, the responses from the second question, "Why did you choose to become a pilot community?" were separated into the 1st order concepts. They were then condensed into the 2nd order themes of Improvements, Starting point, Accomplish goals, Leadership, Acquire skills, Raise awareness, Stay/become current, and Network. From the 2nd order themes, the aggregate dimensions ended up being Goal Achievement and Performance Improvement Development, Strategic Influence, Professional Growth and Skill Development, and Community Building and Relationship Expansion (see Figure 7).

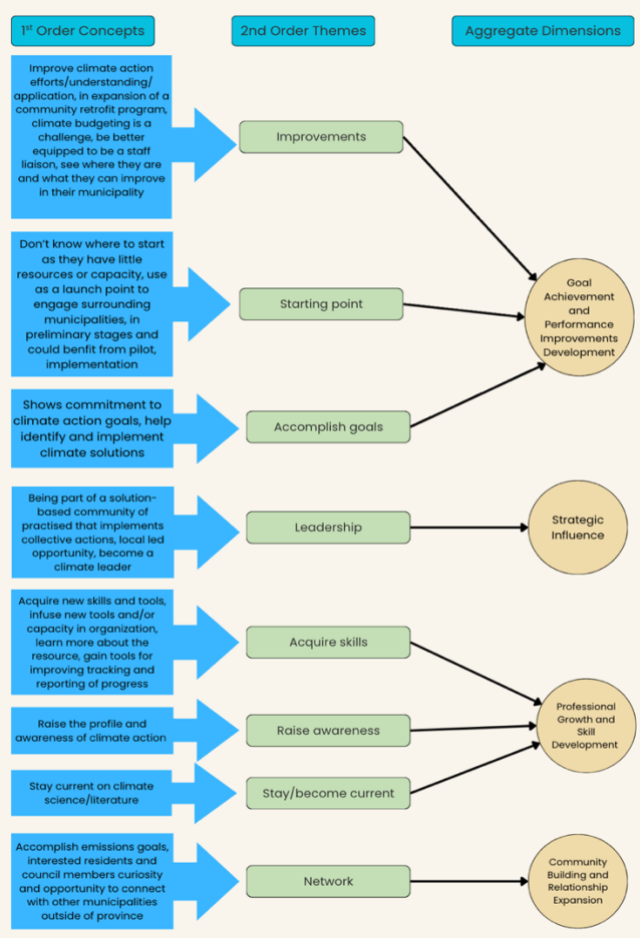


Figure 7: Gioia data structure for Question 2, "Why did you choose to become a pilot community?" in N-ZAP pre-survey

Once again, the responses from the third question, "Do you have any concerns with being able to implement the N-ZAP resource(s) you're piloting?", were separated into the 1st order

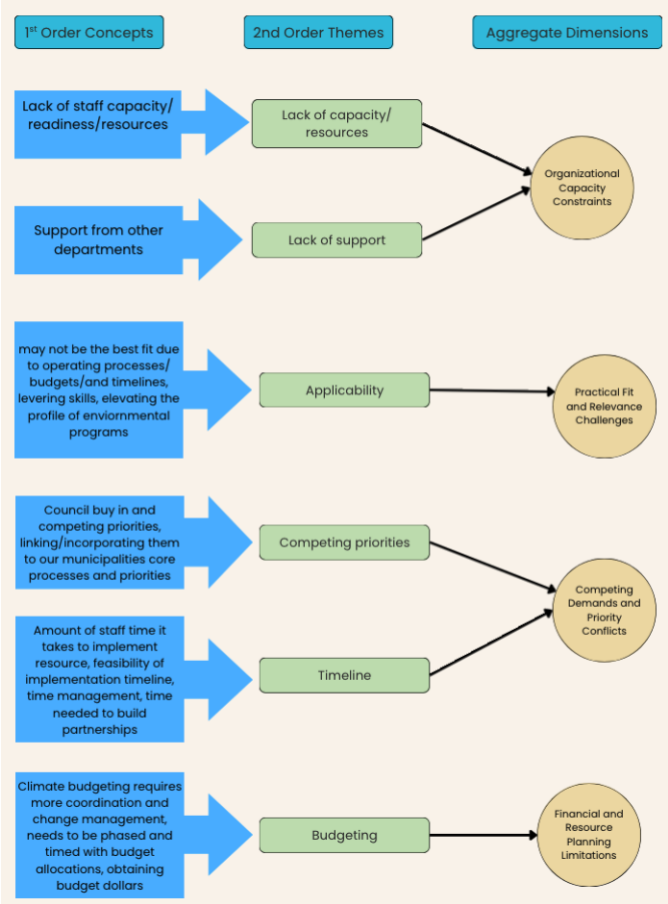


Figure 8: Gioia data structure for Question 3, "Do you have any concerns with being able to implement the N-ZAP resource(s) you're piloting?" in N-ZAP pre-survey

concepts. They were then condensed into the 2nd order themes of Lack of capacity/resources, Lack of support, Applicability, Competing priorities, Timeline, and Budgeting. From the 2nd order themes, the aggregate dimensions ended up being Organizational Capacity Constraints, Practical Fit and Relevance Challenges, Competing Demands and Priority Conflicts, and Community Building and Financial and Resource Planning Limitations (see Figure 8).

4.2 Qualitative approach (interviews)

4.2.1 Mid-point interviews

Overall, there were five themes and 15 sub-themes identified through the coding process of using the Braune and Clarke (2006) method. At the deductive coding stage, the data were coded against the summary table of Knowledge mobilization (KMb) formats (used as a framework) and determined if and how many times a format was mentioned in the interview as a useful or preferred method (Table 4). Through the inductive coding process, 11 new formats were added (formats with the purple rows in Table 4) in the framework.

Structural Features	Municipalities											
KMb Formats	Fredericton		Windsor		Kitimat-Stikine		Antigonish		Tay-Valley		Thunder Bay	
	Yes/ No	Frequency	Yes/ No	Frequency	Yes/ No	Frequency	Yes/ No	Frequency	Yes/ No	Frequency	Yes/ No	Frequency
Case studies	Yes	2	No	-	No	-	No	-	No	-	Yes	2
Peer-to-peer discussion	No	-	No	-	No	-	No	-	No	-	No	-
Coaching	No	-	No	-	No	-	No	-	No	-	No	-
In-person sessions	No	-	Yes	4	Yes	1	No	-	Yes	1	Yes	1
Asynchronous micro-credential	No	-	Yes	1	No	-	No	-	No	-	No	-
Conferences	No	-	No	-	No	-	No	-	No	-	Yes	1
Symposium	No	-	No	-	No	-	No	-	No	-	No	-
Presentations	Yes	1	No	-	No	-	No	-	No	-	No	-
Plain language summaries	No	-	Yes	3	No	-	No	-	No	-	No	-
Workshop	Yes	1	Yes	2	No	-	No	-	No	-	Yes	1
Webinars	Yes	4	Yes	2	Yes	1	Yes	1	Yes	4	No	-
Trainings	Yes	1	Yes	2	No	-	No	-	Yes	3		
Toolkits	No	-	No	-	No	-	No	-	No	-	Yes	1
Guidebooks	Yes	4	Yes	1	Yes	2	No	-	Yes	2	No	-
Worksheet	No	-	Yes	4	No	-	No	-	No	-	No	-
Email	Yes	1	No	-	No	-	No	-	No	-	Yes	1
Repository	Yes	1	No	-	No	-	No	-	No	-	No	-
Monthly calls	Yes	1	No	-	No	-	No	-	No	-	No	-
Template	Yes	1	No	-	No	-	No	-	No	-	No	-
Resource sharing	Yes	2	Yes	1	No	-	No	-	No	-	No	-
Concierge service	Yes	1	No	-	No	-	No	-	No	-	No	-
Community specific information	No	-	No	-	Yes	1	No	-	No	-	No	-
Phone call	No	-	No	-	Yes	1	No	-	No	-	No	-
Surveys	No	-	No	-	Yes	1	No	-	No	-	No	-
Community of Practice	No	-	No	-			No	-	No	-	Yes	1
Self-paced	No	-	Yes	1	Yes	1	No	-	No	-	No	-

Table 4: Summary table of how many times a knowledge mobilization format was mentioned during the mid-point interviews. Count for Worksheet, counted the word "Document" as well.

In the same inductive coding process, this is where the five themes were formed (Table 5). After, combining all similar themes found in the deductive stage, the five themes are as follows: **Theme 1**: Municipalities prefer flexible, low burden formats that respect limited capacity; **Theme 2**: Peer learning and community networks are essential for municipal capacity building; **Theme 3**: Municipalities value practical, action-oriented tools that support

implementation; **Theme 4**: Human support and interaction remain critical, even in written or virtual formats; and **Theme 5**: Format preferences depend on the complexity of the information.

Themes	Description	Representative Quotations
Theme 1: Municipalities prefer flexible, low burden formats that respect limited capacity	Municipalities prefer short, accessible, and low-effort formats, especially virtual or asynchronous options, that fit within limited staff time, small teams, and tight travel budgets.	"Self-paced is really helpful too, because we don't always […] have a ton of capacity. So to be able to pick something up when you have the time to do it is really helpful."
Theme 2: Peer learning and community networks are essential for municipal capacity building	Participants rely heavily on other municipalities for advice, examples, and resource sharing, making peer networks, roundtables, and communities of practice central to how they learn.	"A lot of municipalities have really small [climate focused] teams. So having that networking ability [with surrounding municipalities], you can work together and share resources."
Theme 3: Municipalities value practical, action-oriented tools that support implementation	Municipalities value concrete, hands-on resources, such as toolkits, templates, case studies, and trainings, that help them apply knowledge directly to their work.	"Giving people [..] a template that you could start with a sample slide deck of how to present [the information] to council, like 'here's what we've done' because that's sort of what I've struggled with. And different councils obviously are going to have different levels of knowledge, but, if you [provide] the key messages that should be communicat[ed] when you're talking about [climate] budget, [that would help]."
Theme 4: human support and interaction remain critical, even in written or virtual formats	Regardless of format, participants want access to a knowledgeable person who can answer questions, clarify details, and provide tailored guidance when needed.	"Maybe even having, I always call it the concierge service. If we have questions, and I know we can kind of ad hoc ask questions […], it's going to depend on the needs of each individual municipality. Some municipalities are going to need a little bit more one-on-one interaction."

Theme 5: Format preferences depend on the complexity of the information	Participants choose formats based on how complex the material is: simple content works well in short summaries, moderate complexity fits webinars or recordings, and highly technical topics require interactive, skill-building sessions.	"Yeah, I feel like for really complicated information, a webinar or some sort of recording that you can kind of go back to where there's visuals and audio [would be helpful]."

Table 5: Theme descriptions and representative quotes from the inductive coding stage from interview transcripts.

In these five themes, 15 sub-themes were identified, three in each theme (Table 6). In *theme 1: Municipalities prefer flexible, low burden formats that respect limited capacity*, the three sub-themes are: Asynchronous formats reduce burden; Virtual formats reduce travel/time costs; and Short, concise materials are preferred. Municipalities emphasize limited time, small teams, travel constraints, desire for short and digestible content and the preference for asynchronous or virtual formats.

In *theme 2: Peer learning and community networks are essential for municipal capacity* building; the sub-themes are: Peer-to-peer knowledge exchange; Informal networks as problem-solving tools; Communities of practice as ongoing support systems. Municipalities were found to rely heavily on peer-to-peer discussion, informal networks, communities of practice, roundtables, monthly calls, and resource sharing for capacity building.

In *theme 3: Municipalities value practical, action-oriented tools that support implementation*, the sub-themes are: Implementation tools (toolkits, templates, guides); Skill-building formats (trainings, workshops); and Context-specific examples (case studies, community-specific data). The municipalities emphasized that they want applied, and not theoretical knowledge.

In *theme 4: human support and interaction remain critical, even in written or virtual formats*, the sub-themes are: Desire for accessible expert support; Follow-up and clarification as part of learning; and Preference for formats that blend content and human interaction. Even if there is a preference for asynchronous or written materials, municipalities emphasized that they still want someone to ask questions to, have follow-up conversations, concierge-like support, and opportunities to clarify.

Lastly, in *theme 5: Format preferences depend on the complexity of the information*, the sub-themes are: Simple or Familiar Content Is Best Delivered Through Short, Lightweight Formats; Moderately Complex Information Requires Visual, Structured, and Re-Watchable Formats; and Highly Complex or Technical Information Requires Interactive, Skill-Building Formats. The majority of the municipal representatives stated that they prefer not to spend time on long sessions for simple updates and that short, concise formats help them quickly absorb and communicate information.

Themes	Sub-themes
Theme 1: Municipalities prefer flexible, low burden formats that respect limited capacity	1. Asynchronous formats reduce burden
	2. Virtual formats reduce travel/time costs
	3. Short, concise materials are preferred
Theme 2: Peer learning and community networks are essential for municipal capacity building	1. Peer-to-peer knowledge exchange
	2. Informal networks as problem-solving tools
	3. Communities of practice as ongoing support systems
Theme 3: Municipalities value practical, action-oriented tools that support implementation	1. Implementation tools (toolkits, templates, guides)
	2. Skill-building formats (trainings, workshops)
	3. Context-specific examples (case studies, community-specific data)
Theme 4: human support and interaction remain critical, even in written or virtual formats	1. Accessible expert support
	2. Desire for follow-up and clarification
	3. Blended formats (content and human interaction)

Theme 5: Format preferences depend on the complexity of the information	1. Simple or familiar content is best delivered through short, lightweight formats
	2. Moderately complex information requires visual, structured, and re-watchable formats
	3. Highly complex or technical information requires interactive, skill-building formats

Table 6: Summary table of themes and sub-themes from the inductive coding stage when analyzing the interview data.

Chapter 5: Discussion

The purpose of this study is to explore the preferred knowledge mobilization formats among Canadian municipal staff for enabling climate action. This chapter synthesizes and discusses the empirical results in relation to the literature review to answer the research question posed in this study. Section 5.1 will discuss the study's research question and showcase how the results compare to what was found in the literature. Section 5.2 will discuss the several cross-cutting themes that became apparent when considering the results collectively, and these themes help contextualize the broader implications of the findings.

5.1 Research question

What are the preferred Knowledge Mobilization formats among municipal staff for enabling climate action?

The literature regarding Canadian municipal climate action displays what knowledge is currently available and the barriers they face with climate action. However, it does not discuss which knowledge mobilization format best supports decision-making and implementation in climate action. Through this study, multiple categories were identified on how to better tailor knowledge mobilization to the realities of municipal staff. See table 7 to view what the literature said about each knowledge mobilization format from the framework and new formats discovered through the research, and how the empirical findings compared to what was stated.

Knowledge Mobilization Formats	What the Literature Says	Empirical Findings
Case studies	Investigates real-life contexts to deepen understanding and identify new variables or hypotheses (Bennett, 2004).	In the multiple-choice responses, more than half of respondents prefer case studies. However, in the interviews it was only mentioned twice. Despite the low mention, respondents wanted case studies that would be comparable to their resource constraints.

		Community specific context is a big factor for this format when discussing effectiveness.
Peer-to-peer discussion	Students learn collaboratively without hierarchy, fostering critical thinking and communication skills (Assinder, 1991; Keerthirathne, 2020; Stigmar, 2016).	This was the most preferred format in the multiple-choice responses. While in the interview responses, the idea of a peer-to-peer discussion was mentioned around five times. The networking/collaborative piece of this format was viewed as useful as it helps with critical thinking of problem solving with others.
Coaching	Individualized sessions tailored to learner needs, offering focused guidance and support (Mercer et al., 2018; Stodter & Cushion, 2019).	In the multiple-choice responses, more than half of respondents prefer coaching. While it was not explicitly mentioned in the interview responses, the idea of having tailored sessions for guidance was brought up. This means that the conversations around wanting tailored support validates the result of the multiple-choice responses.
In-person sessions	Face-to-face learning that enhances concentration, commitment, and social interaction (Shlomo & Rosenberg-Kima, 2025).	In the multiple-choice responses, more than half of respondents prefer in-person training. In the interviews, it was mentioned around four times, but the idea of coming together in person was favoured for its social interaction and enhanced learning environment. However, constraints such as budget, time commitment and competing priorities made respondents lean towards other formats out of convenience. This extends on the literature as it is validated, but real-life constraints do not always allow the benefits to reaped.
Asynchronous micro-credential	Short, flexible online programs for reskilling or upskilling, often industry informed (Nguyen Thi Ngoc Ha et al., 2024; University of Waterloo & Renison Continuing Education, 2025).	In the multiple-choice responses, a little more than a quarter of respondents selected this format. In the interviews, it was only mentioned once, for its flexibility. As it was not mentioned a lot, it is difficult to determine whether this format is useful or insufficient for municipal staff other than its flexible nature.
Conferences/ Symposium/ Presentations	Facilitates knowledge sharing and networking, promoting professional growth and collaboration (De Vries & Pieters, 2007; Federation of Canadian Municipalities, 2025; Girard et al., 2011; Niear, 2023).	In the multiple-choice responses, more than half of respondents prefer presentations (conference and symposium were not options). Presentations were only mentioned once in the interviews, but conferences were mentioned three times, while symposiums were not mentioned. The interview responses validate the literature as respondents highly preferred formats that promote knowledge sharing, networking and collaboration.

Plain language summaries	Simplifies complex research for non-specialist audiences, improving accessibility and engagement (Cheung, 2018; Taylor & Francis Author Services, 2025).	This format was not an option in the multiple-choice responses but was mentioned twice in the interview responses. The aspect of having a brief document that made all the information easier to communicate to others was preferred and mentioned among many of the respondents. Hence why this format would be useful as a template for municipal staff to communicate to council or those they must convince. These findings extend the literature as it is even more useful when designed to convince others of the importance in a municipal context.
Workshop/ Webinars/ Trainings	Practical, interactive sessions (online or in-person) for skill development and knowledge application (L. K. Chan & Hodgson, 2011; DigitalDefynd, 2024; Guanci, 2010; Masadeh, 2012; Research Impact Canada & University of Guelph, 2025; Zoumenou et al., 2015).	In the multiple-choice responses, more than half of respondents prefer webinars (workshop and trainings were not options). Workshops and trainings were each mentioned twice, while webinars were mentioned 11 times in the interview responses. Workshops and trainings were both found useful for their interactive nature and skill development. Webinars were highly favoured for their practicality and skill development. However, webinars were found to be more useful when paired with human support such as, follow ups, reference guide or someone to talk to regarding the topic. This extends on the literature as it is appreciated for its uses but is much more appreciated when combined with other formats to help with comprehension.
Toolkits/ Guidebooks/ Worksheet	Self-paced resources providing practical tools and guidance for learning and practice change (Barac et al., 2014; Kaymakci, 2012; Suliya et al., 2023; Thoele et al., 2020; Yamada et al., 2015).	In the multiple-choice responses, close to half of respondents prefer worksheets (toolkits and guidebooks were not options). Toolkits were mentioned once, guidebooks were mentioned three times and worksheets were mentioned twice in the interview responses. Toolkits, worksheets and guidebooks were preferred for their self-pace nature providing guidance on how staff can implement something on their own. However, worksheets specifically were found to be more useful when clarification questions can be asked. This extends on the literature as it validates its uses but is benefitted more when combined with human support.

Email	Not present in literature	Email communication of information was mentioned twice in the interview responses as useful but was not mentioned in the literature. This format was mentioned as a useful option due to its practicality and flexibility to review it whenever desired. However, on a busy day or when there is competing priorities, email communication may never move forward and unintentionally stay in the inbox. While this format aligns with the preference for flexible and practical formats, respondents emphasized additional conditions for its usefulness, including follow-ups. This validates the literature while adding context-specific nuance relevant to municipal practice.
Repository	Literature mentions toolkits but not repository	While the literature discusses toolkits, participants emphasized a specific variation: a repository where they can find and search for all the information and answers they need relating to climate action. This extends the literature by showing that municipalities require a space where they can access municipal climate resources, which is not captured in existing knowledge mobilization framework.
Monthly calls	Not present in literature	This format did not appear in the literature but emerged in the interview responses once. Municipal staff described it as scheduled monthly calls to learn about the topic. It was valued because it was a specific time allocated to receive and share information in live time. This suggests a previously undocumented knowledge mobilization need in municipal contexts, extending existing literature by highlighting the need for human support when trying to understand content.
Template	Not present in literature	This format did not appear in the literature but emerged strongly in the interview responses. Municipal staff described it as a document that will help relate the information to council or whoever they need to convince to be able to enact climate action. It was valued because it is a big constraint that many of the municipal staff struggle to manage. This suggests a previously undocumented knowledge mobilization need in municipal contexts, extending existing literature by

		highlighting the need for extra support when dealing with those who may not see the importance of climate action.
Resource sharing	Not present in literature	This format did not appear in the literature but emerged in the interview responses. Municipal staff described it as neighbouring municipalities sharing their climate related resources with each other. It was valued because it was useful to see what others are doing to deal with their climate issues or how they are formatting an emissions calculation for example. This suggests a previously undocumented knowledge mobilization need in municipal contexts, extending existing literature by highlighting the importance of having close connections to be able to reach out to when a simple template or example is needed.
Concierge service	Not present in literature	This format did not appear in the literature but emerged in the interview responses. Municipal staff described it as a service where if you have questions, you can ask or have a little more one-on-one interaction if needed. It was valued because it is an on-call service that can provide the needed support to staff when needed. This suggests a previously undocumented knowledge mobilization need in municipal contexts, extending existing literature by highlighting the need for human support to enact climate action.
Community specific information	Literature mentions worksheets, case studies and guidebooks but not community specific variations of the information	While the literature discusses worksheets, case studies, and guidebooks participants emphasized a specific variation: information that is community specific and not on a national level making the information less relevant to local government. This extends the literature by showing that municipalities require relatable examples and information that will clearly outline what they can do to reach their climate initiatives, which is not captured in existing knowledge mobilization frameworks.
Phone call	Literature mentions webinars (video call) but not phone call	While the literature discusses webinars, participants emphasized a specific variation: phone calls to have someone to talk about or to clarify the provided information. This extends the literature by showing that municipalities require human support to

		effectively understand some information, which is not captured in existing knowledge mobilization frameworks.
Surveys	Literature mentions worksheet but not surveys	While the literature discusses worksheets, participants emphasized a specific variation: surveys to gather information from different groups. This extends the literature by showing that municipalities require context-specific worksheets that can be shared and later used as an example, which is not captured in existing knowledge mobilization frameworks.
Community of practice	Literature mentions webinars, peer-to-peer discussion and in-person sessions but not community of practice	While the literature discusses webinars, peer-to-peer discussions, and in-person sessions, participants emphasized a specific variation: community of practice where occasionally people get together (virtual or in-person) and there is a speaker to provide expert information. This extends the literature by showing that municipalities require a space where they can get expert advice and their questions answered, which is not fully captured in existing knowledge mobilization frameworks.
Self-paced	Literature mentions webinars and asynchronous micro-credentials but does not differentiate self-paced vs live version	While the literature discusses webinars and asynchronous micro-credentials, participants emphasized a specific variation: self-paced formats to accommodate constraints such as timing and competing priorities. This extends the literature by showing that municipalities require flexible and practical variations of resources, which is not captured in existing knowledge mobilization frameworks.

Table 7: Knowledge Mobilization Framework with newfound formats. The table showcases what was said in the literature and the empirical findings. Green boxes are new formats that were not mentioned in the literature.

5.2 Cross-cutting patterns

5.2.1 Municipalities consistently prefer collaborative, people-centred learning formats

Across municipality sizes, the results consistently demonstrate a strong preference for collaborative, people-centred learning formats. The pre-survey multiple-choice question asked which knowledge mobilization training formats are most effective for them, with the option to

select multiple. Out of 27 responses, 'peer-to-peer discussion' is said to be the preferred format for all municipalities. This aligns closely with the literature, which emphasizes that peer-to-peer learning fosters collaboration, critical thinking, and communication by allowing participants to learn from one another without hierarchical barriers (Keerthirathne, 2020; Stigmar, 2016). Although 'peer-to-peer discussion' was universally preferred, small municipalities showed a tied preference for coaching, webinars, and in-person sessions.

Large municipalities demonstrated a comparable pattern, with community of practice sessions and presentations emerging as close runner-up formats. These are both learning formats that require collaboration and are people-centred, whether it's online or in-person. While a community of practice session is defined as a group of people who share a common interest or set of goals, and come together to learn, share information, and reach the group's objectives (Mercieca, 2017). Through the interview responses, a community of practice was interpreted as a session where participants can learn the topic at hand from an expert. Then afterwards getting an opportunity to either discuss with the expert and/or discuss with those in attendance to gain additional insight from their peers. Although, the definition and interpretation of a community of practice from respondents may have similar designs. The version from respondents can be combined with various other training formats, such as peer-to-peer, coaching, and webinars, to attain the group's objectives. Medium municipalities showed a more distributed pattern of preferences yet still placed 'peer-to-peer learning' at the top. These patterns were reinforced in the Likert-scale results; the 'peer-to-peer learning and networking' and 'collaboration' question fell overwhelmingly in the *Agree* and *Strongly Agree* category across all municipalities.

Preferences for coaching further support the conclusion that municipalities value individualized, relationship-based learning. More than half of survey respondents selected

coaching as an effective format, which aligns with literature describing coaching as a tailored, learner-centred approach that provides focused guidance and support (Mercer et al., 2018; Stodter & Cushion, 2019). Although coaching was not explicitly named in the interviews, participants repeatedly emphasized the need for tailored guidance, validating the survey findings and suggesting that individualized support is an important component of municipal capacity building.

Similarly, in-person sessions were preferred by more than half of respondents, reflecting literature that highlights the benefits of face-to-face learning for concentration, commitment, and social interaction (Shlomo & Rosenberg-Kima, 2025). Interview participants mentioned in-person learning approximately four times, noting that coming together physically fosters stronger engagement and richer discussion. However, participants also described constraints, such as budget limitations, travel time, and competing priorities, that often make in-person formats difficult to implement. This extends the literature by illustrating that while the benefits of in-person learning are well-recognized, practical constraints shape real-world feasibility, pushing municipalities toward more convenient alternatives despite their stated preferences.

Additionally, interview data emphasized the centrality of collaborative learning, one of the identified themes being ‘Peer learning and community networks are essential for municipal capacity building’ (Theme 2). This captured how frequently participants rely on other municipalities for advice, examples, and resource sharing. In the literature review, it states that knowledge mobilization is the process of sharing research, data, and best practices with decision-makers and practitioners by using various training tools to create action. Within that process knowledge translation plays a role in ensuring the comprehension of the decision-makers and practitioners by synthesizing the provided knowledge. This ensures that the provided knowledge

will help the decision-makers and practitioners apply the knowledge to practice. This is also where peer-to-peer sessions comes into play, where municipalities can share already synthesized knowledge with each other. This helps municipalities who may be at different stages of climate action to gain already consolidated knowledge and see how they can apply it to their work firsthand. All in all, municipalities may prefer peer sharing with other municipalities as they may feel they can get more practical information from each other than external organizations.

Many noted that climate teams are small or resource-constrained, making access to neighbouring or comparable municipalities a critical support mechanism. This mirrors the literature's argument that peer-based learning environments enhance problem-solving and reflective thinking by enabling participants to collectively interpret challenges and co-develop solutions (Stigmar, 2016). Together, these findings show that municipalities do not simply prefer information delivery; they prefer people-centred, interactive learning environments that allow them to think through problems with others, validate their approaches, and build capacity through shared experience.

5.2.2 Municipalities value practical, action-oriented, and resource-based tools

Municipalities consistently demonstrated a strong preference for practical, action-oriented, and resource-based tools, a pattern that emerged across the pre-survey, cluster analysis, and interview data. The open-ended pre-survey responses revealed that municipalities prefer knowledge mobilization formats that offer 'Practical Relevance' and 'Operational Feasibility', emphasizing a desire for formats that directly support implementation rather than abstract learning. This aligns with the literature on workshops, webinars, and trainings, which highlights their value as practical, interactive sessions that build skills and support applied learning (DigitalDefynd, 2024; Research Impact Canada & University of Guelph, 2025). In the

multiple-choice survey responses, more than half of the respondents selected webinars as an effective format, and interview participants mentioned webinars eleven times, far more frequently than workshops or trainings. but also emphasized that webinars were most effective when paired with human support, such as follow-ups, reference guides, or opportunities to ask questions. This extends the literature by showing that while webinars are appreciated for their practicality, municipalities prefer them as part of a hybrid learning structure that combines resource access with interpersonal guidance.

Preferences for toolkits, guidebooks, and worksheets further reinforced the importance of resource-based, implementation-focused tools. The literature describes these formats as self-paced resources that provide practical guidance for applying knowledge independently (Suliya et al., 2023; Yamada et al., 2015). Close to half of the survey respondents selected worksheets, and interview participants referenced toolkits, guidebooks, and worksheets multiple times. These formats were valued for offering step-by-step instructions that staff can use to implement climate actions on their own. However, participants also noted that worksheets were most useful when clarification could be sought, extending the literature by showing that self-paced tools are strengthened when paired with opportunities for interaction, rather than functioning as standalone resources.

The cluster analysis provided additional evidence for this preference. Cluster 3 showed a strong inclination toward repositories and resource-only formats, with repositories receiving the highest possible average score (5/5), while all other formats ranged from 2.33 to 3.33. Although this cluster included only three municipalities, the interview data strongly reinforced the underlying logic: participants repeatedly emphasized the value of guidebooks, templates, toolkits, and other implementation-focused tools.

Additionally, several of these formats, particularly templates, did not appear in the knowledge mobilization literature. Participants described templates as essential tools for translating climate information into materials suitable for council or senior leadership, helping them justify and advance climate initiatives. This aligns with literature on plain-language summaries, which emphasizes that simplifying complex research improves accessibility and engagement for non-specialist audiences (Cheung, 2018; Taylor & Francis Author Services, 2025). This format addresses a major operational constraint faced by many municipalities: the need to persuade decision-makers who may not prioritize climate action. Its emergence suggests a previously undocumented knowledge mobilization need, extending existing scholarship by highlighting the importance of political and organizational translation tools that support staff in navigating internal decision-making processes.

In summary, these findings show that municipalities value formats that are practical, implementation-ready, and feasible within constrained operational environments, while also benefiting from human support that enhances comprehension and application. The combination of literature-supported formats (e.g., webinars, toolkits) and newly identified formats (e.g., templates) underscores that effective knowledge mobilization for municipalities must balance resource-based tools with opportunities for interaction, ensuring that staff can both access information independently and receive guidance when needed.

5.2.3 Capacity constraints shape format preferences

Municipalities' learning preferences were strongly shaped by capacity constraints, a pattern that emerged consistently across the interviews, pre-survey responses, and format-specific findings. Interview participants repeatedly emphasized that many municipalities, particularly small and mid-sized ones, operate with very small climate teams, often consisting of

one or two staff members responsible for multiple projects. As a result, their ability to engage with training or knowledge mobilization materials is limited by time, workload, and competing priorities. This explains why municipalities expressed a clear preference for short, accessible, and low-effort formats that fit within their operational realities. Participants described choosing formats that were flexible, convenient, and easy to understand, noting that even if they prefer hands-on or interactive learning, they often cannot justify the time required to attend in-person sessions or multi-day trainings.

These constraints were echoed in the open-ended pre-survey responses, where participants identified a lack of capacity, limited resources, competing priorities, and budgeting constraints as major barriers to implementing the N-ZAP resource they were piloting. These same concerns were raised in interviews when discussing broader climate action work. Participants explained that attending an in-person workshop may require travel, overnight stays, or extended time away from other responsibilities, costs that many municipalities cannot absorb. This helps explain why webinars emerged as one of the most preferred formats in the multiple-choice responses and were mentioned eleven times in interviews. While the literature highlights webinars as effective formats for job-specific applied learning (Masadeh, 2012), the strong preference for webinars specifically reflects their capacity-friendly nature: they require no travel, can be recorded, and can be paused or revisited when convenient.

Similarly, while the literature emphasizes the benefits of in-person sessions, including enhanced concentration, commitment, and social interaction (Shlomo & Rosenberg-Kima, 2025), participants explained that these benefits are often outweighed by real-world constraints. In-person sessions were mentioned four times in interviews and were preferred by more than half of survey respondents, yet participants acknowledged that budget limitations, travel time, and

competing priorities frequently make in-person learning impractical, even when it is their pedagogical preference. This extends the literature by demonstrating that the effectiveness of in-person learning is not solely determined by its educational value but is heavily mediated by organizational capacity and feasibility.

All in all, these findings show that municipalities' format preferences are not simply about learning style; they are ultimately shaped by capacity realities. Municipalities gravitate toward formats that minimize burden, maximize flexibility, and allow staff to engage with content without sacrificing other responsibilities. This underscores the importance of designing knowledge mobilization strategies that are capacity-sensitive, offering practical, accessible formats that acknowledge the operational constraints under which municipal climate staff work.

5.2.4 Format preferences are broadly similar across municipality sizes

Across the analyses, the results indicate that municipality size does not meaningfully differentiate knowledge mobilization format preferences, suggesting that small, medium, and large municipalities share broadly similar learning needs. The Kruskal-Wallis test showed no statistically significant differences across municipality sizes for five of the six Likert-scale questions, with p-values consistently above the 0.05 threshold. Although non-significant results do not necessarily imply the absence of an effect, the pattern likely reflects the small sample size and the subtlety of differences rather than meaningful divergence in preferences.

Question five was the only test with a statistically significant Kruskal-Wallis result ($p = 0.036$), but post-hoc Dunn's tests revealed that none of the pairwise comparisons remained significant after adjusting for multiple comparisons. The largest divergence appeared between large municipalities and the other two groups, while small and medium municipalities were

nearly indistinguishable. The effect size for question five ($\eta^2 = 0.194$) suggests that population size accounted for a meaningful proportion of variability, but the lack of significant pairwise differences indicates that this effect should be interpreted cautiously.

Similarly, in the ordinal logistic regression results, all the Likert scale questions, except number five, were not statistically significant, indicating population size did not meaningfully predict differences in most of the responses. Through all the questions, except number five, both medium and small municipalities have negative and/or small ($t=<1.0$) coefficients, meaning that the population size did not differ from large municipalities in their odds of selecting higher response categories. For question five, the coefficients (t-value) for both small and medium did exceed conventional significance thresholds of $t \geq 1.96$. This means that large municipalities are more likely to agree with the collaboration training format. These results emphasize that collaboration is something that should be further focused on in knowledge mobilization seeing that results did indicate a significance. However, because the proportional odds model used relies on large-sample approximations, and the group sizes in this dataset were small, they should be cautious when considering these results as reliable indications of statistical significance.

For all Likert-scale questions except question five, coefficients for small and medium municipalities were negative or small ($t < 1.0$), indicating that population size did not meaningfully predict differences in the odds of selecting higher response categories. However, for question five, the coefficients did exceed the conventional $t \geq 1.96$ threshold for significance. Showing that collaboration is a reoccurring theme, seeing as it has results and initial findings for Kruskal-Wallis that indicate a significance between groups. Despite this, the small sample size of the study and model diagnostics interpret that: high residual deviance and Akaike Information

Criterion (AIC) values across most questions indicated that adding municipality size did not improve model fit, and even the relatively lower deviance for question four did not translate into significant coefficients. Together, these results suggest that municipality size is not a reliable predictor of format preferences, but that collaboration should be further focused on in future research.

This statistical pattern aligns with the empirical findings from the interviews and multiple-choice responses, which showed that municipalities of all sizes gravitate toward similar formats. For example, webinars were preferred by more than half of respondents across all size categories and were mentioned eleven times in interviews for their practicality and skill-building potential. This aligns with literature describing webinars and trainings as effective, accessible tools for applied learning (L. K. Chan & Hodgson, 2011). Similarly, in-person sessions were preferred by more than half of respondents regardless of size, reflecting literature that highlights the benefits of face-to-face learning for concentration, commitment, and social interaction (Shlomo & Rosenberg-Kima, 2025). However, interviews revealed that capacity constraints, common across all municipality sizes, often limit the feasibility of in-person participation, pushing staff toward more flexible digital formats. This shared constraint helps explain why preferences remain consistent across population sizes.

Other formats showed similar cross-size convergence. Case studies, preferred by more than half of respondents, were valued across municipalities for their ability to provide contextually relevant examples, particularly when tailored to local resource constraints. Peer-to-peer discussion, the most preferred format overall, was consistently valued for its collaborative, problem-solving benefits (Assinder, 1991; Stigmar, 2016). Coaching and toolkits, guidebooks,

and worksheets also showed broad appeal, with municipalities of all sizes expressing interest in individualized guidance and self-paced, implementation-focused tools. Even formats not represented in the literature, such as templates, repositories, and concierge services, were mentioned across municipality sizes, suggesting that emerging needs are shared rather than size-specific.

Overall, these findings demonstrate that municipality size does not meaningfully shape knowledge mobilization format preferences. Instead, municipalities appear to share common constraints, learning needs, and practical considerations that lead them toward similar formats. This suggests that knowledge mobilization strategies should be designed with broad applicability, focusing on flexibility, practicality, and opportunities for human support rather than tailoring formats strictly by population size.

5.2.5 Different types of learning needs require different formats

The cluster analysis revealed that municipalities do not have a single, uniform learning preference; instead, different types of learning needs require different formats, depending on both engagement style and the complexity of the material. The three clusters: Cluster 1: moderately engaged, people-focused learners; Cluster 2: high-engagement, all-format enthusiasts; and Cluster 3: low-engagement, resource-only learners; illustrate how municipalities vary in their desired level of interaction and effort when engaging with climate-related knowledge mobilization tools.

For the three municipalities in Cluster 3, both their Likert-scale responses and multiple-choice selections aligned: they avoided in-person sessions and coaching, instead selecting nearly all low-effort, resource-based formats such as worksheets, repositories, and other

self-paced tools. This pattern suggests that these municipalities prefer formats that allow them to learn independently, at their own pace, and with minimal engagement, an approach consistent with the literature on self-paced and asynchronous learning, which highlights flexibility as a key benefit (Nguyen Thi Ngoc Ha et al., 2024; University of Waterloo & Renison Continuing Education, 2025). However, these findings extend the literature by showing that municipalities choose self-paced formats not only for flexibility but also because capacity constraints make high-engagement formats impractical, even when they may be informatively beneficial.

In contrast, Cluster 2 municipalities, the high-engagement, all-format enthusiasts, selected nearly every option in the multiple-choice question, indicating that they find a wide range of formats effective. This aligns with literature on workshops, webinars, and trainings, which emphasizes that interactive formats support skill development and applied learning (L. K. Chan & Hodgson, 2011; DigitalDefynd, 2024; Masadeh, 2012). These municipalities appear open to both people-focused and resource-based formats, suggesting that they may have greater internal capacity, more staff, or more experience engaging with climate-related materials. Their broad preferences reinforce the idea that engagement style is not fixed but shaped by organizational readiness and comfort with the subject matter.

Cluster 1 municipalities, the moderately engaged and people-focused learners, showed a clear preference for formats such as in-person sessions and peer-to-peer discussions, with only four out of twelve not selecting these options. This aligns with literature emphasizing the value of collaborative, relational learning for enhancing critical thinking, communication, and problem-solving (Stigmar, 2016). These municipalities appear to benefit from interactive, social

formats where they can discuss challenges, exchange experiences, and learn from others, particularly when navigating complex or unfamiliar climate topics.

Additionally, interview data added a deeper layer to these cluster-based patterns by showing that format preferences shift depending on the complexity of the information. Participants explained that simple or familiar content is best delivered through short, lightweight formats such as worksheets, emails, or brief videos. Moderately complex information requires more structured, visual, or re-watchable formats, such as webinars, presentations, or guidebooks, allowing staff to revisit material as needed. Highly complex or technical information, however, demands interactive, skill-building formats such as workshops, trainings, or coaching, where staff can ask questions, practice skills, and receive real-time feedback.

These findings demonstrate that municipalities require a diverse suite of knowledge mobilization formats, each suited to different levels of complexity, engagement, and capacity. Effective climate knowledge mobilization must therefore be flexible and responsive, offering multiple pathways for learning so that municipalities can select the format that best fits both their organizational context and the demands of the material.

5.2.6 Human support remains important even in digital or asynchronous formats

Interview responses revealed that while municipalities frequently rely on digital or asynchronous learning formats for convenience, human support and interaction remain essential components of effective knowledge mobilization. Participants repeatedly emphasized that although online or self-paced formats fit better within their capacity constraints, they still require opportunities to ask questions, clarify content, and receive guidance, particularly when topics are

complex or outside their expertise. This sentiment was echoed in the Likert-scale results, where statements related to mentorship and collaboration opportunities received strong agreement across municipalities. Several participants described the value of a follow-up conversation, a "concierge service", or simply having someone available to talk through the material. These findings suggest that municipalities do not view digital formats as replacements for human interaction, but rather as tools that must be paired with interpersonal support to be effective.

This pattern aligns with, but also extends, the literature on asynchronous micro-credentials, which highlights their flexibility and accessibility for reskilling or upskilling (Nguyen Thi Ngoc Ha et al., 2024). In the survey, just over a quarter of respondents selected asynchronous micro-credentials, and interviews mentioned them only once, primarily for their flexible nature. The limited uptake suggests that flexibility alone is insufficient; municipalities require support structures to ensure comprehension and confidence when engaging with self-directed learning. This nuance is not captured in the existing literature, which tends to emphasize the benefits of flexibility without considering the need for human reinforcement in municipal contexts.

The importance of human support was even more evident in discussions of webinars, workshops, and trainings. While the literature positions these formats as practical, interactive opportunities for skill development (DigitalDefynd, 2024), participants stressed that webinars were most effective when accompanied by follow-ups, reference guides, or someone available to answer questions. Webinars were mentioned eleven times in interviews, far more than workshops or trainings, because they offer both practicality and the potential for interaction. This extends the literature by showing that municipalities value webinars not simply for their digital

convenience but for their ability to blend asynchronous access with human-centred support, creating a hybrid learning environment.

Participants also identified several variations of digital formats that are not well represented in the literature. For example, they distinguished between self-paced and live versions of online formats, noting that self-paced materials are only effective when paired with opportunities for clarification. This extends existing frameworks by highlighting the need for flexible, modular resources that still incorporate human touchpoints. Similarly, phone calls emerged as an important support mechanism, allowing staff to talk through materials or ask questions, an element not captured in the literature, which focuses primarily on video-based webinars. Even email communication, which does not appear in the literature, was mentioned twice as a useful way to receive information due to its practicality and ability to be reviewed at any time. However, participants noted that email is only effective when accompanied by follow-ups, reinforcing the broader finding that digital convenience does not eliminate the need for human engagement.

Together, these findings demonstrate that municipalities prefer digital and asynchronous formats for their flexibility, but do not view them as sufficient on their own. Human support, whether through follow-ups, mentorship, phone calls, or opportunities to ask questions, remains a critical component of effective learning. This suggests that knowledge mobilization strategies for municipalities should prioritize hybrid models that combine the accessibility of digital formats with the relational benefits of human interaction, ensuring that staff feel supported, confident, and equipped to act on climate initiatives.

Chapter 6: Conclusion

6.1 Objective of the study

The objective of this study was to explore the preferred knowledge mobilization formats among Canadian municipalities to identify formats that support decision-making and implementation in climate action. To achieve this objective, statistical analyses were conducted through a descriptive analysis, a Kruskal-Wallis test, a cluster analysis, and an ordinal logistic regression with the purpose of analyzing the differences in the responses from the pre-survey data. Also, two thematic analyses were conducted, the first using the Gioia method for the open-ended questions in the pre-survey data and the second using the Braun and Clarke (2006) method for the mid-point interview data. This had the aim of exploring underlying patterns and themes found in the responses from the participating municipalities. Doing these analyses made it possible to understand which knowledge mobilization format is preferred among the studied municipal staff and how it can best be managed under current municipal circumstances.

6.2 Implications for researchers

The study made several contributions to theory and the literature on local climate action and knowledge mobilization. It validated several findings from the literature on key knowledge mobilization formats to enhance climate action. The exploration of different knowledge mobilization formats in a Canadian municipal context generated insights tied to an understudied area that further extends on theoretical findings from pre-existing literature. Finally, by studying the preferred knowledge mobilization formats of Canadian municipalities, this study was able to contribute findings on how climate trainings can be improved to progress towards climate action in a municipal context.

Some of the validating findings emphasize the importance of collaborative and applied learning formats, but they also extend current literature by identifying previously undocumented needs within municipal practice. Notably, the study highlights the critical role of human support in enhancing the effectiveness of digital or self-paced formats, suggesting that researchers should further investigate hybrid models that integrate interpersonal guidance with resource-based tools. The strong demand for community-specific information also points to a gap in existing knowledge mobilization frameworks, which often assume that generalized or national-level resources are sufficient. Additionally, the emergence of new formats, such as templates for council communication, concierge-style support, monthly calls, and resource-sharing networks, reveals that municipal staff require tools not only for learning but also for navigating internal political and organizational processes. These findings challenge researchers to broaden conceptualizations of knowledge mobilization to include political translation, ongoing relational support, and capacity-sensitive design.

6.3 Implications for practitioners

This study provides several important implications for practitioners working in municipal climate action, especially those responsible for designing and delivering knowledge mobilization initiatives. The strong and consistent preference for collaborative, people-centred learning formats indicates that practitioners should prioritize training environments that facilitate interaction, peer exchange, and relationship-building rather than relying solely on one-directional information delivery. Formats such as peer-to-peer discussions, communities of practice, and coaching emerged as especially valuable because they allow staff to validate ideas, troubleshoot challenges, and learn from comparable municipalities.

Next, practitioners should emphasize practical, implementation-ready tools, such as templates, worksheets, guidebooks, and repositories, that directly support municipal staff in translating knowledge into action. These tools are most effective when paired with human support, such as follow-up calls or opportunities to ask clarification questions, underscoring the need for hybrid delivery models that blend self-paced resources with interpersonal guidance. Finally, practitioners must design materials that are sensitive to municipal capacity constraints and tailored to local contexts. Staff repeatedly emphasized the need for community-specific examples and tools scaled to their size, resources, and political realities. Collectively, these findings suggest that effective knowledge mobilization for municipalities requires formats that are relational, practical, flexible, and context-specific, enabling staff to engage meaningfully despite limited time, staffing, and competing priorities.

6.4 Limitations & future research

This research has several limitations, such as time constraints and recruitment techniques. There were about eight months allocated to data collection, and the pilot project was also reliant on our partners, who were helping to implement the project. Another limitation is the small sample size in the Likert-scale dataset, which limits the statistical power of the Kruskal–Wallis tests and ordinal logistic regression models. As a result, non-significant findings should be interpreted cautiously, as they may reflect insufficient sample size rather than the true absence of differences across municipalities. The proportional odds model also relies on large-sample assumptions, which were not fully met in this dataset, further constraining the reliability of statistical inferences.

A third limitation is that the majority of the pilot communities are from Ontario, with the others coming in from New Brunswick, Nova Scotia, Québec, Saskatchewan, Manitoba and

British Columbia. This means that this study is only focused on these parts of Canada, which leaves a gap for Alberta, Prince Edward Island, Newfoundland and Labrador and the territories. On a similar note, this study is only focused on Canadian municipalities participating in the N-ZAP pilot program. Future research should push to replicate the process introduced in this thesis for municipalities within Canada but focused on the lesser-studied provinces and the Northern territories.

Another limitation is the representativeness of the sample; participants were drawn from municipalities already engaged in the N-ZAP pilot program. This means they may be more motivated, climate-aware, or resource-connected than the broader population of Canadian municipalities. This may have introduced a selection bias toward staff who are already predisposed to engage with knowledge mobilization tools, potentially inflating preferences for collaborative or resource-based formats. Municipalities with no climate staff, limited engagement in climate initiatives, or lower institutional capacity may have different needs that were not captured in this study. Finally, the study's design limits the ability to assess how preferences may evolve over time as municipalities gain experience, face new climate pressures, or adopt new technologies. Future research of a longitudinal analysis would be valuable to understand whether preferences for collaborative, practical, and hybrid formats remain stable or shift as municipal capacity, political contexts, or climate responsibilities change.

Further research is also needed to explore the effectiveness of the newly identified formats that emerged from this study, such as templates, concierge-style support, monthly calls, and resource-sharing networks. These formats are not yet theorized in the knowledge mobilization literature, and future studies could examine how they influence comprehension, implementation, and decision-making within municipal governments. Additionally, this study

found that municipal staff require examples and tools tailored to their size, capacity, and political context, suggesting that generic national resources may be insufficient. Future research should explore how local tailoring influences the uptake, comprehension, and implementation of climate strategies. Doing so would examine how localized tailoring affects learning effectiveness, policy adoption, and implementation success.

6.6 Concluding summary

In summary, this study demonstrates that effective knowledge mobilization for municipal climate action must be grounded in the lived realities, capacity constraints, and relational learning needs of municipal staff. By identifying both well-established and previously undocumented format preferences, the research provides a more nuanced understanding of how municipalities learn, share, and apply climate information. The findings show that staff consistently value collaborative, people-centred environments and practical, implementation-ready tools, while also requiring human support and community-specific guidance to translate knowledge into action. These insights extend existing literature by highlighting the importance of hybrid learning models, political translation tools, and sustained support systems that have not yet been fully theorized. Despite the study's limitations, it offers a foundation for future research to explore the effectiveness of emerging formats and the evolving nature of municipal learning needs. Ultimately, this research contributes to strengthening municipal climate capacity by clarifying how knowledge mobilization strategies can be designed to better support staff in navigating complex responsibilities, limited resources, and the urgent demands of climate action.

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Appendices

Appendix A: Pre-survey questions

Section 3: Preferred Learning Formats & Collaboration Opportunities

Q20 – Q25 Likert Scale Questions:

Likert Scale:

1. Strongly Disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

1. I/we would prefer hands-on workshops over online self-paced learning modules

2. Peer-to-peer learning and networking with other municipal leaders would be valuable for knowledge sharing

3. I/we would find it useful to participate in a mentorship or advisory program with climate policy and emissions reporting experts

4. Access to a centralized repository of best practices and templates would be beneficial

5. I/we am interested in regional or national collaboration opportunities to align our municipal efforts with broader climate approaches

6. Earning a micro-credential is a valuable way to demonstrate my/our participation in training on climate mitigation

Multiple Choice Question:

7. For those in the cohort training, what training formats are most effective for you (Select all that apply):
   a. Case studies
   b. Peer-peer discussion
   c. Community of Practice
   d. Coaching
   e. Presentations
   f. Worksheets
   g. Webinars
   h. In-person sessions
   i. Asynchronous micro credential

j. Other _____

8. Why do you prefer these formats?

Section 4: Additional Insights

Optional Open-Ended Questions:

9. Why did you choose to become a pilot community?
10. Do you have any concerns with being able to implement the N-ZAP resource you're piloting?
11. Is there anything else you would like to mention?
12. How do you typically share climate-related knowledge within your organization?

Appendix B: Mid-point interview questions

1. What are your preferred training formats to enact climate action within your municipality? For example, in-person, live webinars, recorded content, written content, etc.
    - *Follow-up: Why do you prefer this format?*
    - *Follow-up: Where do you typically get information or guidance?*

2. How do you personally prefer to receive guidance related to climate mitigation in your municipal role?

3. What types of information delivery are most useful to you when learning about climate mitigation strategies for your work?

    - *Follow-up: Why do you prefer the types of knowledge formats you engage with?*

4. What makes a tool or resource difficult to use?

Appendix C: Ethics certificate

UNIVERSITY OF WATERLOO

Notification of Ethics Clearance to Conduct Research with Human Participants

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Principal Investigator: Amelia Clarke (School of Environment, Enterprise and Development)

Student investigator: Corey McPherson (School of Environment, Enterprise and Development)

Student investigator: Karlyn Dion (School of Environment, Enterprise and Development)

Student investigator: Mark Rudolf Goudsblom (School of Environment, Enterprise and Development)

Administrative Support: Samantha Linton (School of Environment, Enterprise and Development)

Co-Investigator: Corrine Cash (Mount Allison University)

Co-Investigator: Laura Tozer (University of Toronto)

Co-Investigator: Mark Roseland (Arizona State University)

File #: 47274

Title: Municipal Net-Zero Action Research Partnership - Pre-, mid-, and Post-Implementation - Knowledge Mobilization Research

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The Human Research Ethics Board is pleased to inform you this study has been reviewed and given ethics clearance.

Initial Approval Date: 06/05/25 (m/d/y)

University of Waterloo Research Ethics Boards are composed in accordance with, and carry out their functions and operate in a manner consistent with, the institution's guidelines for research with human participants, the Tri-Council Policy Statement for the Ethical Conduct for Research Involving Humans (TCPS2 2022), the Ontario Personal Health Information Protection Act (PHIPA), and all laws and regulations of the province of Ontario (as applicable). Additionally, CREB operates in a manner consistent with the International Conference for Harmonization of Technical Requirements for Pharmaceuticals for Human Use (ICH) Guidance E6(R2): Good Clinical Practice , the International Organization for Standardization of Good Clinical Practices (GCP) as set out by ISO 14155 - Clinical investigation of medical devices for human subjects, Part C, Division 5 of the Food and Drug Regulations, Part 4 of the Natural Health Products Regulations, Part 3 of the Medical Devices Regulations. Both Boards are registered with the U.S. Department of Health and Human Services under the Federal Wide Assurance, FWA00021410, and IRB registration number IRB00002419 (HREB) and IRB00007409 (CREB).

Expiry Date: 06/06/26 (m/d/y)

Multi-year research must be renewed at least once every 12 months unless a more frequent review has otherwise been specified. Studies will only be renewed if the renewal report is received and approved before the expiry date. Failure to submit renewal reports will result in the investigators being notified ethics clearance has been suspended and Research Finance being notified the ethics clearance is no longer valid.

Level of review: Delegated Review

Signed on behalf of the Human Research Ethics Board



Karen Pieters, Manager, Research Ethics, karen.pieters@uwaterloo.ca, 519-888-4567, ext. 41495

This above-named study is to be conducted in accordance with the submitted application and the most recently approved versions of all supporting materials.

Documents reviewed and received ethics clearance for use in the study and/or received for information:

file: WG5_Interview_recruitment-email_version 4_June4_2025.docx

file: WG5_Survey_recruitment-email_version 4_June4_2025.docx

file: WG5_Acuity confirmation email_version 3_May25_2025-2.docx

file: WG5_Interview_follow-up-email_version 3_May25_2025.docx

file: Draft Interview Questions_version 3_May25_2025.docx

file: Draft Pre_Survey Questions_version 4_May26_2025.docx

file: Draft Post_Survey Questions_version 4_May26_2025-2.docx

file: WG5_Survey_information letter_version 4_June4_2025.docx

file: WG5_Interview_information letter_version 2_April28_2025.docx

file: WG5_Interview consent through Acuity_version 3_May25_2025.docx

file: WG5_Survey_consent_version 4_June4_2025.docx

file: WG5_Acuity confirmation email_version 3_May28_2025-2.docx

file: WG5_Verbal_Consent_Script_Interview_version 2_May26_2025.docx

file: WG5_Survey_thank-you-email_version 3_May25_2025.docx

file: WG5_Interview_thank-you-email_version 3_May25_2025.docx

Approved Protocol Version 3 in Research Ethics System

This is an official document. Retain for your files.

You are responsible for obtaining any additional institutional approvals that might be required to complete this study.

Appendix D: Interview invitation script email to pilot communities

Subject: N-ZAP interview invitation
Sender: N-ZAP Researcher **[Student Researcher Name]**
CC: Dr. Amelia Clarke, FCM Staff

Dear [Title, Name],

I am writing to you on behalf of the Municipal Net-Zero Action Research Partnership (N-ZAP) to invite you to participate in an interview for our research study. We are examining barriers and enablers to effective climate mitigation implementation, and tools for creating effective knowledge mobilization in Canadian municipalities. I am a researcher at the University of Waterloo in Waterloo, Ontario, and this research study is collecting experiences and insights for improving the N-ZAP piloting program.

In 2025 you completed a survey indicating your willingness to pilot an N-ZAP resource (i.e., the community partnership guide and/or the climate budgeting guide). As a result of your engagement as a pilot community, we would like to invite you to participate in an interview. We want to learn more about your experience with the guide and get your insights into how we can better support your community's climate efforts.

Please take a few moments to review the attached information letter and to schedule an interview through the Acuity Scheduling link below.

Acuity Scheduling Link: [Insert Link to Interview Landing Page]

Participation in this interview is voluntary, will take the form of a 60-minute interview via Zoom, and will take place at a mutually convenient time.

If you have any questions about participation in this research study, please feel free to contact reply back to this email. For questions about N-ZAP, please contact Dr. Amelia Clarke at amelia.clarke@uwaterloo.ca.

We are looking forward to hearing from you.

Karlyn Dion
N-ZAP Research Assistant
School of Environment, Enterprise and Development (SEED)
University of Waterloo
karlyn.dion@uwaterloo.ca
Municipal Net-Zero Action Research Partnership (N-ZAP)

N-ZAP is a research partnership funded, in part, by the Government of Canada through the Climate Action and Awareness Fund (CAAF) and jointly led by the University of Waterloo, ICLEI Canada and the Federation of Canadian Municipalities' Green Municipal Fund (FCM), working with 11 other academic institutions, and 9 other national organizations and 15 municipal partners.

Appendix E: Information letter and oral consent

Information Letter

You have been invited to participate in an interview to understand pilot community participants' experiences with N-ZAP tools and resources. This interview will also explore questions related to climate action, including those not specific to the N-ZAP resource, but still about your municipality's climate efforts. These interviews are part of the Municipal Net-Zero Action Research Partnership (N-ZAP) project.

The interview questions relate to the following themes: barriers and enablers to effective climate mitigation implementation, and tools for creating effective knowledge mobilization. The interview responses will be used by the University of Waterloo, the Federation of Canadian Municipalities' Green Municipal Fund (FCM) and ICLEI Canada to improve knowledge mobilization and climate mitigation performance from the Canadian perspective, and for academic research. The name of your municipality and/or your role will be identified in research papers and reports as a study participant. Some responses from your interview may be included in research papers and reports with attribution to your municipality. All quotes attributed to your municipality will be validated prior to inclusion and will not be published without your permission.

By agreeing to participate in the study you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

The interview will be **less than 60 minutes** and can be scheduled at your convenience using Acuity, an online scheduling software. The interview will be hosted through Zoom, so you can join the interview through a laptop, or you can dial in by phone. Zoom has implemented technical, administrative, and physical safeguards to protect the information provided via its services from loss, misuse, and unauthorized access, disclosure, alteration, or destruction. However, no Internet transmission is ever fully secure or error free. If you prefer not to complete this interview through Zoom, please contact our research assistant by email and we will make arrangements to provide you with another method of participation, such as a phone interview.

Participation in this study is voluntary. **You may decline to answer any questions that you do not wish to answer, and you can withdraw your participation by contacting our research assistant.** There are minimal anticipated risks from participating in this study for you or your municipality, as all parties will have access to the information prior to publication. **Further, after you have participated in the interview on behalf of your municipality, you may also withdraw your interview responses until data is used for analysis.** The data will be stored for at least 10 years on password-protected computers of researchers and a shared Dropbox Folder with restricted access by only researchers from this project.

This study has been reviewed and received ethics clearance through the University of Waterloo Research Ethics Board (REB # 47274). If you have questions for the Board, contact the Office of

Research Ethics, toll-free at 1-833-643-2379 (Canada and USA), 1-519-888-4440, or reb@uwaterloo.ca.

Should you have any questions about your involvement in this research, please contact **the N-ZAP project manager, Samantha Hall Linton, by email at shlinton@uwaterloo.ca.**

If you have any general comments or questions related to the N-ZAP project, please contact **Dr. Amelia Clarke**, N-ZAP Project Lead, at 519-888-4567 ext. 48910 or by email at **amelia.clarke@uwaterloo.ca.**

If you would like to receive a copy of the results from this study, please confirm your contact information during the interview so that we may follow up with you.

Thank you for your consideration.

Karlyn Dion
N-ZAP Research Assistant
School of Environment, Enterprise and Development (SEED)
University of Waterloo
karlyn.dion@uwaterloo.ca
Municipal Net-Zero Action Research Partnership (N-ZAP)

N-ZAP is a research partnership funded, in part, by the Government of Canada through the Climate Action and Awareness Fund (CAAF) and jointly led by the University of Waterloo, ICLEI Canada and the Federation of Canadian Municipalities' Green Municipal Fund (FCM), working with 11 other academic institutions, and 9 other national organizations and 15 municipal partners. Working Group 5 is co-chaired by Dr. Corrine Cash, Mount Allison University and Joe Rogers, Federation of Canadian Municipalities.

Verbal Consent Script and Documentation Form

Have you had a chance to read the information letter? Do you have any questions?
As a reminder, participation is voluntary, and you may end the interview session by advising me of your decision at any time. If you have questions for the Research Ethics Board, contact information for the Office of Research Ethics is listed on the information letter that you received prior to this session. For all other questions about the study, you may contact me at **[Insert Student Researcher Email].**
As a reminder, you provided your consent to participate in the interview on [Insert Date], indicating the following responses:
[Indicate that all that were selected as being agreed to and ones that were not (if applicable)].
Has your consent to participate in this interview changed since [Insert Date of Original Agreeance]
[ ] YES [ ] NO
Do you give permission for your interview to be audio-recorded?
[ ] YES [ ] NO

Participant's name: _____

Researcher's signature: _____

Date: _____

Appendix F: Thank you letter

N-ZAP WG5 Interview: Thank-you Email

Subject: Thank you for participating in the N-ZAP interview
Sender: Interviewer **[Researcher Name]**

Dear [Title, Name],
Thank you for taking the time to participate in the Municipal Net-Zero Action Research Partnership (N-ZAP) interview. We sincerely appreciate your time and insights. Your contribution ensures that your local government's experiences are reflected in the national climate conversation and supports collective efforts to advance local GHG emissions reductions across Canada.
Should you have any questions about your involvement in this research, please contact Samantha Hall Linton, Project Manager, N-ZAP at shlinton@uwaterloo.ca. If you have any general comments or questions related to the N-ZAP project, please contact Dr. Amelia Clarke, N-ZAP Project Lead, at 519-888-4567 ext. 48910 or by email at amelia.clarke@uwaterloo.ca.
If you would like to stay informed about N-ZAP updates, feel free to join our mailing list here.
This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board (REB #47274). If you have questions for the Board, contact the Office of Research Ethics, toll-free at 1-833-643-2379 (Canada and USA), 1-519-888-4440, or reb@uwaterloo.ca.
Thank you for your time and cooperation,

Karlyn Dion
N-ZAP Research Assistant
School of Environment, Enterprise and Development (SEED)
University of Waterloo
karlyn.dion@uwaterloo.ca
Municipal Net-Zero Action Research Partnership (N-ZAP)

N-ZAP is a research partnership funded, in part, by the Government of Canada through the Climate Action and Awareness Fund (CAAF) and jointly led by the University of Waterloo, ICLEI Canada and the Federation of Canadian Municipalities' Green Municipal Fund (FCM) working with 11 other academic institutions, and 9 other national organizations and 15 municipal partners. Working Group 5 is co-chaired by Corrine Cash, Mount Allison University and Joe Rogers, Federation of Canadian Municipalities.