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Municipal climate communication as a tool in amplifying local climate action and developing a place brand

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Abstract

Both climate communication and place branding are familiar concepts, whose potentials have been recognized. Cities have engaged in communication and climate work for several years, yet studies linking municipal climate action and communication are scarce. We conducted targeted interviews and a broader survey of climate workers and communicators of forerunner municipalities in Finland and found gaps between climate action and communication. Synergies could be achieved if the two functioned in synchronicity rather than separate tasks, as words require actions, but full impacts of actions fall short without communication. Municipalities have progressed on both fronts but are hindered by lacking time and human resources. Results revealed several opportunities of climate communication in amplifying local climate action and strengthening municipal brand image, but many remain underexploited. Sufficient resources and stronger legitimacy are still needed for climate matters to be better integrated into everything the municipality does and communicates.

1. Introduction

Anthropogenic climate change is one of our era’s greatest challenges, and the central role of cities in mitigating it has widely been recognized. Several cities already have ambitious greenhouse reduction targets and roadmaps to carbon neutrality (Salvia et al., 2021; Mattinen-Yuryev et al., 2021; Seppälä et al., 2019). Alongside these ambitious climate goals, cities must provide and maintain infrastructure and services for their citizens, companies and other stakeholders. As globalization has led to increased competition with cities, regions and nations vying for climate goals, cities must provide and maintain infrastructure and services for their citizens, companies and other stakeholders.

However, information alone does not always lead to action (Gislason et al., 2021). Climate messages resonate with audiences when they have a cultural context, are meaningful and encourage action (Schweizer et al., 2013). A public lacking awareness and understanding can feel overwhelmed, frightened or ignore the magnitude of the issue (Moser & Dilling, 2004). Highlighting the urgency of climate change mitigation is important but should be done leading with hope instead of fear (Nerlich et al., 2010; Gislason et al., 2021). Framing climate change as a global issue with local implications and attaching it to the social and physical surroundings of people can increase the engagement towards environmental issues (Altinay, 2017; Campbell & Vainio-Mattila, 2003). A local context is important, as is understandability, aided for example by storytelling and visualisation (Gislason et al., 2021; Clayton & Manning, 2018). Including solutions in climate messages can help people feel like they can act on climate change, and actions and events have been identified as effective modes of communication that encourage engagement (Clayton & Manning, 2018; Gislason et al., 2021; Nerlich et al., 2010). Showcasing the results of climate action is also important in order to catalyse further action (Sheppard, 2012).

To date, there seem to be few studies looking specifically at how cities communicate their climate actions (Boussalis et al., 2018), but it has been identified as a challenge (Riekkinen et al., 2020).
networks are one way of giving cities a platform to disseminate their activities and make a name as an environmental forerunner while accessing innovations, best practices and technologies shared therein (Andersson, 2016; Gustavsson et al., 2009; Elander & Gustavsson, 2007). Andersson (2016) also states that networks can help cities gain visibility both nationally and internationally, by providing a platform to showcase municipal actions but also by steering media interest towards the municipal climate actions. Networks might also help attract private sector investments or public funding, which in turn accelerate sustainable development in cities (Gustavsson et al., 2009). Network membership may in fact lead to lower greenhouse gas emission levels in participating municipalities1 and legitimise local level climate action (Karhinen et al., 2021).

To improve the image of cities, place branding has been studied as one tool. According to Anholt (2007) place branding aims to change or mould the perceptions and images people have of different place entities such as cities, nations, tourist attractions or nature locations to make them more attractive, especially when competing against other similar places. Environmental aspects have been found to be an important factor of the future attractiveness of a place (Moini, 2009). Even though place branding has been suggested as being a key driver of the sustainability of a place, the link between place branding and sustainable development is not well known (Maheshwari et al., 2011). Werraas et al. (2014) and Källström (2016) point out that municipal branding is more complex since it is based on more than just place; a municipality is a service provider and a political institution, so their branding must serve the interests of their employees, businesses, visitors and the general public.

Place branding is a communication-based phenomenon as the implementation of a branding strategy relies heavily on different types of communication (Lindstedt, 2011). Place brand communication starts from cities’ actions and behaviours, which don’t have communication as their main goal, referred to as primary communication (Kavaratzis, 2004). Secondary communication refers to intentional brand communication, including for instance information dissemination, marketing and the visual brand identity (Kavaratzis, 2004). Tertiary communication, or word-of-mouth communication, happens through third parties such as friends, family, or traditional and social media, and is outside the direct control of the city (Kavaratzis, 2004).

This research aims to link climate action, communication and branding in municipalities. More specifically, we set out to provide a deeper understanding to the following questions:

- How have municipalities communicated their climate activities?
- What are the key obstacles and lessons learned in doing so?
- How can climate communication develop a place brand and amplify climate action?

This is done through a case study of municipal climate forerunner network members in Finland. In the article, section 2 describes the case study, data and methodology and the results are presented in section 3. Section 4 offers a discussion of the key findings and their applicability to the broader topic of climate related communication and branding efforts, with concluding remarks.

2. Materials & methods

2.1. Case Hinku network—towards carbon neutral municipalities

Hinku is a Finnish network of forerunner municipalities in climate change mitigation, coordinated by the Finnish Environment Institute (SYKE). By municipal council decision, members commit to aiming for 80% reductions in their greenhouse gas emissions by 2030 from 2007 levels. Joining also requires meeting a set of membership criteria, which include processes through which the municipality can plausibly work towards carbon neutrality. These include establishing a working group and appointing a contact person; planning and budgeting emission reduction investments; as well as informing municipal staff, the local council and stakeholders about mitigation measures (SYKE, 2021). Since its establishment in 2008, the network has grown from 5 small municipalities to include at the end of 2021, 81 municipal members and 5 regions, with an overall coverage of 2.3 million inhabitants - over 40% of Finland’s population.

Previous studies of the Hinku network have analysed its impacts as an intermediary for climate action and low-carbon experiments (Saikku et al., 2017), also finding it can lower local emission levels while offering expert and peer support as well as communication help and visibility, among others (Karhinen et al., 2021). This network was chosen as its members have already taken at least some strides in climate work but have also highlighted development potential on the communications front (Karhinen et al., 2021; Riekkinen et al., 2020).

1 Finland’s cities are known as municipalities (AFLRA, 2021a).
Table 1. Topics of interview questions with relevance to the research framework.

| Interview topics | Relevance to the research framework |
|------------------|-----------------------------------|
| Introduction     | Interviewees’ roles in municipal climate action and communication |
| Being a climate forerunner | Understanding municipalities views, perceptions and understanding of what makes a climate forerunner and whether they consider themselves as such |
| Climate issues in communication & branding | Understanding the history and foundations of the municipal brand, what climate communications consists of, the linkages between the municipal brand and climate brand, and the presence of projects and climate networks like Hinku in the climate brand |
| Target groups of climate communication & branding | Understanding the key target groups of climate communication and brand and which stakeholders are involved and engaged in the communications and development process and what kind of feedback climate communication and brand have received |
| Communication in climate work | Understanding who oversees and does climate communication, which communication channels and tones of voice are used and have been most successful |
| Advantages & effects of climate communication | Understanding the challenges and potential conflicts of interest between actions, communications and branding, as well as the best practices, advantages and impacts that climate branding and communication bring to the municipality |

Table 2. Definitions of key terms.

| Climate work | All work relating to climate change mitigation and adaptation, including both direct emission reduction measures and indirect and enabling activities |
| Climate communications | All internal and external communications and information exchange relating to climate change and climate work, even if not directly mentioned |
| Climate brand | Views and conceptions of and connecting to climate related work and communications, including for example the name, image, identity, attitudes, expectations and reputation |

2.2. Interview methodology

Twelve in-depth interviews were conducted with Hinku municipalities, selected through purposive sampling, to gain deeper insights into the state of municipal climate communication and branding. Four were initially chosen for having shown active climate forerunner communication, while a selection of other member municipalities was later included to represent the network more broadly in terms of visible climate communication as well as geographic location and size. While the sample is diverse, it is not fully representative of the Hinku network or all Finnish municipalities due to the small sample size (see section 2.3), which is why a survey was also conducted (see section 2.3). Interview responses expand upon survey results but are not included in quantitative analyses.

The aim was to conduct pair interviews to capture both the views of employees working more with concrete climate actions, the ‘climate workers’, as well as those working mainly with communications, brands or marketing, the ‘communicators’. This was the case for 9 interviews, but in two cases only the climate worker or communicator was interviewed due to recent staff changes, and one interview included two climate workers and one communicator.

The semi-structured interviews were conducted by researchers of SYKE between October 2020 and May 2021 online due to the COVID-19 pandemic. Informed consent was obtained from participants during interviews. Each interview lasted between 45 and 94 min (average 75 min) and was recorded and transcribed to allow for content analysis using NVivo software. Content analysis of the interview topics (table 1) was both conventional and directed (Hsieh & Shannon, 2005).

2.3. Survey methodology

An online survey was sent to all 78 Hinku member municipalities via e-mail in April 2021. The survey included questions and statements relating to municipal climate work, climate communications and the climate brand (defined in table 2). Participants were also asked to rate key challenges of climate brand communication, offer solutions to the challenges, provide examples of impacts, and assess the past, present and future state of climate work and communication.

The aim was to receive answers from both the communicators and climate workers from each municipality. The survey was sent to the municipalities’ Hinku contact people (usually climate workers), who were asked to forward the survey to the right people, especially from the communications side, as no public record of these was available. Representatives from 53 municipalities responded to the survey, covering 68% of the membership at the time. 51 respondents from 49 municipalities answered from a climate perspective (yielding a completion rate of 63%), while only 21 answered from the communications point of view (27% completion rate, not counting...
for all municipalities not having a designated communications employee). To encourage participation, respondents were asked to respond regardless of their level of experience. Survey reminders also went through the contact people, which might have affected the share of communications respondents ultimately being lower than climate respondents. Although respondents were instructed to answer independently, in two cases respondents had filled the survey from both points of view simultaneously. To correct for these and other possible limitations, comparisons between respondent groups were only made for those municipalities, from which there were separate answers from both groups, yielding a smaller but more comparable sample.

Survey results were compiled and assessed, and certain questions underwent more robust analyses, available in the appendices. A cluster analysis of municipalities’ challenges in climate communication can be found in appendix A. Respondents’ assessments of the past, present and future states of climate work and communications, and of the roles of climate issues in the municipalities’ strategic action, day-to-day communication and brand image were also evaluated for differences between small, medium and large municipalities using a Kruskal–Wallis test (Kruskal & Wallis, 1952), and a post-hoc pairwise Dunn’s test (Dunn, 1964). These evaluations are detailed in appendix B.

2.4. Studied sample

The titles and job descriptions of the interviewees and respondents varied significantly. Over half of the titles of climate workers related to the environment or environmental protection, climate or sustainable development (managers, leaders, secretaries, inspectors, experts, engineers, coordinators, planners), and many others related to technical, energy or building related management or expertise. A few were project leaders or coordinators, two directly mentioned Hinku. Some individuals answered from the management and finance departments, and one was a mayor. 45 out of 51 climate workers were Hinku contact people. Communicators’ titles related mostly to informing, communications and marketing, some also to tourism and development (managers and leaders, planners, coordinators and secretaries), one was a mayor’s secretary. Two of 21 were Hinku contact people.

For this study, municipalities were grouped into three categories: small municipalities with under 10 000 inhabitants, medium-sized municipalities with under 50 000 inhabitants and large municipalities with 50 000 inhabitants or more. The details of the studied sample of municipalities in relation to the Hinku network and all Finnish municipalities are outlined in table 3. The surveyed and combined study sample is representative of the Hinku network, covering over 70% of its members and 83% of its population, while the interviewed sample contains larger and more urban municipalities. Overall, Finnish municipalities are small, with a median population of just over 6 000 inhabitants (OSF, 2021). The smallest municipalities are underrepresented both in the Hinku network and in this study. It is also worth noting that smaller municipalities have on average been members of Hinku slightly longer (5.1 years) compared to medium-sized (3.3 years) and large municipalities (3.2 years), as the network was originally started for smaller municipalities.

3. Results

Section 3.1. outlines how climate issues are present in Hinku municipalities’ activities and communication, providing insights into the key target groups, content, style, means and channels of climate communication. Section 3.2 highlights the key challenges of municipal climate communication, followed by a short assessment in section 3.3 of the evaluation and development of climate work and communication. Section 3.4. summarises how climate communication might help amplify local climate action and provides evidence on the presence and impacts of climate matters in municipal brands.

3.1. Climate issues in municipal actions and communication

3.1.1. Structural organisation of climate work and communication

Municipal climate actions and behaviour are a form of communication. When assessing the role of climate issues in the municipality’s strategic activities, answers ranged between survey respondents, providing an average of 6.4 (figure 1). Communicators tended to evaluate climate issues as having a higher role than climate workers when comparing answers from the same municipalities, but not statistically significantly. Municipal strategies were said to include climate issues by over 60% of respondents. Between 50%–75% reported having a roadmap, annual plans and/or a working group for their climate work, despite these being part of the Hinku membership criteria.

Most respondents agreed that municipal climate action has managerial support, 77% agreeing that political decision makers are also in favour of climate work. Almost half of respondents agreed that climate work is seen within the municipal organisation as financially profitable. The interviews also revealed that attitudes in the municipality have become more climate friendly when municipal leaders and decision makers have committed to climate goals and actions. However, more respondents disagreed than agreed that their municipality takes
### Table 3. Details of the studied municipal sample, Hinku members and all Finnish municipalities.

|                                | Finland | Hinku network (on 31.3.2021) | Study sample (interviews &/survey) | Interviews | Survey |
|--------------------------------|---------|-------------------------------|-----------------------------------|------------|--------|
| Number of municipalities       | 309     | 78                            | 55                                | 12         | 53     |
| Share of small municipalities (under 10 000) | 68.6%   | 50.0%                         | 45.5%                             | 33.3%      | 45.3%  |
| Share of medium municipalities (10 000–49 999) | 24.6%   | 35.9%                         | 36.4%                             | 25.0%      | 35.8%  |
| Share of large municipalities (50 000 or more) | 6.8%    | 14.1%                         | 18.2%                             | 41.7%      | 18.9%  |
| Average population\(^a\)       | 17 900  | 27 600                        | 32 800                            | 54 100     | 33 300 |
| Share of urban municipalities\(^b\) | 18% urban municipality | 34% urban municipality | 42% urban municipality | 58% urban municipality | 42% urban municipality |
| Average Hinku membership years (range) | —       | 4.3 years (0.1–13.3)         | 4.1 years (0.1–13.3)              | 4.7 years (1.3–9.9) | 4.0 years (0.1–13.3) |

Data
\(^a\) OSF (2021), rounded to the nearest hundred
\(^b\) SYKE (2020)
climate issues into consideration in all significant decision making (only around 5% fully agreeing), despite this also being stipulated in membership criteria.

Just over half of surveyed respondents agreed that climate work is done across all sectors within the municipality. While nearly 90% of survey respondents described their climate actions as ordinary, interviewees described them as bold, agile, and boosting participation. Just over half of survey respondents reported doing a lot and/or significant climate actions, and 55% felt that their municipality is a climate forerunner.

One of municipalities’ numerous tasks is informing different stakeholders about their actions, yet under half of survey respondents agreed that information is gathered about the most significant climate measures. Out of both climate workers and communicators, more respondents agreed that climate communication is mostly done by climate workers, than by communicators. In some municipalities climate actions and climate communications can also be tasked to regional development companies. Half of survey respondents felt that collaboration between the communication department and climate actors works smoothly, especially in smaller municipalities with smaller organisations. However, many also agreed that climate work is siloed and that communicators aren’t aware of the municipality’s climate actions. Involving communicators in climate working groups was seen as useful in sharing information.

The role of climate issues in municipalities’ day-to-day communications was on average seen to be lower than in their strategic activities, with an average of 3.9 (figure 2), and significantly higher in large municipalities compared to medium ones (see appendix B). The interviews revealed that it is important to have a plan and common guidelines for climate communication that everyone can use in their work, but only 7% of survey respondents reported having one. 15% of respondents agreed that climate issues are present in the municipality’s general communication guidelines. A climate communication guide was said to help understand the climate theme as a whole, which can then help make climate communication and branding coherent throughout different sectors. According to the interviews, a few municipalities had outsourced the making of the plan.

3.1.2. Main target groups of climate communication
The climate communication of interviewed municipalities concentrated on a local context, with everyday climate actions aimed at municipal residents. Municipal residents were seen as the most important target group for municipal climate communication (figure 3). Other important target groups were companies, political decision makers, new and free-time residents, and the media. Several municipalities also highlighted the importance of internal communication and raised concerns over how to reach young people.

Survey respondents mentioned wanting not only to inform target groups through their climate communication, but also to act as an example and appear attractive to them. Some also mentioned wanting to

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2 Regional development companies receive funding from and are partially owned by the region’s municipalities. Their aim is to accelerate regional development projects and help municipalities build vitality. (AFLRA, 2021b)

3 Seasonal and periodic residents of second homes or holiday homes, whose primary residence can often be in another municipality.

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Figure 1. Survey respondents’ assessments of the role of climate issues in their municipality’s strategic activities on a scale of 0 (no role) to 10 (very large role), with an average of 6.4 (N = 72).
instigate climate actions among stakeholders, as they are needed to reach municipalities’ ambitious targets.

A few municipalities had also helped local organizations and companies by calculating their carbon footprints, helping reduce their emissions through guidance. Some municipalities were struggling with how to revive projects and collaborations postponed because of COVID-19, especially as many active (smaller) participants of local climate partnership networks had gone bankrupt.

3.1.3. Style and content of climate communication

In general, the style of the interviewed municipalities’ climate messages was said to be encouraging, positive and comprehensible, which was also reflected in survey respondents’ answers (see figure 4). Municipalities emphasized that climate communication must be based on real climate actions, not just promises, and contain concrete examples of what has been done. Some interviewed forerunners also mentioned that it is easy to communicate about new exceptional climate actions, like being the first to do something in Finland or even globally. Survey results showed that the majority of municipalities showcase their own climate actions and sometimes those of local citizens and companies, but less often actions of other Finnish or foreign municipalities. When communicating actions, interviewees found it useful to include their economic advantages and other benefits in addition to their environmental impacts, but in an understandable way. 75% of survey respondents also agreed that this is done in their climate communication. Interviewees especially
mentioned companies to appreciate numbers showing the effectiveness of climate actions. Visuality was also deemed important: pictures, videos and graphs make data more approachable and interesting, while online tools can make municipalities’ climate actions known to larger audiences.

In addition to the content and style, the language of communication was seen as important, relating to both reach and inclusivity. Areas with larger Swedish-speaking populations must produce content in both Finnish and Swedish, and some Northern municipalities also in Sámi languages. If a municipality is aiming for international recognition, climate communication should also be available in English. Multi-lingual communication certainly has benefits but was also seen in some municipalities (around 22%) as another resource challenge. In-house translation services were found extremely useful among interviewees if they were an option.

According to interviewees, practical and ordinary messages work when communicating to residents. ‘People talking to people’ rather than ‘organisations communicating’ make communication more natural, approachable and acceptable. Fun, unexpected actions are memorable. Audiences are more accepting of climate messages and actions of their peers or trusted, well-known public characters, rather than demands and requirements coming from the municipal organisation. As a concept, using influencers and ambassadors also piqued interest among those municipalities who had yet to try them in their own communications.

Some interviewees mentioned including climate networks and projects in their climate communications for more visibility, for example through social media hashtags like #Hinku. 44% of survey respondents agreed that various network memberships are visible in the municipality’s climate communication and about half mentioned Hinku in their strategy. 61% of respondents agreed that networks help municipal climate communication, but municipalities would also like to receive more help from them.

3.1.4. Means and channels
Results from both the survey and interviews indicated that out of various channels, the most popular ones for climate communication are municipalities’ websites (figure 5). These are used to share materials, current activities, implemented climate actions as well as useful tips for sustainable living. Interviewees praised having a

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4 49% of Finland’s municipalities are either Swedish-speaking (all located in the autonomous Åland islands) or bilingual (covering just over a third of Finland’s population of 5.5 million) (AFLRA 2021b).

5 Finland is home to an indigenous minority, the Sámi people, whose three different native languages have held official status since 1992 (Kotus, 2021). In practice, the Sámi language law applies mostly to their home region, including four Finnish municipalities situated in Lapland, where Sámi people always have the right to receive public services in their native language (Sámediggi 2021).
designated climate website, as all climate topics can then be both posted and found in one place. Different stakeholders can also be included by giving them their own sections within the website.

Other channels most used often by surveyed municipalities included local media, often reached by press releases, as well as Facebook. Interviewees saw social media as a useful, low-threshold way to reach many people fast. Of the different platforms, Facebook was seen as the one for working adult residents, whereas Twitter was for researchers, authorities, other municipalities and media. Instagram, YouTube and TikTok were seen as potential ways of reaching younger audiences.

As a mode of communication, climate themed events were mentioned by interviewees as offering people a low threshold to participate in local level climate action. Different kinds of events work for different groups, from quizzes to cycling campaigns or from mass events to small city district events. Successful events were characterised as unique and fun, with a minimal climatic and environmental footprint. In addition to organising them, attending and speaking at others’ events and partaking in research were also seen as methods of sharing the municipality’s climate actions, both nationally and internationally.

Because of COVID-19, several campaigns and events have either been cancelled altogether, held with limited participation, or moved online. In addition to events, videos, podcasts, and infographics were considered by interviewees as good modes of communication that work despite the pandemic. As examples, some had trialled introductory videos of the municipality’s climate work as well as climate-themed interviews and shows in the local radio.

3.2. Key challenges of climate communication

57% of survey respondents agreed that climate communication is laborious. The biggest obstacles in municipal climate communication and brand work related to a lack of time as well as human and financial resources, followed by the overflow and fragmentation of information. Of all the challenges, lacking time and human resources stood out as the two most important challenges also with the least dispersion, according to a hierarchical cluster analysis (see appendix A). One fifth of respondents estimated their municipality to have no human resources for climate work that is outside of what is legally required from municipalities, while nearly half of respondents had zero human resources for climate-related communication (figure 6).

Municipalities are broad entities with multiple different fields of activity and numerous projects, which makes coherent climate communication challenging. The interviewed municipalities found that climate communication is usually done if time remains after other work tasks, meaning it is often deprioritised. For example, COVID-19 had taken up most of the available communication space and resources, bypassing most other issues, including climate change. As another result of COVID-19, the financial situation in municipalities

![Figure 5. Channels of climate communication used by Hinku municipalities according to survey respondents (N = 72).](image-url)
has been even more unstable than before. COVID-19-related decisions have understandably taken up more
time and space in municipal administration meetings than other matters.

At least a third of the studied municipalities reported that their climate communication is currently done
with project resources, which can be a big help to those struggling with lacking resources. Indeed, several
interviewees as well as 65% of survey respondents agreed that projects support municipal climate
communication. However, interviewees also pointed out that applying for external funding often requires extra
time that municipalities rarely have. Municipalities suggested hiring a regional or shared human resource
between municipalities to do these applications.

In addition to a lack of resources, a lack of communication between climate workers and communicators
was found to significantly hinder climate communication. 44% of survey respondents found internal
information exchange to be a (fairly or very) large challenge. One challenge experienced by interviewees and over
half of all survey respondents was that municipal employees often fail to recognize their actions as climate
actions in the first place. In a few interviewed municipalities this had led to one-sided climate communication
that concentrates on just one aspect or field of activity. Interviews also revealed that municipalities are often
being extra careful around climate communication, as they do not want to spread false information, be
misunderstood, or accused of greenwashing. However, 58% of survey respondents found the fear of spreading
false information to be a small challenge.

Some interviewees mentioned that if climate values are truly integrated into all municipal activities, they can
also become so ordinary that employees forget to communicate about them altogether. Another example was
important information getting lost in the mass. 49% of survey respondents also found the prioritisation of other
communication before climate matters as a large challenge. The minimal communication expertise of
environmental experts was also seen as a challenge in some interviewed municipalities. Over a third of survey
respondents found the lack of know-how to be a large challenge, but another third saw it only as a small
challenge. Climate workers and communicators were seen to form a great team for climate communication,
where both parties can combine their expertise.

3.3. Evaluation and development of climate work and -communication

3.3.1. Feedback and evaluation

Over half of survey respondents had not monitored the reach of their climate communication. When asked to
estimate the reactions of target groups to their municipality’s climate communication, two thirds estimated
reactions to be positive, and just under a third couldn’t say. Most feedback had been received via word-of-
mouth. The climate website, for example, had received positive feedback. Interviewees mentioned that in the
opinion section of local newspapers, climate issues are present in both positive and negative ways, adding that
negative opinions are voiced more often and more strongly than positive ones, especially on social media.

Sometimes public feedback to certain actions, like the closure of a secondary health centre, had also been
negatively associated with the municipality’s green image can negatively affect conversations for a long time. Of the interviewed municipalities, few had monitored
or requested feedback on their climate communication or brand, but they recognized the importance of developing this, also identifying potential ways of doing so.

### 3.3.2. Development pathways of climate work and -communication

When asked to assess the state of their municipalities’ climate communication and climate work in different time frames, survey respondents’ answers ranged a lot, most evaluating their climate work to be at a higher level than climate communication (figure 7). Almost all municipalities had experienced development on both fronts from past to present, marginally more so in climate work than communication. Some felt no change on one of the two fronts, and a couple felt that the state of either their climate work or climate communication had decreased, but only slightly. Interestingly, one respondent felt a significant deterioration on both levels. Lacking resources were connected to a lower evaluation. Going forward, municipalities were mostly expecting improvements on both fronts, especially in communications.

Large municipalities evaluated the state of their past climate work significantly higher than small and medium municipalities, and current climate work to be significantly higher than medium municipalities did (figure 8, full results in appendix B). Large municipalities also evaluated the state of their past climate communications significantly more highly than medium sized municipalities, and currently more highly than both small and medium municipalities did. Differences in evaluations of future states were not statistically significant.

### 3.4. Climate communication in brand development and action amplification

#### 3.4.1. The presence of climate issues in municipal place brands

Overall, Hinku municipalities were at very different stages in their branding efforts. A few interviewed municipalities avoided using terms like ‘brand’ and ‘branding’ altogether, rather talking about shaping people’s impressions, while some had created complete guidelines for the municipal brand, including everything from visual elements and fonts to tone of voice and target groups. 69% of survey respondents agreed that the focus of a municipality’s brand usually arises from the municipal strategy.

Climate issues were seen as varyingly present in municipalities’ images, with an average of 5.6 (figure 9). Communications and marketing employees are usually in charge of brand work, but if resources are limited, this can also fall on the climate worker. Some respondents had only recently started thinking how climate actions could be integrated to the municipal brand, while in several municipalities, climate aspects were no longer seen as a separate entity, but rather a cross-cutting theme that traverses the whole organisation. In one interview, the environment was described as an overarching thematic umbrella under which the municipality’s policies steer its actions. Key climate-related brand themes mentioned in the interviews included sustainable lifestyles, acting together, education, nature values and biodiversity, as well as emission reductions and reaching carbon neutrality (often ahead of others). Interviews revealed that climate networks are also an integral, sometimes defining part of some municipalities’ brands, where they have become known as Hinku municipalities by local newspapers and residents alike. 71% of survey respondents agreed that Hinku membership improves the image of a municipality.

Interviewed municipalities recognized that their brand is built up of not only the municipality’s own actions and communications, but also those of external parties. For example, local universities’ educational offerings...
were identified as potentially affecting the brand. Students of sustainability-related topics can help strengthen the municipality’s image as a climate friendly municipality, while incorporating environmental education into lower degrees was also seen as an important factor of forming future brand image.

3.4.2. Perceived impacts of climate brand communication

Municipalities with a head start in climate brand communication had already experienced its impacts, while those in the early stages identified possibilities. Like with actions and communications, 79% of survey respondents agreed that the visibility of climate issues in the municipality’s image had increased in recent years. Overall, having a climate-positive brand had had positive impacts on studied municipalities. Perhaps more than anything, it had brought increased visibility and recognition both locally and nationally; sometimes even internationally.

According to research participants, a climate friendly brand speaks to modernity, positivity, and future orientation, improving the image of a municipality, having in some municipalities attracted new residents such as young adults and climate conscious individuals to the area. Some municipalities had also managed to attract...
sustainable businesses and therefore jobs to the area; others had even received concrete investments. Prior to the pandemic some had also seen a rise in media attention, sustainable travel, and an increase in demand for educational and expert travel, where visitors come to learn about a forerunner municipality’s climate actions, but COVID-related travel restrictions had halted these.

55% of survey respondents agreed that a climate-friendly image can affect decision making. In at least one municipality, communication has been successful in achieving acceptance towards the costs of climate actions. Indeed, some respondents mentioned that climate issues were now more present in their decision making, and that climate actions had spread to multiple fields of service within the municipality. On the one hand, decision makers and managerial support can improve the legitimacy of climate matters in a municipality, but on the other, successful climate communication can influence decision-makers’ opinions, which is crucial as they can both enable and thwart municipal climate action.

3.4.3. Communication as a gateway to action

Responses revealed that positive recognition from successful climate actions can spur further action, at least within municipal organisations. One interviewee mentioned that the visibility their travel department’s climate work had received had increased willingness to advance climate matters on a broader municipal scale, which then spurred them to join the Hinku network. According to another respondent, the interest their municipality had received from taking an active stand on climate mitigation overall had also worked as encouragement to put more effort into climate issues in their own work, thus amplifying climate action within the municipal organisation.

Municipal representatives recognized that to reach their climate goals, everyone must participate. One of the reported goals of municipal climate work was to show an example to increase citizens’ interest and excitement towards their own climate actions. According to several research subjects, attitudes have become more climate friendly as a result of successful climate work and communication, hopefully leading to changes in behaviour and consumption habits. 35% of survey respondents agreed that a climate-friendly image affects the actions of citizens. As a good example of climate action that can spur further action while presenting a climate-friendly image, interviewed municipalities mentioned improving infrastructure that enables and encourages the use of sustainable transportation.

Through collaborative communication, messages receive an even wider audience than when communicated by the municipality alone. Interviewees mentioned having collaborated with schools and universities, local companies, sports clubs and other organisations, networks, national parks, local media, nature industries (like fishing, hunting or reindeer husbandry) as well as other municipalities and regions. Forms of collaboration included climate action, communication, campaigns, projects, volunteering and events, which as previously mentioned were found particularly encouraging to action.

Impacts of climate communication can also extend beyond borders. Some municipalities’ residents had pressured their own leaders to take climate action, as other forerunner municipalities had already done so, potentially amplifying impacts.

4. Discussion and conclusion

Climate action, communication and place branding have all been widely studied, yet research combining all three has been scarce. This study provided a deeper understanding of how municipalities have included climate issues in their communication efforts, shedding light on the key challenges, impacts and opportunities of doing so. Targeted interviews and a survey of climate workers and communications employees of Finnish municipalities showed that despite having already taken climate strides by committing to ambitious emission reduction targets, even many forerunner municipalities were still in the process of integrating climate communication into their day-to-day operations.

The presence of climate issues in municipal activities has increased in recent years. Most surveyed municipalities reported elements of strategic organisation of climate matters, but they are not yet broadly taken into consideration in all significant decision making, despite this being a part of the forerunner network membership criteria. We found gaps between climate action and communication. Not all municipalities had necessarily understood that actions themselves are an important form of communication. Moreover, municipal employees often fail to recognize actions as climate actions, or don’t see them as significant enough, thus forgetting or choosing not to communicate about them. This ties in with the notions of green hushing (Font et al., 2017). Exaggerated modesty and caution can become an obstacle if climate actions are not seen as important enough to communicate. As public organisations, it is important for municipalities to be transparent in telling its residents what climate actions are done and what benefits they may bring. Many actions, such as green
electricity or solar panels on hidden rooftops are invisible to the public, and thus without communication their potential as image-improving, motivational, exemplary actions that spur further action is lost.

One of the key findings of our study emphasizes the importance of basing climate communication and climate branding on real climate actions in order for them to be relevant and trustworthy. This supports Kavaratzis’ (2004) notion that secondary communication is largely reliant on primary communication. In a recent study of climate knowledge circulation in Finnish municipalities, Virtanen et al. (2022) agreed that climate experts, communicators and working groups are important in gathering, condensing and circulating climate knowledge within the municipality, with roadmaps helping to both steer and implement actions, while also gathering different actors together. Thus, internal communication and collaboration are crucial. Our findings suggest that municipal climate action and communication function more efficiently in symbiosis than as separate entities, with climate workers and communicators forming a great team for communicating climate actions, but many municipalities evidenced room for improvement in bridging the gaps between the two. A guide to municipal climate communication, a designated climate website and climate themed events were found to be helpful tools in climate communication. Connecting climate issues broadly into everyday communication using the right angles was identified as a useful way of communicating climate issues, rather than it being a separate entity.

Effective local climate change communication requires an assessment of local perceptions and previous knowledge to better tailor communication activities and predict potential interpretations of messages (Nerlich et al., 2010; Gislason et al., 2021; Clayton & Manning, 2018). Local citizens and companies were seen as the most important target groups of Hinku municipalities’ climate communications, followed by decision makers, media and internal audiences. Young people were also mentioned specifically. Hinku municipalities recognized the importance of tailored messaging. Although they had gathered little feedback, research participants found it beneficial to highlight the financial and social benefits of climate actions in addition to environmental ones, when appealing to diverse audiences. Those more advanced in their climate communication identified several points that help with the framing and forming of the messages, also proposed by Clayton & Manning (2018). Linking climate communication to local contexts, concentrating on the right channels and communicators, as well as utilising existing partnerships and networks, makes the information more relevant to the local individual. Hinku municipalities have started to utilise networks and influencers in their climate communication, but more could be done to widen their reach and encourage pro-environmental behaviour (see Dekoninck & Schmuck, 2022).

Communicating about new, innovative climate actions was found easy, but municipalities’ climate actions were also often described as ordinary. The term is open to interpretation, as some might refer to approachable, everyday actions that can be easily multiplied. Overall, Hinku municipalities’ style and tone veered towards positivity, with a focus on local mitigation solutions rather than urgency or the impacts of climate change as a phenomenon. This is in line with Clayton & Manning’s (2018) suggestion that climate communication should highlight solutions to build engagement and hope, and Moser & Dilling’s (2004) notions of guiding the public towards needed actions to avoid confusion and denial. Nerlich et al. (2010) and Bucchi (2008) suggested that climate change communication should move to more engaging and dialogue-based communication to promote understanding, emotion and especially behaviour change, Gislason et al. (2021) reminding that increased knowledge about climate issues does not lead to action on its own. As suggested by Altinay (2017) and Campbell & Vainio-Mattila (2003), framing the climate communication by adding the unique context of a certain municipality to climate communication can help the stakeholders connect to the issues on a personal level and catalyse action.

Hinku municipalities identified public engagement especially through events and environmental education as important avenues for amplifying action through communication, also recognizing the importance of stakeholder collaborations and collective communication. More concretely, they can and have also attempted to nudge stakeholders towards climate action through infrastructure changes and removing institutional constraints, two important aspects also emphasized by Nerlich et al. (2010). Simultaneously informing and nudging trigger both cognitive and behavioural change (Olander & Thogersen, 2014). Openly communicating local climate actions may also unlock export opportunities for local sustainable businesses (Andersson, 2016). There is no single solution that is perfect for everyone and even the established communication’s effectiveness needs to be monitored and developed constantly. Behaviour change towards more sustainable practices needs multiple measures, and communication will only work when combined with more practical measures like policy changes and climate action (Nerlich et al., 2010), which requires sufficient resources.

Key challenges faced by municipal employees in climate communication related to lacking time and human resources—with municipalities’ numerous responsibilities, climate communication is often deprioritised. COVID-19 had taken a toll on already scarce resources, further deprioritising climate matters in many places, but also forced a digital leap into new ways of activating and engaging different audiences online and on social media, which might prove useful in the post-COVID era. Alleviation to some of the experienced resource
Almost all municipalities had experienced development in both climate work and climate communication, rating both the state and progress of climate work slightly higher than communication. Going forward, most were expecting improvements on both fronts, this time slightly more so in communications. While large municipalities have to date been more advanced in their climate work and communications, perhaps due to better resource availability, municipalities’ self-assessments suggest that small and medium sized municipalities have started and plan on continuing to bridge the gap. The fact that large municipalities haven’t been statistically significantly ahead of small municipalities in past communications and present climate work is interesting. Certain respondents found internal communication and collaboration easier to implement in small organisations. Perhaps Hinku network membership has also played some small role—in average have longer membership in the network, which from the start has offered visibility and communication support from both peers and experts, having recently also managed to increase support through increased funding (Karhinen et al, 2021).

Kavaratzis (2004) outlined that tertiary communication lies outside municipalities’ spheres of influence but investing in primary and secondary communication may offer returns in terms of how the municipality is perceived. As Källström (2016) points out, the competition between municipalities has increased due to globalisation, stating that today it is ‘absolutely necessary’ for them to be attractive, and that brand management can be used to achieve and communicate this. Moilanen and Rainisto (2009) found environmental aspects an important factor of the future attractiveness of a place, and in turn, Maheshwari et al (2011) found that place branding drives sustainable development while facilitating economic growth, providing better employer brand and employability, financial stability and environmental improvements. The visibility of climate issues in Hinku municipalities’ images had increased in recent years, bringing positive impacts, mostly in visibility and recognition. Sustainability-related visits had also been rising in some places prior to the pandemic. Positive recognition from climate actions and communication had been found to boost climate work within the municipal organisation, and some municipalities had also managed to attract new residents, sustainable businesses, jobs and even investments into the area. Hinku membership was seen to improve a municipality’s image, and a climate-friendly image was in turn seen to improve attitudes towards climate work and affect decision making.

While outside the scope of this study, future research efforts might triangulate these findings with content-based analyses of Hinku municipalities’ primary and secondary climate communication outputs, for instance by looking at direct municipal press releases and other content (like in Boussalis et al, 2018 or Busch & Anderberg, 2015), or their presence in various media (like in Lyytimäki et al, 2020). Further research on tertiary communication, the way it works and the effects it has could also add valuable information to municipalities’ branding and communication efforts. Replicating this study for other municipalities could also offer valuable comparisons between other forerunner municipalities as well as those outside of similar networks, both in Finland and abroad.

This study highlights that even municipalities with a history in climate action can struggle with their communication, leaving several benefits and opportunities of climate communication underexploited. The most important challenges hindering climate communication relate to lacking time and human resources. Outside of increasing resources, stronger legitimacy and collaborations within municipalities and municipal organisations, especially between climate workers and communicators would help to bring climate issues onto the shared agenda. Successful climate communication based on concrete actions, local solutions and opportunities for engagement can improve attitudes towards climate work but also has the potential to positively affect the municipality’s brand image, which in turn may affect decision making and boost municipalities’ competitive abilities by improving their attraction and retention potentials, potentially leading to a snowball effect of amplified climate action and brand development, but the full impacts of these would warrant further study.
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Data availability statement

The data generated and/or analysed during the current study are not publicly available for legal/ethical reasons but are available from the corresponding author on reasonable request.

Appendix A Clustering of climate communication challenges

Methods

The respondents evaluated the challenges to climate communication on a 5 level Likert-type scale from very small to very large. We followed Tumpa et al (2019) in using hierarchical cluster analysis in order to find the most important challenge clusters. Agglomerative hierarchical clustering works by first considering each instance as their own cluster and then iteratively joining the two most similar clusters, continuing until there is just a single cluster to create a binary tree structure (see figure A1). The distances used in the clustering were calculated using Euclidean distances with group average linkage. Silhouette method and visual inspection of the resulting dendrograms were used to find the optimal number of clusters.

There are many different methods for determining the optimal number of clusters for analysis from the resulting structure. We used the Silhouette method and the resulting silhouette is given in figure A2. The suggestions given by the Silhouette method were also confirmed by looking at the dendrogram of the clusters.

In order to carry out the analysis, the categorical answers were recoded into numeric values, and corresponding distance metrics were calculated based on them. Each level was given integer values from 1–5, starting from very small (1) to very large (5) (table A1).

For each challenge (listed in table A2), a relative importance value (XRIV) was created by calculating the mean of the answers given by the respondents for each challenge. Do not know -answers were dropped. The standardized means (Z(XRIV)) and standard deviations (Z(XS)) of the significance scores were used in the clustering. The formulas used for calculating the values are presented below in the formulas (1–6). The use of

Cluster Dendrogram

Figure A1. Results of hierarchical clustering of challenges in climate communication.
standard deviation allowed us to also consider heterogeneity in the opinions instead of ranking the challenges only according to the means.

The cluster analysis and other analyses of the survey data were conducted using the R Statistical language (version 4.1.2; R Core Team, 2021) on Windows 10 × 64 (build 19042) and tidyverse (version 1.3.1; Wickham et al., 2019). The following packages were used for the cluster analysis: factoextra (Kassambara & Mundt, 2017), NbClust (Charrad et al., 2014).

Results
The analysis identified four clusters of challenges presented in figure A3. The first cluster consists of the critical challenges, a lack of time and human resources, which had a high mean and smaller variation in opinions. The second cluster is made of important challenges which relate to storytelling, targeting, visualizing and managing information, for example. The third cluster of challenges is made of challenges that are selectively important, i.e. they are relatively important, but there is some variation in the opinions of the respondents. These include challenges related to the communication of the climate actions, like the difficulty of proving the effectiveness of actions. The fourth and final cluster include the non-important challenges, that is inconsistent information and the fear of spreading false information.

Formulas

**Challenge importance metrics.** Selected challenges are represented by $X_i$, where $i = (1, 2, 3 \ldots m)$ and $m$ is the number of challenges. The importance is measured using relative importance value (RIV), that is the mean of the evaluations of the respondents ($X_{i \text{RIV}}$) and standard deviation (SD) to measure the differences in opinions ($X_{i \text{SD}}$). The relative importance ($X_{i \text{RIV}}$) and standard deviation ($X_{i \text{SD}}$) are calculated with the following equations:

$$X_{i \text{RIV}} = \frac{1}{n} \sum_{j=1}^{n} x_{ij}$$

Table A1. Measures of importance and numeric conversion.

| Survey item scale        | Numeric value |
|--------------------------|---------------|
| Very small               | 1             |
| Somewhat small           | 2             |
| Neither small nor large   | 3             |
| Somewhat large           | 4             |
| Very large               | 5             |

Figure A2. Values of average silhouette width.
Table A2. Means, standard deviations and standardized values for climate communication challenges used in clustering analysis.

| Challenge                                                                 | $X^{RIV}$ | $X^{SD}$ | $Z(X^{RIV})$ | $Z(X^{SD})$ |
|---------------------------------------------------------------------------|-----------|----------|---------------|-------------|
| Lack of time                                                              | 4.44      | 0.79     | 2.39          | -2.14       |
| Lack of personnel resources                                               | 4.30      | 0.78     | 2.11          | -2.17       |
| Lack of financial resources                                               | 4.00      | 0.94     | 1.49          | -0.64       |
| Too much information                                                      | 3.77      | 0.89     | 1.01          | -1.20       |
| Visualizing information                                                   | 3.70      | 0.86     | 0.89          | -1.42       |
| Reaching the target audiences                                            | 3.49      | 1.02     | 0.45          | 0.05        |
| Other municipal communications are prioritized over climate communications | 3.44      | 1.19     | 0.36          | 1.69        |
| The effectiveness of climate action is difficult to prove                 | 3.43      | 1.21     | 0.33          | 1.91        |
| Internal communication                                                    | 3.43      | 0.97     | 0.33          | -0.42       |
| Framing information for different audiences                              | 3.43      | 0.91     | 0.32          | -0.96       |
| Climate actions are not recognized                                       | 3.42      | 1.12     | 0.30          | 1.00        |
| Communication to businesses                                              | 3.38      | 0.91     | 0.23          | -1.01       |
| Communication to residents                                               | 3.35      | 0.96     | 0.17          | -0.50       |
| Selecting the right content                                               | 3.35      | 0.98     | 0.16          | -0.26       |
| Storytelling with information                                             | 3.32      | 0.87     | 0.10          | -1.13       |
| Climate change is a challenging theme                                    | 3.25      | 1.17     | -0.05         | 1.54        |
| Finding and selecting up-to-date information                              | 3.20      | 0.96     | -0.14         | -0.54       |
| Finding the right communication channels                                  | 3.18      | 1.00     | -0.17         | -0.13       |
| Divided opinions of target groups on climate change                      | 3.11      | 1.09     | -0.33         | 0.76        |
| Narrow job description                                                    | 3.10      | 1.25     | -0.36         | 2.31        |
| Lack of expertise                                                         | 3.09      | 0.97     | -0.37         | -0.38       |
| Communication to visitors / tourists                                      | 2.98      | 1.04     | -0.59         | 0.23        |
| Balancing messaging between seriousness, urgency and excessive threats     | 2.97      | 1.08     | -0.62         | 0.67        |
| Lack of Knowledge                                                        | 2.95      | 1.09     | -0.65         | 0.75        |
| Producing multilingual communication                                     | 2.69      | 1.16     | -1.19         | 1.44        |
| Strong backlash against climate communication                             | 2.65      | 1.15     | -1.27         | 1.33        |
| Controlling the image of the municipality                                 | 2.61      | 1.10     | -1.34         | 0.82        |
| Inconsistency of information                                              | 2.54      | 0.88     | -1.49         | 1.29        |
| Fear of spreading false information                                       | 2.25      | 1.00     | -2.08         | -0.12       |

Figure A3. Clustering of the perceived challenges over all survey respondents according to relative importance. The cluster plots show the standardized relative importance and its standard deviation values on the Y-axis and X-axis respectively. The higher the $Z(X^{RIV})$ is, the more important the challenge was rated, and the lower the $Z(X^{SD})$ value the lower the differences in opinions.
\[
X_i^{SD} = \sqrt{\frac{1}{n} \sum_{j=1}^{n} (u_j - X_i^{RIV})^2}
\]

where \(u_j\) represents the score given to challenge \(X_i\) by participant \(j\); \(n\) is the total number of responses received.

**Standardization.** Both relative importance and standard deviation variables are then standardized using following equations (Kaufman & Rousseeuw, 2009: 8–9):

\[
\mu_{X^{RIV}} = \frac{1}{M} \sum_{i=1}^{M} X_i^{RIV}
\]

\[
\mu_{X^{SD}} = \frac{1}{M} \sum_{i=1}^{M} X_i^{SD}
\]

\[
Z(X_i^{RIV}) = \frac{X_i^{RIV} - \mu_{X^{RIV}}}{\sqrt{\frac{1}{m} \sum_{i=1}^{m} |X_i^{RIV} - \mu_{X^{RIV}}|}}
\]

\[
Z(X_i^{SD}) = \frac{X_i^{SD} - \mu_{X^{SD}}}{\sqrt{\frac{1}{m} \sum_{i=1}^{m} |X_i^{SD} - \mu_{X^{SD}}|}}
\]

**Appendix B Statistical analysis of the state of climate work and communication.**

The assessments of the state of the municipalities’ climate work and communications and the score given for the size of their role in the municipalities brand, communication and strategic action were evaluated for differences between small, medium and large municipalities. The hypothesis was that larger municipalities have better resources, more personnel and capabilities that would be reflected in the state of both climate work and communication, as well as in the role that climate issues are given in municipalities’ strategic activities, day-to-day communications and brand image. Non-parametric tests were used as the variables of interest were non-normally distributed, although at times only slightly. First, a Kruskal-Wallis test (Kruskal & Wallis, 1952) was

![Figure B1. Kruskal-Wallis and Dunn’s tests between large, medium and small municipalities for their assessments of the role of climate issues in municipalities’ strategic activities.](image)
Figure B2. Kruskal-Wallis and Dunn’s tests between large, medium and small municipalities for their assessments of the role of climate issues in municipalities’ image.

Figure B3. Kruskal-Wallis and Dunn’s tests between large, medium and small municipalities for their assessments of the role of climate issues in municipalities’ day-to-day communication.
Figure B4. Kruskal–Wallis and Dunn’s tests between large, medium and small municipalities for their assessments of state of climate communication 5 years ago.

Figure B5. Kruskal–Wallis and Dunn’s tests between large, medium and small municipalities for their assessments of state of climate communication now.
Figure B6. Kruskal-Wallis and Dunn's tests between large, medium and small municipalities for their assessments of state of climate communication 5 years from now.

Figure B7. Kruskal-Wallis and Dunn's tests between large, medium and small municipalities for their assessments of the state of climate work 5 years ago.
used to check for significant differences, followed by a post-hoc pairwise Dunn’s test (Dunn, 1964) to identify the groups that are different.

As seen in figures B1, B2 and B3, municipalities’ assessments of the role of climate issues was only significantly different in day-to-day communications between municipality groups (Kruskal-Wallis test, \(p = 0.043\), figure B3). Dunn’s test showed that only the difference between large and medium-sized municipal groups was significant (Dunn’s test, \(p = 0.044\)).

Figure B4 shows that there was a statistically significant difference in the assessments of the state of climate communication five years ago between municipality groups (Kruskal-Wallis test, \(p = 0.013\)). Dunn’s test showed that only the difference between the large and medium municipal groups was significant (Dunn’s test, \(p = 0.010\)).

There was also a statistically significant difference in the assessments of the current state of climate communication between municipality groups as assessed using the Kruskal-Wallis test (\(p = 0.026\), figure B5). Dunn’s test showed that large municipalities were significantly different from both medium and small municipalities (Dunn’s test, \(p = 0.031\) and \(p = 0.033\) respectively).

There was no statistically significant difference in the assessments of the future state of climate communication between municipality groups as assessed using the Kruskal-Wallis test (\(p = 0.072\), figure B6).

Figure B7 shows that assessments of the state of climate work five years ago were significantly different between groups (Kruskal-Wallis test, \(p = 0.008\)). Pairwise Dunn’s test showed that the large municipalities were significantly different from both medium and small municipalities (Dunn’s test, \(p = 0.011\) and \(p = 0.011\) respectively).

There was also near statistically significant difference in the assessments of the current state of climate work between municipality groups as assessed using the Kruskal-Wallis test (\(p = 0.055\), figure B8). Dunn’s test showed that large municipalities were significantly different from medium municipalities (Dunn’s test, \(p = 0.0482\)).

There was no statistically significant difference in the assessments of the future state of climate work between municipality groups as assessed using the Kruskal-Wallis test (\(p = 0.12\), figure B9).
CRediT authorship contribution statement

Niina Nousiainen: Conceptualisation, Methodology, Formal analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Project administration. Venla Riekkinen: Conceptualisation, Methodology, Formal analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualisation, Project administration. Teemu Meriläinen: Methodology of statistical analyses, Formal analysis, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualisation.

Declaration of interest

We declare that we have no known relevant financial or non-financial competing interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

AFLRA (Association of Finnish Local and Regional Authorities) 2021a Finnish municipalities and regions. Retrieved 8.12.2021 (https://localfinland.fi/finnish-municipalities-and-regions)
AFLRA (Association of Finnish Local and Regional Authorities) 2021b Regional and Economic development. Retrieved 21.1.2022 (https://localfinland.fi/regional-and-economic-development)
Altinay Z 2017 Visual communication of climate change: local framing and place attachment Coastal Management 45 293–309
Andersson I 2016 'Green cities' going greener? Local environmental policymaking and place branding in the 'Greenest City in Europe' European Planning Studies 24 1197–215
Anholt S 2007 Competitive identity: The new brand management for nations, cities and regions. (Basingstoke, England: Palgrave Macmillan)
Boussalis C, Coan T G and Holman M R 2018 Climate change communication from cities in the USA Clim. Change 149 173–87
Bucchi M 2008 Of deficits, deviations and dialogues: theories of public communication of science ed M Bucchi and B Trench (2008). Handbook of public Communication of Science and Technology (New York: Routledge International Handbooks) 57–76
Busch H and Anderberg S 2015 Green attraction: transnational municipal climate networks and green city branding Journal of Management and Sustainability 5 1–16

Campbell L and Vainio-Mattila A 2003 Participatory development and community-based conservations: opportunities missed for lessons learned? Human Ecology 31 417–437

Charrad M, Ghazali N, Boitue V and Niknafs A 2014 NbClust: an R package for determining the relevant number of clusters in a data set Journal of Statistical Software 61 1–36

Clayton Sand Manning C 2018 Psychology and climate change: Human perceptions, impacts, and responses. ed S Clayton and C Manning (London: Elsevier Academic Press)

Comfort S E and Park Y E 2018 On the field of environmental communication: a systematic review of the peer-reviewed literature Environmental Communication 12 862–875

Dekoninck H and Schmuck D 2022 The Mobilizing Power of Influencers for Pro-Environmental Behavior Intentions and Political Participation. Environmental Communication 16 458–472

Dunn O J 1964 Multiple comparisons using rank sums Technometrics 6 241–52

Elander I and Gustavsson E 2007 Preprint (http://urn.kb.se/resolve?urn=urn%3Amn%3Aaonr%3Adiva-40417)

Font X, Elgammal I and Lamond I 2017 Greenhushing: the deliberate under communicating of sustainability practices by tourism businesses Journal of Sustainable Tourism 25 1067–23

Gislon M K, Galway L, Buse C, Parkes M and Rees E 2021 Place-based climate change communication and engagement in Canada’s provincial North: lessons learned from city champions Environmental Communication 15 530–45

Gustavsson E, Elander I and Lundmark M 2009 Multilevel governance, networking cities, and the geography of climate–change mitigation: two Swedish examples Environment and Planning C: Politics and Space 27 (1) 59–74

Hsieh H F and Shannon S E 2005 Three approaches to qualitative content analysis Qual. Health Res. 15 1277–88

Kallström L 2016 Rethinking the branding context for municipalities, from municipal dominance to resident dominance Scandinavian Journal of Public Administration 20 77–95 (http://urn.kb.se/resolve?urn=urn%3Amn%3Aaonr%3Adiva-16569)

Kassambara A and Mundt F 2019 Package ‘factoextra’. Extract and visualize the results of multivariate data analyses https://cran.r-project.org/web/packages/factoextra/index.html

Karhinen S, Petloma J, Riekkinen V and Saikku L 2021 Impact of a climate network: the role of intermediaries in local level climate action Global Environmental Change 67 102225

Kaufman L and Rousseau P J 2009 Types of data and how to handle them. Finding Groups in Data: an Introduction to Cluster Analysis. (New Jersey: Wiley) 8-9

Kavaratzis M 2004 From city marketing to city branding: Towards a theoretical framework for developing city brands Place Branding and Urban Diplomacy 1 56–72

Kotus (The Institute for the Languages of Finland) 2021 Languages of Finland - Saami. Retrieved 16.12.2021 (https://www.kotus.fi/en/on_language/languages_of_finland/Saami)

Kruskal W H and Wallis W A 1952 Use of ranks in one-criterion variance analysis J. Am. Stat. Assoc. 47 583–621

Lindstedt J 2011 Place, identity and the socially responsible construction of place brands Place Branding and Public Diplomacy 7 42–9

Lyttimäki J, Kangas H-L, Mervaala E and Vikström S 2020 Muted by a crisis? COVID-19 and the long-term evolution of climate change newspaper coverage Sustainability 12 (20) 8575

Maheshwari V, Vandewalle D and Bamber D 2011 Place branding’s role in sustainable development Journal of Place Management and Development 4 198–213

Mattinen-Yrjäyri M et al 2021 Missa mennään kuntien ilmasto- ja luontotyössä? [Where are municipalities with their climate and nature work?] (https://sitra.mensa-mennan-kuntien-ilmasto-ja-luontotyossa.pdf)

Moser S C and Dilling L 2004 Making climate HOT: Policy and Media. Global Environmental Change 7 103–112

Moser S C and Dilling L 2004 Making climate HOT: Policy and Media. Global Environmental Change 7 103–112

Noussiai E, Ruiz-Celis F and Ruiz-Celis L 2003 The role of intermediaries in local level climate action Global Environmental Change 10 119–26

Ölander F and Thøgersen J 2014 Informing versus nudging in environmental policy Environmental Communication 12 (1) 1–17

Riekkinen V, Saikku L, Karhinen S, Aro R, Helonheimo T, Peltomaa J, Pitkänen P, Leskinen P and Koskela S 2017 Diffusion of solar electricity in the network of private actors as an experimental strategy to mitigate climate change J. Clean. Prod. 142 2730–2740

Salvia M et al 2021 Will climate mitigation ambitions lead to carbon neutrality? An analysis of the local-level plans of 327 cities in the EU Renewable and Sustainable Energy Reviews 135 110253

Sámediggi 2021 Mitä kielellisiä oikeuksia saamelaisilla on Suomessa? [What linguistic Rights do Sámi People have in Finland?] Retrieved 16.12.2021 (https://samediggi.fi/kiekkeliset-oikeudet-ovat-perusoikeuksia/mita-kielellista-oikeutta-saa-saamelaisilla-on-suomessa/)

Schweizer S, Davis S and Thompson J L 2013 Changing the conversation about climate change: a theoretical framework for place-based climate change engagement Environmental Communication 7 42–62

Seppälä J, Saikku L, Soimakallio S, Lounasheimo J, Regina K and Ollikainen M 2019 Hiihtoneutraaliut ja luontopolitiikassa—valtio, alueet ja kansat (Carbon neutrality in climate policy—state, regions and municipalities) 5/2019Suomen ilmastopaneeli

Sheppard S 2012 Visualizing climate change: a local guide to visual communication and climate change development in local solutions (London: Taylor & Francis Group)

SYKE (the Finnish Environment Institute) 2020 Retrieved 6.5.2022 (https://ymparisto.fi/fi-FI/Elinymparistoja_kaavoutois-Yhdyskuntarakenteet/Tietoa_yhdsyskuntarakenteesta.html)

SYKE (the Finnish Environment Institute) 2021 Hinku criteria. Retrieved 1.3.2022 (https://hiilineutraali-suomi.fi/en-US/Hinku_-hinku_-criteria)

Tampa T J, Ali S M, Rahman M H, Paul S K, Chowdhury P and Rehman Khan S A 2019 Barriers to green supply chain management: an emerging economy context J. Clean. Prod. 236 117617

Virtanen M J, Reinekoski T, Lahikainen L and Lehtonen T -K 2022 Travels and trials of climate knowledge in finnish municipalities Science & Technology Studies 35 2–20

Warras A, Bjørn H and Moldenes T 2014 Place, organization, democracy: three strategies for municipal branding Public Management Review 17 238–304

Wickham et al 2019 Welcome to the tidyverse Journal of Open Source Software 4 1686