Stories from the Peaks: An Interactive Data Storytelling to Narrate Climate Change Impacts through a Pluralism of Voices

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Abstract

Explaining the seriousness of climate change while encouraging audiences to take action to counteract it is especially challenging. Data about temperature and CO2 increases are often perceived as abstract and ungraspable, while extreme events like floods and droughts generate a sense of awe and helplessness. This paper presents the design process of an interactive data storytelling prototype about climate change and overtourism in Trentino. Rooted in the principles of data humanism and feminist epistemologies, this study emphasizes the importance of combining scientific data with locality and including a plurality of voices. Through a meticulous data curation process involving public institutions and scientific experts, the storytelling was designed to integrate human and more-than-human perspectives, grounded in rigorous and credible data. An initial evaluation with eleven users shows that data-driven narratives can effectively convey the complex challenges climate change imposes on mountain communities and ecosystems.

CCS Concepts

• **Human-centered computing** → **Interaction design**; **Visualization**; **Visualization design and evaluation methods**.

Keywords

Climate change, Data storytelling, More-than-human, Mountain

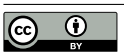
ACM Reference Format:
Eleonora Mencarini, Chiara Leonardi, Paolo Massa, and Francesca D'Errico. 2025. Stories from the Peaks: An Interactive Data Storytelling to Narrate Climate Change Impacts through a Pluralism of Voices. In *CHItaly 2025: 16th Biannual Conference of the Italian SIGCHI Chapter (CHItaly 2025), October 06–10, 2025, Salerno, Italy*. ACM, New York, NY, USA, 8 pages. https://doi.org/10.1145/3750069.3750130

1 Introduction

Climate change is one of the most urgent issues of our time, yet communicating its impacts to the broader public remains a challenge. This is mainly due to its complexity, as climate change originates from multiple causes and has diverse impacts on different geographical regions and timescales [22]. The data used to describe them are often perceived as abstract and unrelated to the local contexts; thus, they appear "cold", difficult to understand, and disconnected from everyday experiences of people [13]. The lack of clear, relatable narratives and the overwhelming nature of climate information result in disengagement and a sense of helplessness. Alarmistic tones and sensationalism are often picked as communication strategies to shake consciences. However, these often yield opposite results, generating eco-anxiety and paralysis rather than fostering actions [5], or nurturing the polarization of public opinion [10].

To address these challenges, HCI studies explore new communication approaches that challenge conventions and embrace narrative possibilities rooted in subjectivity and locality [14, 17]. Studies show how data humanism, positive framing, and localized narratives can enhance user engagement with climate data [14]. In this context, data storytelling emerges as a promising approach to engage audiences, raise awareness, and drive pro-environmental social change [13, 28]. Building on these works, we developed *Stories from the Peaks*, a digital storytelling prototype that enables users to explore the interconnected impacts of climate change and overtourism in a mountain region in Northern Italy. The platform features diverse data-driven narratives developed using the personas method [7] to illustrate the regional impacts of climate change through relatable stories that strengthen public engagement.

Our work is grounded on the recognition that not all perspectives, knowledge, and fragilities are represented in climate change communication. It explores how pluralistic local perspectives —-including more–than–human viewpoints —-can make climate communication more inclusive and empathetic. We describe the design process to examine the impacts of climate change within the region through concrete, relatable perspectives based on personas [7]. It was carried out in collaboration with representatives from the local public administration and an expert from the Natural Science Museum. The paper concludes with the findings from an initial prototype evaluation, conducted with eleven participants, highlighting three main aspects. First, integrating more-than-human perspectives proved highly effective in fostering emotional engagement and empathy with climate data. Second, using personas grounded in real data helped create relatable characters that balance authenticity and narrative appeal. However, striking this balance remains a challenge. Third, embedding practical, context-specific action tips



CHItaly 2025, Salerno, Italy

ACM ISBN 979-8-4007-2102-1/25/10
https://doi.org/10.1145/3750069.3750130

within data stories empowered participants and enhanced motivation, highlighting the importance of linking storytelling with concrete environmental policies and community interventions through interdisciplinary collaboration.

2 Related Work

2.1 Critical Data Study

Recent developments in critical data analysis and visualization challenge assumptions about data's neutral and objective nature, examining how they are produced, structured, analyzed, and used [16, 27]. Data humanism [19], for instance, seeks to make data more accessible, meaningful, and impactful for people by unveiling the human stories and experiences behind the numbers [12]. Another interesting framework on data communication is Data feminism [8], which provides a set of principles aimed at challenging unequal power structures embedded in data science. It encourages examining who collects data, whose voices are included or excluded, and how data practices shape power dynamics, offering a framework to leverage data for social justice and equity. It promotes pluralism, emotional engagement, and visibility of labor by stressing the importance of inclusivity and diversity when representing data and incorporating diverse data sources, including local and traditional knowledge. These principles align with a growing body of Sustainable HCI (SHCI) research that connects social justice discourses with post-anthropocentric perspectives [4], recognizing that many beings and entities directly affected by climate change - such as low-income or indigenous human communities and non-human entities within the natural world - often lack a voice in climate governance and technology design [9, 18].

2.2 Interactive Data Storytelling about Climate Change

HCI has addressed sustainability issues for over two decades, leading to the consolidation of the subfield of Sustainable HCI [15]. SHCI increasingly engages with climate change as a critical research domain, advancing technological interventions that support sustainable development, resilience, behavior change, and communication [21, 28]. Ferreira et al. [11] examined how HCI research has approached climate change communication to the general public over the past decade, showing that the most frequent framing of the problem is neutral, and no actionable steps or hints for solutions are offered. These communicative choices limit the potential impact on public understanding and engagement.

Digital storytelling is emerging as a powerful approach to address these gaps. Multiple disciplines have recognized the importance of storytelling as a fundamental aspect of human society for communication, knowledge transfer, identity construction, and cultural preservation, and studies have demonstrated how it can be used to engage audiences, raise awareness, and drive social change [3]. In his work, Theocharis [29] explores the use of Community Digital Storytelling to document and amplify the lived experiences of communities in regions severely impacted by climate change. His study, which involved local communities in Bangladesh and Vietnam, highlights how vulnerable populations use digital storytelling to express their perceptions, challenges, and resilience strategies related to climate crises such as flooding, sea-level rise, and environmental degradation. Ferreira et al. [14] addressed the challenge of engaging the public with climate change data, noting that traditional approaches often rely on neutral or negative framings that can lead to disengagement and a lack of action and eco-anxiety. Their research is grounded on the Data Humanism approach [12] that aims to make climate data more relatable, contextualized, and action-oriented for non-academic audiences. The study suggests that humanized, solution-focused data visualizations in everyday public spaces significantly boost user engagement. Audiences responded positively, finding the visuals clear, relevant, and actionable [12]. Shahu et al. [26] combined anecdotal experiences with factual data to develop a game that fosters engagement and awareness of climate change issues. Their study demonstrates how data-driven storytelling can evoke strong emotions, encourage critical thinking, and inspire climate action, while emphasizing the importance of community-based efforts. Building on these works, our study explores how data storytelling can bridge local experiences with scientific data, integrating qualitative narratives with quantitative evidence on the impact of climate change in the Alpine regions.

3 The design of Data Stories

This section presents the context and the design process we followed from the curation of official climate data in Trentino and the analysis of local impacts to the elaboration of the different perspectives that personify those impacts.

3.1 The Research Context

This study is part of the EU-funded project NEVERMORE, which aims to develop innovative digital tools to inform citizens and policymakers about plausible future scenarios and support informed climate mitigation and adaptation decisions. The case study representing the Alpine climate hotspot in NEVERMORE is Trentino, an Italian Autonomous Province in the Eastern Alps. As a tourist destination renown for its beautiful landscapes, Trentino attracts mountain lovers worldwide for a wide range of outdoor activities year-round. However, mountain areas are particularly at risk of climate change and face specific vulnerabilities, such as the reduction of snow cover, which is a vital water source for local communities. For this project, we gathered and curated data on climate change and tourism in Trentino, realizing that, despite the significant amount of data available, effectively reaching and communicating with the broader public remains challenging since datasets are often fragmented or dispersed across several websites. Reports from the local administration are a first attempt to put data in context and create a narrative that explains them. Yet, "There is growing consensus that the mere release of data is not enough to realize the full potential of openness" [23].

3.2 Data Curation

To ground the project in locally relevant climate change and tourism issues, we engaged in a data curation process. We grounded our work on the Report on Climate in Trentino [2], published by the Local Agency for Environmental Protection in collaboration with the regional research institutions. This report is organized according to three main sections: i) Data about climate change in Trentino, ii)

Impacts on nature, and iii) Impacts on socio-economic sectors. The fourth author of this paper analyzed the information reported there and selected those related to tourism. First, she noted the general data about the effects of climate change on the Trentino landscape, which is one of the region's main assets. A few examples of this information are that the Careser glacier has lost 69% of its water mass since 1967, and the Marmolada glacier collapsed in 2022. Another extreme event was the Vaia storm in 2018, which caused the fall of many trees, landslides, and the spread of a bark beetle epidemic in the woods. Then, she continued the analysis, organizing the main challenges caused by climate change and their consequences on the different socio-economic sectors in an Excel spreadsheet.

Building on that information, we designed a storytelling website that leverages personas to represent different categories of people present in Trentino and affected by climate change, such as tourists, mountain professionals, residents, and nature. Afterward, we asked the Autonomous Province of Trento's Tourism and Mountain Heritage office to validate our concept. They approved it; still, they emphasized the need to balance serious communication of climate challenges with positive messaging about regional resilience and actionable steps for the audience. A helpful suggestion was to conclude each narrative thread with actionable tips based on the Strategy for Trentino Sustainable Development [1]. In the following section, we describe the data curation we conducted to populate each persona profile, the challenges we encountered, and the design decisions we made to overcome them.

3.3 Developing persona-based data stories

Among various storytelling strategies [24], we chose the personas method to narrate the impacts of climate change from diverse perspectives. Unlike testimonial-based approaches, which often rely on anecdotal evidence, personas are grounded in systematic research. They synthesize data from multiple sources to create credible, nuanced, and representative profiles. This made them a coherent methodological choice for our study, which aimed to start from data. Developed initially to represent user characteristics in technological design [7], personas have since evolved into research-based tools that support communication within design teams and across disciplines [25]. Leveraging this approach, we created five personas—four human and one non-human—each offering a situated lens on the local impacts of climate change.

The four human personas are the residents, the mountain hut manager, the mountain professional, and the tourist. In addition to the human perspectives, we wanted to include a more-than-human viewpoint to broaden the scope of the narrative and consider the impacts of climate change not only on human communities but also on the vulnerabilities of non-human entities, such as ecosystems, wildlife, and natural systems increasingly at risk. These five personas were chosen to represent the most affected eco-socio-economic sectors reported in the Report on Climate in Trentino [2]: water management, agriculture, human health, tourism, and biodiversity. In addition to the specific challenges of each sector mentioned in the report, the creation of the personas was based on the availability of data and narrative elements about those actors. To this end, the authors relied on other first-hand studies like interviews with mountain hut managers, newspaper articles, datasets, and the local network of experts in the mountain fauna and flora.

While creating the personas, an issue about their level of characterization arose: we needed to balance the fictional characters' verisimilitude to ensure plausibility and representativeness of their category without creating ambiguity in the audience about their actual existence. We explicitly stated that the characters depicted in the prototypes were fictional constructs, not real-life testimonials. To mitigate the risk of misidentification, we avoided using images of real people and carefully crafted the personas' profiles—especially those of the hut manager and the professional—by balancing detail and abstraction so they could not be traced back to actual individuals in Trentino. In the following paragraph, we explain how each persona was created and which data was used to make them plausible for the Trentino context.

Residents. The residents had to embody the challenges climate change and overtourism present to people staying in urban areas for a prolonged time and, as such, could not be represented by any other persona. The challenges assigned to them were: i) Greater tourist flows towards mountain resorts characterized by cooler temperatures (Tourism); ii) Increased risks of spring frosts linked to the early vegetative recovery and an increasing demand for water for the operation of frost protection systems (Agriculture); iii) Mainly in summer, conflicts over water use (drinking, storage, agriculture); iv) Increase in allergic diseases due to the higher concentration and duration of pollens and allergens (Health). Conversely, as an opportunity, climate change allows them to grow vegetables and fruits typical of the Mediterranean climate (Agriculture). This persona was personified by a young couple working from home and living in Val di Fiemme, a valley often congested by tourists in transit to reach the nearby valley, Val di Fassa.

Mountain Hut Manager. Mountain huts managers were selected as a persona since they are the so-called *keepers of the mountains*. By working at high altitudes during summer months, they have a privileged point of view on the impacts of climate change and overtourism in an arduous and already scarce-resource environment. Climate change poses 3 main challenges to them: i) Shrinking glaciers and degradation of permafrost increase instability, causing more landslides and mudflows (Nature); ii) Decrease in the availability of water resources (Nature); iii) Increase in tourist flows in search of cooler temperatures (Tourism). And one opportunity: milder mountain temperatures are extending the summer tourist season. We made Andrea, a 53-year-old mountain hut manager from Val Rendena, impersonate the lived experience of these effects.

Mountain Professional. Ski instructors, mountain guides, and environmental guides are the reference points for tourists who want to experience the mountains fully and safely. They accompany people on walks or other sports activities, explaining the territory and keeping them safe. Climate change poses them three main challenges: i) Reduction of snow and length of the winter season, which increases the demand for water by ski areas for snow production (Energy); ii) Altered usability of the relevant environments from a landscape and naturalistic point of view, such as glaciers and forests (Nature); iii) Changes to the landscape due to the rise of vegetation bands (Nature). And again, the opportunity of milder mountain temperatures that extend the summer tourist season (Tourism).

These climate change effects led us to create Anna, a 38-year-old instructor, who teaches skiing and downhill mountain biking in Val di Sole.

Tourist. Tourists are at the same time the cause and the victims of overtourism. Climate change poses 3 main challenges to them: i) Increase in tourist flows in search of cooler temperatures (Tourism); ii) Modification of the usability of environments that are relevant from a landscape and naturalistic point of view, such as glaciers and forests (Nature); iii) Increased spread of infectious diseases and zoonotic diseases, particularly vector-borne (mosquitoes and ticks) (Health). And one opportunity: milder mountain temperatures are extending the summer tourist season. Our tourist persona is Federico, a 42-year-old lawyer from Milan.

The More-than-Human Persona. To develop a more-than-human perspective, we were inspired by the methodology proposed by Tomitsch et al. [30], according to whom we should rely on literature, expert insights, and observations to define species-specific behaviors and needs. Our initial selection of possible perspectives included: i) mountain fauna: marmots, golden eagles, and vipers were considered good candidates to illustrate local biodiversity at risk ii) the water cycle: elements such as glaciers and snow were explored to highlight their critical ecological functions and vulnerabilities, leveraging the glaciological expertise present in the area, iii) forests and flora: specific plant species, including spruce (affected by bark beetle infestations), larch, and edelweiss, were examined to underscore their ecological significance; iv) mountains: a perspective centered on the mountains themselves was considered, emphasizing their geological history, resilience, and contemporary challenges. Following these initial considerations, experts from the local natural science museum were consulted to provide reliable, data-driven insights into the impacts of climate change on the local wildlife. They suggested focusing on an alpine bird species, the Alpine (or Snow) Finch (Montifringilla Nivalis), extensively studied by a biology researcher at the natural museum. This decision enabled a scientifically grounded and ecologically meaningful representation, thus ensuring the credibility and accuracy of the more-than-human perspective within the platform. The fourth author conducted a semi-structured interview with the expert researching the Alpine Finch to identify the main aspects to be communicated. Afterward, the researcher's scientific knowledge of the complex ecological dynamics was translated into accessible and compelling narrative elements to convey the Finch's challenges.

4 Stories from the Peaks: The Data Storytelling Prototype

The data storytelling prototype was developed as an interactive experience, utilizing Shorthand (https://shorthand.com/), a platform enabling dynamic content presentation. Shorthand was selected due to its ability to support visually rich, scroll-based storytelling without requiring advanced coding skills, which allowed for rapid prototyping within the project's time and resource constraints. Its built-in tools for multimedia integration and responsive design were well-suited to our goals of accessibility and engagement. In particular, the platform's features—such as smooth transitions and modular story structures—enabled a balance between narrative flow and data-driven content, facilitating the integration of interactive charts and explanatory videos, which enhanced the visual representation of the data, making the narrative both engaging and immersive.

As shown in Figure 1, the web prototype was structured into three sections. The homepage contextualizes the scope of the platform and introduces key climate change effects by showing trends about local temperature and extreme meteorological events, snow precipitations, glaciers melting, and tourist flows. Then, at the bottom of the homepage, the user is invited to select one of the five points of view on what climate change's effects can entail. These perspectives highlight the interconnectedness of environmental, social, and economic factors, offering a nuanced understanding of the challenges faced in alpine areas. Each persona's section includes a personal story, contextualizing their lived experience, followed by specific climate-related challenges that impact their daily lives and livelihoods. As represented at the end of Figure 1, each perspective section is further supported by practical tips and the sources on which our storytelling is based, ensuring that, besides engaging with compelling narratives, users feel empowered to take action and deepen further their knowledge of the climate-related problems of Trentino. Through a selector, it is always possible to switch to another perspective, whether the exploration of the current perspective is complete or not.

5 Evaluation

With the evaluation, we aimed to assess three main aspects of the prototype: i) The overall user satisfaction, including the prototype usability aspects; ii) The effectiveness of data storytelling in improving users' understanding of the effects of climate change in Trentino; iii) The emotional impact of the narrative parts in raising awareness about climate change and overtourism. We used a scenario-based think-aloud methodology, where participants interacted with a predefined context and verbalized their thoughts and emotions during the process. The data were collected using a separate observation grid for each participant, which was structured to take note of the section of the website the user was exploring, their verbalized thoughts, emotions expressed, difficulties, and general notes from the observing researcher. Furthermore, each session was audio-recorded as a backup for later analysis. After each think-aloud session, semi-structured interviews were conducted to explore participants' prior knowledge, the clarity and impact of the platform's content, emotional responses, and overall engagement with the narrative.

The study involved 11 participants: 7 women and 4 men, aged between 23 and 56 years. The group included 4 long-time residents of Trentino, 6 new residents (i.e., people living in Trentino for less than 3 years), and a tourist who regularly visits Trentino in winter. According to their profile (i.e., long-time resident vs. new resident/tourist), participants were assigned a brief textual scenario to read before interacting with the prototype to help them imagine why they would find themselves navigating such a prototype and the context in which the interaction might occur. Eight participants navigated the prototype using a PC, while 2 completed the evaluation on a tablet. In the next section, we report the main results from this evaluation.

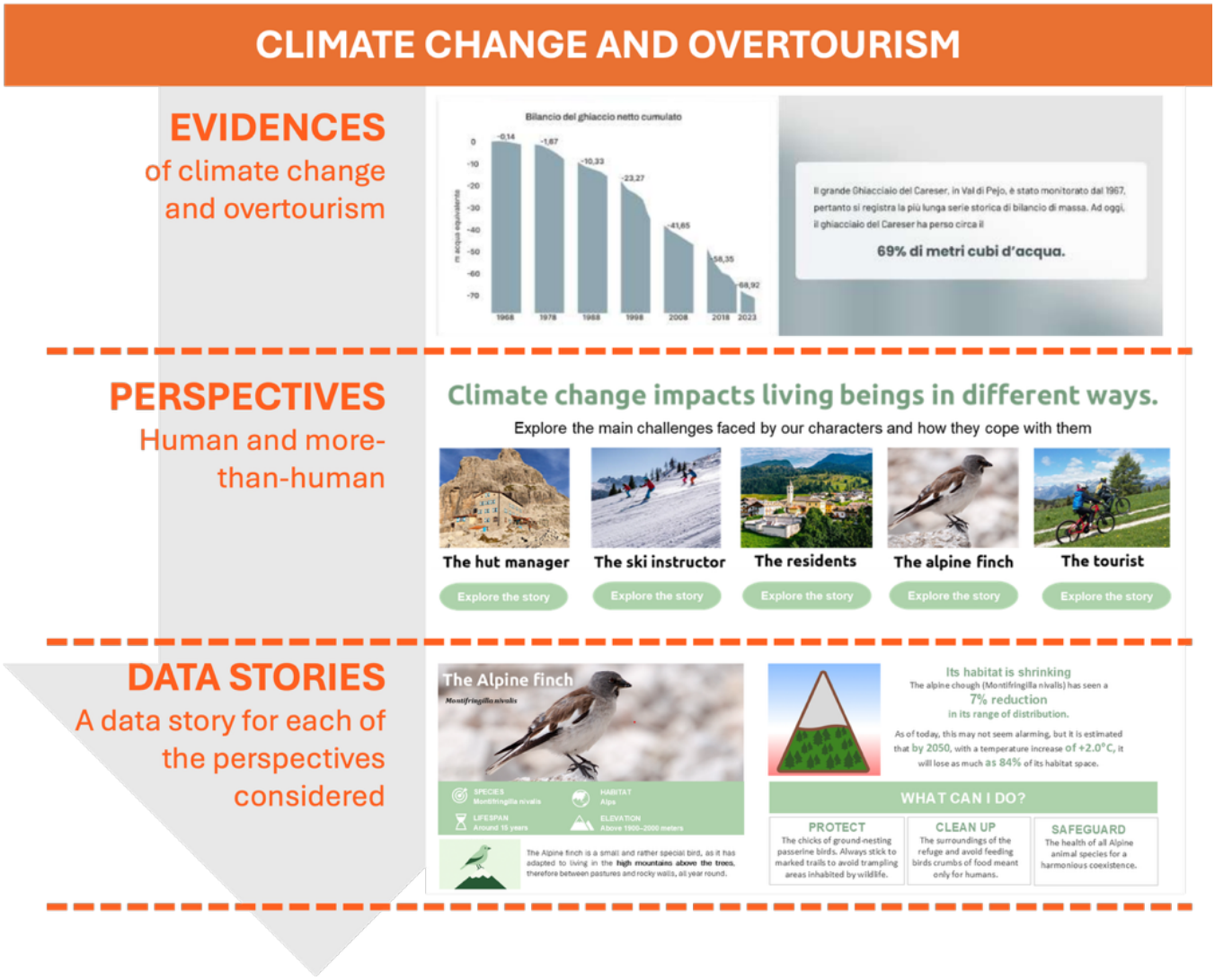


Figure 1: Architecture of the "Stories from the Peaks" prototype.

5.1 Results

Overall satisfaction. All participants appreciated the website's ease of navigation and interactivity, which helped enhance engagement with the narrative. As for the content, participants generally found it well-structured. However, some struggled to connect climate change and tourism, as these topics were not directly linked on the homepage. Some felt the tourism-related information was unnecessary, while others found it clearer after exploring the "residents" section. During the think-aloud sessions, participants expressed a range of emotions, especially concern, anxiety, or eco-anxiety, mainly tied to the content, not the presentation style. The platform's tone was perceived as informative and neutral, grounded in data rather than opinions. The actionable tips at the bottom of each page were generally perceived as motivating: "I like that it is written what I can do" (P9), but it was sometimes too generic. For example, when reading "protect all animal species", they wished to have links to real-world organizations they could engage with. As for the combination of different visual styles to convey information, user feedback was mixed. While the visual storytelling and interactive components were praised for their compelling content, some data visualizations were unclear. We observed some difficulties from participants in understanding graphs and the data represented (such as the Climate Stripes or mass loss of the Careser glacier), which, at times, have been also clearly stated by participants: "To make the graph clearer, especially for those who are not familiar or who don't know about the Climate Stripes, it would be helpful to include a note explaining that the blue [stripes] indicate a relatively smaller change, while red [ones] represent a significant increase, and that the difference is measured against the pre-industrial thirty-year period" (P4).

Familiarity with the topic and website effectiveness in conveying new awareness. All participants stated that they were aware of

climate change in the region and considered themselves familiar with the mountain environment, with most residents reporting a medium-to-high familiarity, while tourists generally showed a medium-to-low level of familiarity. However, all but one were unfamiliar with the socio-economic impacts and detailed information about the environmental impacts presented by the website. The most memorable elements for participants were the Alpine Finch, due to its novelty, and the data related to the temperature increase in Trento and the mass loss of the Careser glacier. The glacier and temperature data left the strongest impression, with participants remembering figures like +2.2°C or −69%. Ultimately, all reported learning something new about climate change and its impacts in Trentino.

Perspective-guided navigation. After exploring the initial section on climate change in the region, participants proceeded to the part presenting the different perspectives. This section was particularly well received, as it allowed them to be guided by their curiosity, grasp the diverse impacts of climate change, and empathize with the personas. In the words of P2: "Viewing all these perspectives makes me realize that each category has a different perception of what climate change impacts may be". Despite the interest, some participants found it difficult to determine whether the personas representing each perspective were real Trentino inhabitants participating in an awareness campaign as testimonials, or fictional characters. P4 suggested adding a note stating that the personas were not representing actual people: "It would be advisable to make it explicit or include a note stating that these are not real people but fictional ones, or that they are representative individuals with fictitious names…". Although this information was provided on the homepage, repeating it on each persona's page could help prevent confusion during interpretation. Moreover, the perspectives induced different levels of identification in the participants. Some of them looked for the personas representing their role in the territory. For example, when choosing the first perspective to navigate, P6 says, "So, let's start with the residents... I am one of them, therefore I'm interested..." and later, "It is clear that the story is useful to put yourself in the shoes of the category members". Others found it difficult to relate due to the demographic characteristics we assigned to the persona. This is the case of P3, who expressed difficulty in experiencing the storytelling from the point of view of the tourist because of gender issues: "Well, I am a female… I do not feel represented by Federico, who is a 42-year-old man..." (P3). The least selected perspective was that of the mountain professional, while the most frequently chosen perspective was that of Alpine Finch, selected by 8 out of 11 participants, with 4 participants selecting it as the first perspective to explore (P3, P5, P7, P9). Introducing a lesser-known animal species as a narrative lens was widely praised, especially because it brought a fresh and uncommon perspective toward a more inclusive view of climate change: "I enjoyed seeing things from the point of view of both people and animals. It was the first time (...) I had never seen this kind of trick to create empathy or to better understand certain concepts" (P0), or "Ah! The Alpine finch (...), I'm very interested because it's a different point of view. I want to look into it further" (P9). Some participants expressed a desire for other stories about endangered species and organisms actively transforming ecosystems, such as the bark beetle.

6 Discussion

Our work explored how data storytelling can foster engagement and emotional connection to the fragility of mountain ecosystems in the context of climate change. We designed the prototype *Stories from the Peaks* to represent the diverse local impacts of climate change through data-driven, embodied narratives. Although preliminary, our study confirms the potential of data stories to effectively communicate climate change's impacts. By grounding narratives in localized climate data and embedding them in human and more-than-human perspectives, our findings suggest that participants not only gained a clearer understanding of climate-related challenges but also developed a more situated and affective connection to the issues at stake. In the following, we discuss the findings of this analysis, reflecting on tensions and outlining research implications for designing data stories that are locally grounded and that include different voices.

6.1 More-than-human Data Stories

Participants valued data's pluralistic and embodied representation, highlighting the importance of designing tools that give voice to diverse viewpoints and agents—human and beyond. Integrating a more-than-human perspective proved effective in generating interest and engagement—indeed, it was the most frequently selected by participants. This points to the possibility of raising engagement toward the impact of climate change through emotional engagement. Animals have long served as powerful mediators for fostering empathy, emotional engagement, and connection with the public, and our findings align with previous research showing the potential of narrative storytelling focused on animals. For example, Małecki et al. [20] demonstrated that participants exposed to first-person narratives from the perspective of animals reported significantly higher levels of empathic concern. Whitley et al. [31] found that animal portraiture evokes emotional responses, fostering empathy and a sense of personal connection with animals. This aligns with HCI research, which found that using a non-human perspective, such as whales in an interactive data story, enhanced participant engagement with climate impacts [14]. This finding also resonates with Boros et al. [6], who introduce data-centric personas representing non-human agents that articulate the needs, goals, and challenges of species or natural processes during placemaking activities, making non-human stakeholders more relatable and visible.

Implications and lessons learned: Transforming abstract narratives into emotionally resonant stories can counteract climate change disengagement. This perspective not only broadens the focus beyond the human but also serves as a powerful communicative strategy for fostering empathy. This pluralistic approach challenges anthropocentric frameworks and expands the scope of climate communication by acknowledging the agency and vulnerability of more-than-human life, helping audiences connect abstract climate data to tangible, empathetic experiences. However, to effectively design reliable data-driven narratives from more-than-human viewpoints, it is essential to carefully select the entities represented, deeply understand their behaviors, and consider how these are changing in response to climate change. This calls for more substantial involvement of experts in natural sciences, such as ethologists and

other representatives of the natural world, to help translate scientific findings into accessible, meaningful data and compelling narratives.

6.2 Embedding Perspectives: Balancing Realism and Fictional Features

Stories are brought to life by characters, who are those making a story engaging and enjoyable. Defining fictional characters grounded in scientific data presented a challenge because we faced the need to balance authenticity and storytelling. We employed the personas method [7] to design the different perspectives because it aligns with our approach of constructing diverse data-based perspectives, i.e., relatable narratives that connect complex data with human experiences. We hypothesized that perspectives represented through personas might offer a balanced compromise between realism and fiction: on the one hand, personas anchor narratives in real data and contexts; on the other, they provide the flexibility necessary to craft engaging and accessible stories that foster empathy and understanding. This choice raised some concerns among participants and made us reflect on how voices could be better developed to avoid this ambiguity and potential misunderstanding.

Implications and lessons learned: Embedding perspectives through carefully designed characters enables data stories to present complex information in an accessible and emotionally resonant manner, deepening the audience's connection to the data and its broader context. However, achieving this impact requires carefully balancing data fidelity and narrative engagement. Characters that are too realistic may come across as dry or impersonal, while those that lean too heavily into fiction risk undermining the story's credibility. Future work could further investigate how personas can be effectively used in data stories, anchoring them in real data while preserving enough narrative flexibility to ensure they remain relatable and engaging.

6.3 Action-oriented Stories

Each of our five data stories concluded with practical tips designed to empower users to take action on the challenges presented through each persona's perspective. This approach was suggested by the Autonomous Province of Trento's Tourism and Mountain Heritage office (our local government partner) and confirmed by findings from other studies emphasizing the importance of making data actionable to support pro-environmental behaviors [13]. Participants positively received this aspect and expressed a desire for even deeper, more actionable guidance. These responses led us to reflect on the potential of digital storytelling to act as a mediating artifact—bridging data and local engagement—by motivating citizens toward context-specific, pro-environmental behaviors.

Implications and lessons learned: Balancing data that creates alarm with an optimistic vision that aims for change, making the data actionable, supports the notion that climate change communication benefits from emotionally compelling, relatable storytelling. Our findings confirm that embedding practical, context-specific actions within narrative-driven data stories can enhance users' sense of agency and motivation. While the current prototype does not yet include direct connections to local initiatives or NGOs, our findings highlight this as a critical next step to strengthen the transition from awareness to action; integrating such links would provide users with concrete pathways for engagement and reinforce the potential of storytelling to drive localized, collective responses. This also highlights the need for HCI researchers to strengthen collaborations with associations and public bodies involved in concrete actions, environmental policies, and local interventions.

7 Conclusions

This paper explored how interactive data storytelling can help communicate the complex interrelations between climate change and overtourism in Trentino. By connecting scientific data to a specific local context and involving both human and more-than-human perspectives, we aimed to create a narrative that goes beyond abstract numbers and invites people to reflect on roles and opportunities in facing climate change. By weaving together diverse forms of knowledge, our work tried to build a richer, more accessible understanding of complex climate and environmental challenges, making them not only more relatable and comprehensible but also more actionable for multiple audiences. The design was based on principles of data humanism and feminist epistemologies, i.e., paying attention not only to the data itself but also to how it is presented and whose voices are included. This also helped ground the project in real-world concerns and perspectives, offering initial insights into shifting audiences from awareness to meaningful action.

8 Limitations and Future Work

The prototype was tested with limited participants who do not represent the full diversity of potential users regarding background, age, or familiarity with climate issues. Future research should involve a broader and more representative sample, allowing for a more profound and systematic evaluation of how localized, more-than-human data stories affect user understanding, emotional engagement, and behavioral change. Future work will explore ways to more strongly represent the interconnections between human and non-human actors—including fauna, flora, and entire ecosystems—across narratives, aiming to foster a more holistic understanding of the complex interdependencies that shape responses to environmental change. This includes tracing cascading effects, such as how rising temperatures influence vegetation patterns, water resources, and glacial dynamics, to illustrate how human and non-human behaviors adapt within these shifting ecological systems.

Acknowledgments

The authors would like to thank Dr Chiara Bettega for the valuable information she provided us about the Alpine Finch. The research presented in this article was supported by the NEVERMORE project (https://www.nevermore-horizon.eu/), which is funded by Horizon Europe Framework Programme, under the Grant Agreement No. 101056858.

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