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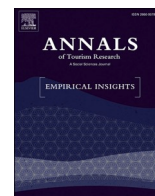
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When motivation follows the climate: Changing mountain environment influences motive constructs of recreational alpinists

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ABSTRACT

Alpinism, a high-risk and skill-intensive form of mountain tourism, is deeply intertwined with the mountain environment, making it a practice highly susceptible to the impacts of climate change. This study examines European alpinists' motivations and the impact of climate-driven landscape changes, like glacier retreat and increased hazards. Using a mixed-methods approach, the study combines a survey of 1071 alpinists with 30 in-depth interviews to identify key motivational constructs and how a changing climate influences these constructs. Results reveal that motives centre on the natural environment, social connection, the sporting nature of alpinism, and achieving iconic climbing objectives. The analysis highlights the emergence of a "last-chance to climb" motive, driven by disappearing or increasingly inaccessible routes due to climate change.

1. Introduction

Why do people climb mountains? In March 1923, when a New York Times journalist asked George Mallory to explain why he wanted to climb Mount Everest, he famously replied, "because it is there".¹ Since the inception of the practice, scholars and writers alike have sought to understand why individuals risk their lives for the pursuit (e.g., Amy, 2020; Ewert, 1985). The motives to engage in climbing a mountain have sometimes been considered futile, a sentiment echoed by the title of the famous book by Lionel Terray (1961), "Conquistadors of the Useless".² These motivations are far from simple, encompassing a complex interplay of physical challenge, personal fulfilment, and a deep connection to the natural environment (Galiakbarov et al., 2024). Despite some insights into what drives individuals to climb mountains, their underlying motivations and the factors influencing them remain poorly understood.

Yet, the motivations for participating in adventure tourism activities more broadly have been studied for decades and are often categorized into "soft" and "hard" activities (Pomfret & Bramwell, 2016). "Soft" activities are considered lower-risk, require less technical skill, and attract a broader range of participants (Rantala et al., 2018), including

hiking, biking, and trekking. In contrast, "hard" activities are characterized by demanding more advanced skills and greater commitment and are pursued by a smaller, more specialized group of people (Gross & Sand, 2019). Mountaineering and alpinism, though often used interchangeably, represent distinct facets of hard adventure tourism activities, both with the shared goal of reaching the summit of a mountain (Blake, 2022). Mountaineering broadly encompasses activities involving the ascent of mountains, often blending scrambling and technical climbing practiced in diverse environments ranging from moderate hills to high-altitude snow and ice-covered peaks. Meanwhile, alpinism, a subset of mountaineering, specifically refers to more technical climbing that demands a high level of physical fitness, technical skill, mental resilience, and commitment to a "light and fast" style of climbing in more risky, complex, and exposed environments (UNESCO, 2019).

Although it is difficult to quantify participation in alpinism due to its largely informal nature, estimates suggest there are around 700,000 active alpinists in France, Switzerland, and Italy alone (UNESCO, 2019). Despite this, evidence indicates a potential decline in participation, and while mountain tourism has experienced a resurgence in popularity since the COVID-19 pandemic (Pröbstl-Haider et al., 2023), this growth

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¹ Article from the New-York Times published on 18 March 1923. Available here: <https://graphics8.nytimes.com/packages/pdf/arts/mallory1923.pdf>

² Translation of the original title "Les conquérants de l'inutile".

appears concentrated in soft recreational activities at lower altitudes, such as hiking and skiing, rather than in mountaineering and alpinism. Supporting this trend, a recent study found that summer visits to mountain huts in Switzerland, commonly used by mountaineers to prepare for ascents, declined by 11 % between 1995 and 2019 (Mourey et al., 2023). This decline is particularly significant given the overall expansion of outdoor and adventure tourism during the same period (Sand & Gross, 2019). Despite alpinism's symbolic importance to mountain tourism, encompassing the economic contributions of mountain guiding and the equipment industry, the sport itself, and especially the motivations of its participants, remains under-researched.

This lack of understanding is compounded by the fact that the motivations behind climbing mountains and the associated safety of doing so, have become increasingly complex and critical in light of the profound impacts of climate change (Mourey et al., 2022). Warming temperatures have accelerated glacier retreat, destabilized permafrost, and increased rockfall hazard, fundamentally altering the landscapes and risks associated with climbing (Purdie et al., 2015; Ravanel et al., 2017; Ritter et al., 2012; Watson & King, 2018). Alpinism, in particular, appears to be disproportionately affected by climate change compared to other mountain tourism activities, likely due to its intricate relationship with and reliance on technical mountainous terrain. For instance, summer temperatures in the Alps have increased by around 2 °C since pre-industrial times, resulting in a large reduction in glacier volume since 1850 (Sommer et al., 2020) and subsequent changes in the mountain landscape, including moraine destabilization, permafrost degradation, increased rockfall, and the widening of crevasses, which have not only altered the physical feasibility of climbing but also increased safety concerns (Mourey, Marcuzzi, Ravanel, & Pallandre, 2019).

In some cases, these changes have even led to the disappearance or significant alterations of well-established climbing routes (Mourey et al., 2022). In response, mountain guides in France (Mourey et al., 2020), Canada (Rushton & Rutty, 2023), the United States (Voorhis et al., 2023), and Italy (Salim et al., 2019) are starting to change the way they work to cope with increased uncertainty and changes in route conditions. In the Canadian Rocky Mountains, changes in the mountain environment have already placed increased pressure on early-career guides compared to those with more experience, as they face greater challenges delivering the same level of service due to increasingly hazardous conditions (Hanly et al., 2023). These transformations have also influenced climbers' motivations and behaviours, with some opting for alternative activities or safer routes (Rushton et al., 2025; Salim, Mourey, et al., 2023).

The profound environmental transformations in mountain regions brought about by climate change not only reshape the physical landscape of high-altitude climbing but also raise important questions about how these changes influence the motivations and behaviours of alpinists. However, while existing research has examined the general motivations of tourists in mountain environments (Pomfret & Bramwell, 2016) and mountaineers more broadly (Galiakbarov et al., 2024), the specific influence of climatic changes on recreational alpinists remains underexplored. This paper seeks to address this gap by identifying distinct segments of alpinists and exploring their motivations to climb in the context of a changing climate. Segmentation analysis appears to be important to identify potentially different profiles of alpinists in this diverse population and to understand specific changes in their motivations.

2. Literature review

2.1. Motivation in mountain recreation and tourism

Key motivational factors of participants in rock climbing, kayaking, and canoeing reveal three primary motivational factors: (1) 'social', characterized by the desire to be part of a group and to develop

friendships; (2) 'sensation-seeking', encompassing the pursuit of risk and the experience of exhilaration in challenging landscapes; and (3) 'self-image', defined as the aspiration to demonstrate skills or to be perceived by others as an adventure recreationist (Ewert et al., 2013). Similarly, qualitative interviews with experienced participants in adventure sports, including river surfing, mountain biking, kayaking, mountain climbing, and hand gliding, revealed that the primary motivations for engaging in these activities are the achievement of a goal, the desire to take risks, social motivation, the need to escape from boredom, the urge to test one's limits and overcome fear, and the desire to connect with the natural environment. Additionally, the participants reported experiencing a sense of pleasure derived from bodily movement and physical exertion (Kerr & Houge Mackenzie, 2012). These motives were also shown by other studies, adding the sense of achievement, personal growth, escape, autonomy, and the importance of the flow (Ewert et al., 2020; Pomfret & Bramwell, 2016).

While motivations in outdoor recreation and adventure tourism have been studied, much of the existing research has focused on soft and more accessible activities, such as hiking or kayaking (Pomfret & Bramwell, 2016). However, recent research by Galiakbarov et al. (2024) highlights the unique motivations driving experienced alpinists, including a deep sense of calling, the pursuit of mindfulness, self-actualization, and the desire to re-live past climbing experiences. These findings emphasize that alpinists often see climbing as a core part of an individual's identity. Yet, despite alpinism's symbolic importance in mountain tourism (Apollo & Wengel, 2021), the history of human ambition, and the sports' vulnerability to climate change, alpinist's motivations remain under-explored, particularly in terms of how motivations are affected by external factors such as climate change.

Research has shown that recreational or tourist adaptations to disrupted activities can take various forms, including spatial, temporal, informational, activity-based, or strategic approaches (McCreary et al., 2019; Rutty et al., 2015). In the context of glacier tourism, climate change has been found to influence tourist motivations, which are primarily driven by the desire to experience the environment, a sense of discovery, and social bonding (e.g., Salim, Mayer, et al., 2023; Stewart et al., 2016). Additionally, this motivation often includes the notion of "last-chance tourism," where individuals are compelled to visit a destination before its features are permanently altered or disappear altogether (Lemieux et al., 2018). This concept, developed by Lemelin et al. (2010), refers to the motivation tourists have to see and experience a feature in a destination before its disappearance, which correlates with an individual's perception of the extent and impact of climate change (Salim & Ravanel, 2020). This concept is particularly relevant in the context of alpinism, where perceptions and the extent of environmental degradation in mountain landscapes may drive some individuals to climb a route before it disappears (Hanly & McDowell, 2025).

Recent exploratory studies underline the acute awareness among alpinists regarding climate change's impact on climbing routes, prompting many to adopt substitution and adaptation strategies (Rushton et al., 2025; Salim, Mourey, et al., 2023). These studies also reveal that while climbers recognize the influence of climate change on their motivation, the precise nature and extent of this influence remain underexplored. Given the increasingly precarious conditions of climbing routes caused by climate change, understanding alpinists' motivations is critical to capturing the evolving dynamics of this activity. By examining how adaptation behaviours align with motivations, valuable insights can be gained into the future trajectory of alpinism in a warming world.

2.2. Theoretical aspects and means-end chain

In the psychological literature, motivation can be defined as what people want and is a state of desire for change that drives behaviour. In other words, motivation is the process that gives behaviour its energy, direction and persistence (Reeve, 2018). The literature distinguishes between motivation, which is the process that motivates a person to

behave (e.g., in tourism, motivation is the process by which a tourist makes a decision to choose a destination) and motives, which are the specific reasons that explain a particular behaviour (Crompton & Petrick, 2024). Crompton and Petrick (2024) suggest that eight constructs explain tourism behaviour, which are inherently personal (i.e., curiosity, boredom, alleviation, disinhibited play, biophilia replenishment and stress reduction) and relational (i.e., ego-enhancement, bonding with family and friends, and expanding social network).

The primary theoretical framework underlying the tourism motivation literature is the push-and-pull theory, which suggests that tourists undertake exploratory journeys driven by a mix of intrinsic and extrinsic factors (Dann, 1977). This framework, along with the associated motivation scales (e.g., the Leisure Motivation Scale developed by Beard & Ragheb, 1983; and the Recreation Experience Preference scale by Manfredi et al., 1996), is further supported by the means-end chain theory and the laddering technique, which allow for an in-depth exploration of both concrete and abstract aspects of specific motives (McDonald et al., 2008). The extant literature on nature-based tourism highlights key motives, such as appreciating the scenery, the relationship with the environment, the prestige associated with the activity, the physical exertion involved, and the novelty of the experience (Mehmetoglu & Normann, 2013).

In outdoor recreation, a behavioural approach has been employed to ascertain the needs and goals individuals pursue when engaging in such activities (Driver & Toucher, 1970). Means-end chain theory, developed in marketing research, postulates that behaviour is driven by the value the individual is seeking to achieve (McIntosh & Thyne, 2005). In this framework, *attribute* is the characteristic of the object (i.e., a product, a goal or an activity), *consequence* reflects the result of using the object, and *value* is a belief that a way of behaving or an end state of existence is preferable (McDonald et al., 2008). These three dimensions are hierarchical in terms of their levels of abstraction. Previous studies (e.g., Aebli, 2019; Klenosky, 2002) have shown that this theory is useful for understanding and deepening the motive construct in tourism, which is the focus of this study. However, these frameworks have rarely been applied in high-risk contexts or hard adventure tourism activities, such as alpinism, where environmental risks and landscape change play a critical role.

Building on the literature reviewed, this paper explores how climatic changes in the mountain environment may influence alpinists' motivations. The research question guiding this study is 'What are the motivational constructs of recreational alpinists, and how are they shaped by their perceptions of climate change?'. This primary research question is further explored through the following sub-questions:

1. What are the distinct segments of alpinists, and how do their perceptions and motivations differ in the context of climate change?
2. How does the perception of route degradation and increasing risks due to climate change influence the overall motivation and route choices of recreational alpinists?
3. What factors contribute to the emergence of the 'last-chance to climb' construct, and how does it interact with broader motivational drivers?

3. Research design

This research adopts a multi-paradigm framework (Flint, 2016) that integrates positivist testing with constructivist understanding (Creswell, 2009) through a mixed-methods approach. The positivist component is based on a quantitative survey that aims to identify alpinists' motivations and segment participants into clusters based on their practices, perceptions of environmental change, and motivations. These segments form the foundation for the constructivist phase, which involved qualitative interviews that explored alpinists' lived experiences and how they construct meaning around their practices and relationships with a changing mountain environment. Using a constructivist paradigm is

consistent because it enables exploration of how individuals make sense of their actions (Avenier, 2011). This mixed-method approach ensures that diverse perspectives are captured and analyzed, providing both structured data from the survey and deeper insights from the qualitative exploration. Such research is particularly timely given the rapid transformations occurring in high mountain ecosystems.

3.1. Quantitative method

3.1.1. Survey design and implementation

The survey is part of a larger research project focusing on the impact of climate change on alpinism in Western Europe. The questionnaire was designed to explore motivation using the Recreation Experience Preference (REP) scale developed by Manfredi et al. (1996), complemented by constructs from the literature for assessing last-chance and different sport-oriented motivations (Alexandris et al., 2009; Salim, Mayer, et al., 2023). The motivation part of the survey is composed of 23 Likert-scale questions (1 = not important at all; 5 = very important). The remaining parts of the survey consisted of 53 questions covering topics such as climate change perceptions (based on Howe et al., 2015; 4 questions), alpinists' perspectives on climate change (based on Mourey, Marcuzzi, Ravanel, & Pallandre, 2019; Mourey, Ravanel, & Lambiel, 2022, 16 questions), potential substitution and adaptation behaviours (based on McCreary et al., 2019; Mourey et al., 2020; Salim et al., 2019), 11 questions), and socio-demographic and praxis experience (based on Salim et al., 2019, 22 questions).

Due to the informal nature of the communities in the European Alps, an online survey was distributed in German, French, English and Italian on general and specific social media platforms, using Limesurvey software. Facebook groups related to alpinism were the main medium, searched using the keywords "alpinism", OR "alpinist", OR "climb", OR "climbing", OR "climber" in each language available for the survey. This resulted in 39 groups with 498,127 users to whom a request was sent with a brief explanation of the purpose of the study and an invitation to participate via a link. As a result, 33 of the 39 groups identified agreed to be included and to submit the request. The administrators of the remaining six groups declined the survey. Simultaneously, the survey was sent to specific websites, including popular alpinism community platforms in France (camptocamp.org), Italy (gulliver.it) and the German-speaking part of the Alps (Germany, Alemannic Switzerland and Austria; hikr.org). Members were informed of the study and invited to take part. The survey period was from August to December 2022. Two months after the initial invitation to participate, a reminder was sent to each group.

The distribution resulted in a total of 3157 questionnaires. Only questionnaires completed until the end were included in the analyses. This resulted in removing 552 incomplete questionnaires from participants who did not go to the last page (17.5 %) and 1534 questionnaires where participants stopped on the first page (48.6 %). The final sample consisted of 1071 completed questionnaires.

3.1.2. Analysis

Statistical analyses were conducted using SPSS v.29.0.2 and R. In addition to descriptive statistics, exploratory factor analyses were conducted to reduce the number of variables for each construct included in the segmentation analysis, namely, motive constructs, perspectives on climate change and alpinism, and adaptation and substitution behaviours.

A latent class analysis was used to identify different segments of alpinists, which is a useful tool for analyzing multivariate categorical variables, particularly in segment cases (Nylund-Gibson & Choi, 2018) that has been widely applied in environmental (Sacher et al., 2022) and recreational studies (Kemperman, 2021) to identify unobserved subgroups within populations. It assumes that a population consists of segments with different preference structures, distinguishing it from cluster analysis. The statistical model behind the latent class analysis

seeks to uncover a latent categorical variable (X) explaining the differences between observed polytomous variables (L) (Linzer & Lewis, 2013). The model selection involves comparing information criteria (IC), such as Akaike Information Criterion or Bayesian Information Criterion, with lower values indicating a better data fit (Train, 2009). We applied the R package poLCA (Linzer & Lewis, 2013) to segment alpinists.

3.1.3. Qualitative method

Participants in the quantitative survey were offered to provide their email addresses so they could be contacted for a semi-structured interview. Of the 1071 completed surveys, 471 (44 %) provided an email address. Based on the results of the analysis, and to explore the motivational construct in each of the identified alpinist segments, 172 invitations were sent to participants (approximately 43 per segment) to request an interview. This resulted in 30 semi-structured interviews conducted online using Zoom between March 2023 and June 2024. The duration of the interview ranged from 22 to 90 min, with an average of 52 min (Appendix A). Saturation occurred at the 22nd interview (Creswell, 2009), with no new motives emerging, but to ensure validation, the process continued until the 30th interview.

The interview guide included questions about the profile of the alpinists (experience, type of practice, level, etc.), their perspectives on climate change and its impact on alpinism, how they substitute or adapt, and their motivations. The motivation part, based on the means-end chain theory, used the laddering technique (Klenosky, 2002). The interviewer first asked the participants to list their motives for practising alpinism. For each item listed, the respondent was asked to explain why the motive was important to them. This process continued until the respondent was unable to list any new reasons.

All interviews were transcribed and analyzed using MaxQDA software. Conventional content analysis was used with inductive category development (Hsieh & Shannon, 2005). This technique consists of coding the text to capture the key concepts for each construct (motive, perception, etc.). Each concept is then recoded to expand the understanding of the underlying construct (Kondracki et al., 2002). In this case, coding comprises four categories: (1) attributes, (2) consequences, (3) instrumental and (4) terminal values. Inductive category development was applied for each category, and the relationship between constructs was explored.

4. Results

4.1. Quantitative results

4.1.1. Construct preparation

Detailed results of the quantitative survey are reported in Appendix B. Exploratory factor analysis was used to group the motivational items and reduce the motivational dimensions. Items loading above 0.4 or cross-loading in different factors were excluded. The analysis results in seven factors explaining 54 % of the total variance (Appendix C), with a reliable Kaiser-Meyer-Olkin of 0.745 and a sig. <0.001 (Andy, 2013). All factors provided a reliable Cronbach Alpha of >0.600 (Nunnally & Bernstein, 1994).

The mean score for each factor shows that the 'environment' factor is the most important motive (4.49), followed by the 'sharing' factor (3.77) and the 'sport' factor (3.57). Below the mean score of 3 are the 'risk-taking' factor (2.62), the 'objectives' factor (2.58) and the 'last-chance' factor (2.12).

Several exploratory factor analyses were conducted to identify factors measuring the participant's perspectives on the impacts of climate change on the climbing route, the respondent's practice type and adaptation and substitution behaviours (results are detailed in Appendix C). In addition to the motivation factors, the results identified eight factors belonging to three dimensions used in the segmentation (see Table 1).

Table 1

Dimensions and factors resulting from the exploratory factor analyses and to be add in the latent class analysis.

Dimension	Factor	Meaning
Motivation	Environment	Reflects the desire to experience natural beauty, connect with nature, and enjoy the qualities of the environment.
	Sharing	Highlights the importance of social experiences, including spending time with friends and creating shared memories.
	Sport	Captures the motivation to stay fit, engage in physical activity, and challenge physical and mental performance.
	Freshness	Represents the appeal of being in a cool, refreshing environment, providing relief from heat
	Risk-taking	Reflects the thrill of facing challenges, stepping out of one's comfort zone, and confronting the forces of nature.
	Objectives	Focuses on climbing iconic peaks and following in the footsteps of historical mountaineering achievements. Emphasizes the urgency to complete routes or climb peaks before environmental changes make them harder or impossible.
	Last-chance	Includes rock climbing activities
Practice type	Rock-based	
	Ice-snow-based	Includes snow-ice and mixed routes
	Itinerary	Perspectives on climate-related route degradation
Perspective on the impact of climate change	Risks	Perspectives on climate-induced increased risks
	Rockfall	Perspectives on climate-induced increased rockfalls
	Informational	Increased use of information
Adaptation and substitution behaviour	Activity/Spatial	Change in activity and/or practice space
	Temporal	Change of practice season

4.1.2. Latent class analysis

The latent class analysis resulted in a four-class segmentation model. With an Akaike Information Criterion value of 57,020.18 and a Bayesian Information Criterion value of 59,881.58, this model is acceptable even though a three-class model exhibited slightly lower (i.e. better) indices. Nevertheless, the four-class model appears to offer a more insightful interpretation in the context of the research question. The following classes were identified in Fig. 1.

Class 1 (28 % of respondents) comprise individuals with the highest levels of motivation to climb. This group scores highly on the motivational factors of objective and sharing, as well as on last-chance motive, risk, and freshness. Members of this class climb more frequently and tackle higher levels of difficulty, even though they are not the most experienced group. They are highly aware of the impact of climate change on mountaineering and the high mountains. Members of this class employ all three adaptation strategies but score the highest for informational and activity/spatial coping. Additionally, they have the second-highest perception of climate change influencing their motivations. Given their high frequency of practice, level of difficulty, and emphasis on achieving objectives, this group is labelled as "core climbers".

Class 2 (7 % of respondents) is characterized by the lowest perception of the impact of climate change on mountaineering and alpinism, as well as the lowest level of concern about climate change. Members of this group also place little value on adaptation and substitution strategies. Despite this, they rank second in terms of climbing frequency and difficulty and score the highest for experience. They have the lowest scores for all motivational factors except risk-taking. Class 2 members report minimal influence of climate change on their motivations. Given

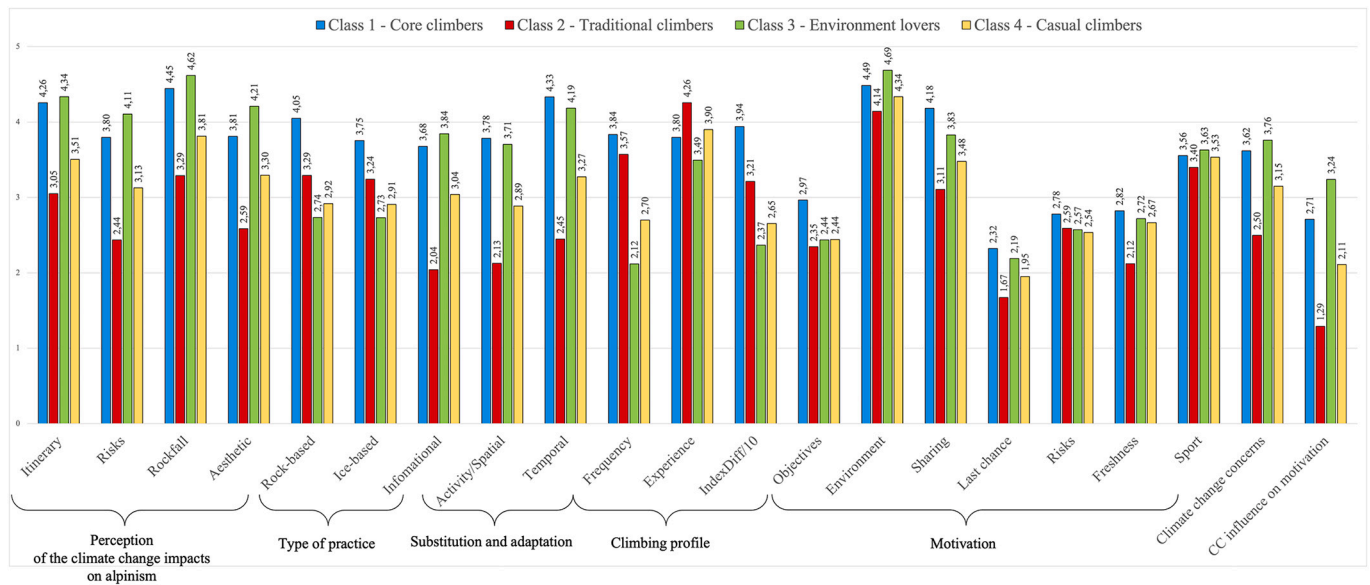


Fig. 1. Four latent classes of recreational alpinist segmentation model and means value of factors on which the classes are built.

their high level of experience combined with low adaptation behaviours, this group is labelled as “traditional climbers”.

Class 3 (34 % of respondents) is the largest group and is characterized by the highest levels of environmental motivation and awareness of the impact of climate change on mountains and alpinism. This group is also the most likely to use informational coping strategies. Members of Class 3 have relatively low climbing frequency, experience, and difficulty levels. However, they report the highest perceived influence of climate change on their motivations. Their strong environmental motivation, heightened perception of environmental issues, and deep concern about climate change have led to this group being labelled as “environment lovers”.

Class 4 (31 % of respondents) individuals are characterized by low last-chance and objective motivations. Members of this group have the second-highest level of experience and demonstrate moderate frequency and difficulty levels in their climbing practice. Their perception of environmental issues is moderate, and they primarily adapt through temporal substitution (adjusting the timing of their activities). Class 4 members report a moderate influence of climate change on their motivations. This group is referred to as “casual climbers”.

4.2. Qualitative results

Among the 30 interviews conducted, 10 belong to class 1 (33 %), 2 to class 2 (7 %), 7 to class 3 (23 %) and 11 to class 4 (37 %). The age of the interviewees ranged from 23 to 67 years, with 3 to 47 years of mountaineering experience. Females represented five persons interviewed (17 %) and males the remaining 25 (83 %).

4.2.1. Motive constructs and hierarchical map value

The laddering technique yielded 32 different motive constructs that fall into six motive categories (environment, sport, sharing, objectives, last-chance, self-determination). Compared to the quantitative results, the freshness motive did not emerge during the interview, and the items of the risk-taking factor rely on the identified self-determination motive. According to the connections made by the respondents between the different motives, four motivational paths can be identified based on the attributes of the activity: environment, sport, sharing and objectives (See Appendix D for further details on the motive constructs and their relationship to the quantitative results).

4.2.2. Environment pathway

The environmental attribute (Fig. 2) emerged as the most popular theme among respondents, mentioned in 25 of the 30 interviews. This attribute is closely associated with participants motivated to experience wilderness, solitude, and beautiful landscapes. Wilderness was described as the “manifestation of the forces of nature and the environment as it has not been overly affected by man” by one participant (AE3) and for many individuals, immersing themselves in the mountain environment is a long journey, offering a profound sense of disconnection and self-reflection. As AE4 explains: “I’d say it’s quite long, you get away from it all, you disconnect for a long time, it involves quite a bit of concentration, you’re really in your own bubble in fact.”

This immersion was seen to lead directly to satisfaction and pleasure but is also described as a way to engage in an adventure, by being in an unknown environment and trying to find a way to complete the itinerary, often described as a need to adapt to the mountain. Individuals noted that such experiences lead to better self-knowledge and the ability to react in difficult situations, offering both satisfaction and a broader perspective on life. AE10 illustrates this sentiment: “One time when I was really scared, when I came back down, I felt a bit insignificant at first, [...]. I did a lot of stupid things, but you have this feeling of telling yourself, it’s OK, after seeing that, you go back to work, what have I been through? Let’s just say that when you go back to real life, you’re much less scared, [...] things pass you by a bit, and as a result, you deal with them in a much more rational way.”

Results also showed that solitude plays a significant role, emphasizing the contrast between everyday life and the mountain environment. As AE29 notes: “You can be in the middle of a city of 500,000 people and an hour later you’re all alone. All alone. And that’s a real change of scenery, a [...] radically different atmosphere.” (AE29). This solitude is often described as a space of freedom, where individuals make their own choices and face the consequences. For many, this autonomy fosters progress, self-awareness, and a sense of independence not commonly found in daily life. AE22 highlights: “It’s one of the few environments where you have a lot of initiative in managing your route and your safety. You have a lot of initiative, and you have to make your own decisions. You are trained, but you manage your own safety. That’s something that has become very rare these days.” (AE22).

The mountain environment is also seen as an environmentally friendly space, contributing to participants’ satisfaction. The beauty of the landscape, characterized by light, peaks, and a sense of the sublime, is a recurring theme. Many respondents describe the mountain

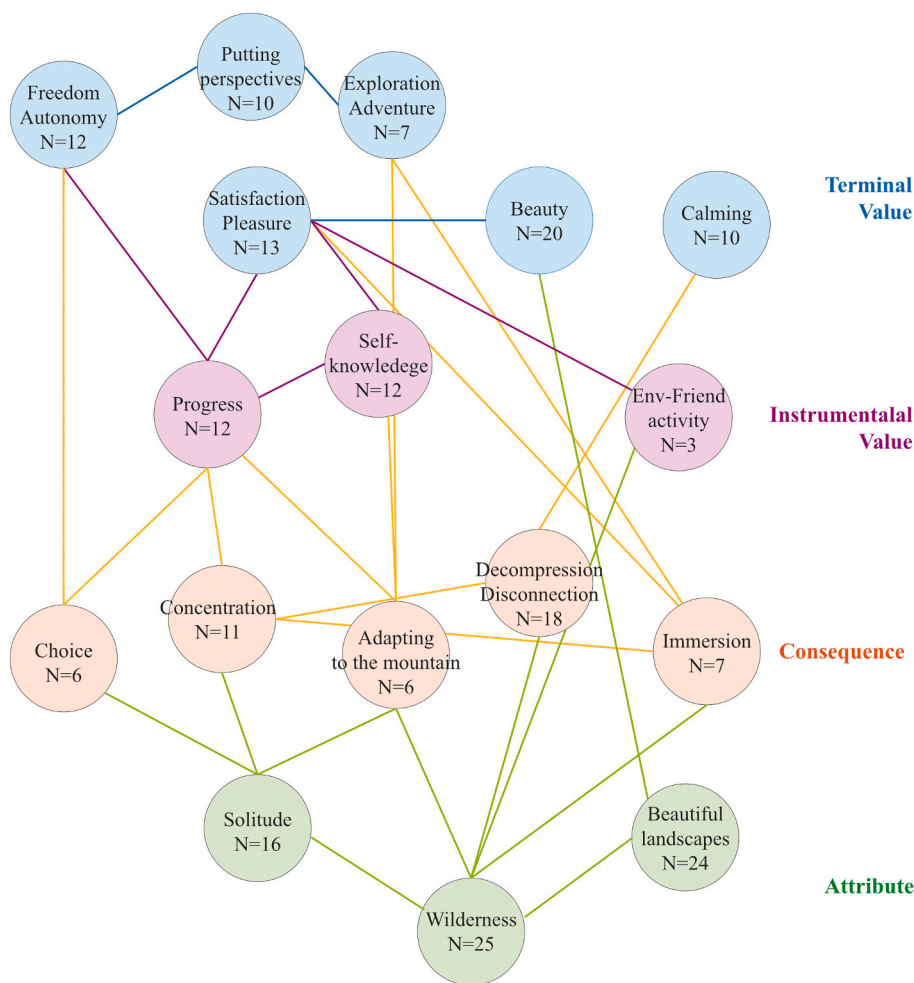


Fig. 2. Hierarchical value map of the Environment category.

environment as a fusion of the scary, impressive, and beautiful. As AE28 summarizes: “a hostile yet beautiful environment” (AE28).

4.2.3. Sport pathway

The sporting pathway (Fig. 3) captures the multifaceted nature of alpinism, blending physical, technical, and intellectual challenges that motivate individuals to participate in this demanding pursuit as noted by 23 or 30 respondents. The physical aspect of alpinism was associated with maintaining fitness and promoting good health, but it is also viewed as a personal challenge, a challenge that fosters learning, progress, and self-awareness. As AE4 explains: “[Now] I’m starting to get to know myself, I’m interested in the movements, the physical challenge, the challenge, not competing with the others but really seeing how I behave in certain passages, in certain places.”

However, the results showed motivations beyond just the physical realm. Alpinism as an intellectual and technical activity also necessitates making strategic choices to progress and manage risks. AE14 elaborates: “I’m not at all interested in taking risks. On the other hand, it’s interesting to manage them. To avoid them, to put yourself in a dangerous environment. And then, in the end, because we make choices, because we work together and put things in place, we manage to get around them and evolve in an environment that is hostile, with risks that are contained.”

The progress and choices involved in alpinism often feed a need for autonomy and freedom, as well as enhance feelings of satisfaction, prestige, and distinction. AE9 highlights this sense of uniqueness: “I’m not a masculine man, but in a way it’s special [to do alpinism]. Not everybody climbs mountains. There are lots of them, but even so, the average

person doesn’t climb.”

The sporting attribute of alpinism is also described as a way to achieve a sense of disconnection through focused concentration. These experiences not only lead to a satisfying feeling of progress but also have a calming effect on some participants. Finally, the physical nature of the activity is often described as involving specific and technical movements which fulfill a need for beauty. AE10 captures this sentiment: “When you make a beautiful move in climbing, [...] sometimes you feel you’re doing well, sometimes you have only one hand, you feel the balance is there, [...] you feel your body well, you feel your balance, and sometimes there are just beautiful moves.”

4.2.4. Sharing pathway

The attribute of social interaction (Fig. 4) was mentioned by 17 of the 30 respondents. Except for solo climbing, most respondents cited the relationships they form with their companions as a key motivation for climbing. Many respondents argued that climbing with someone in a wilderness environment fosters strong bonds, as it allows climbers to quickly understand how others behave and react in challenging situations. This process also raises self-awareness and deepens knowledge of their own reactions. AE4 captures this sentiment: “I like the spirit of the rope party, it’s important to make connections, really strong connections, I think. I’ve made very strong bonds with people I haven’t seen very often, but when you’ve had two or three experiences in the mountains, your character is immediately revealed, and you can sometimes be surprised by yourself or by others.”

Social interaction was also frequently discussed in the context of

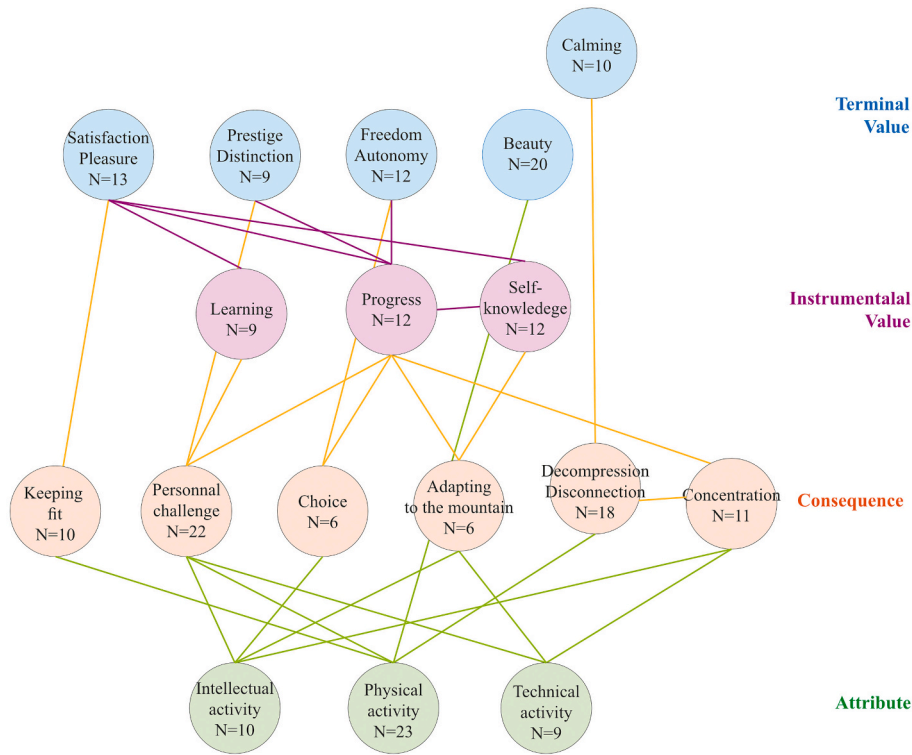


Fig. 3. Hierarchical value map for the sport category.

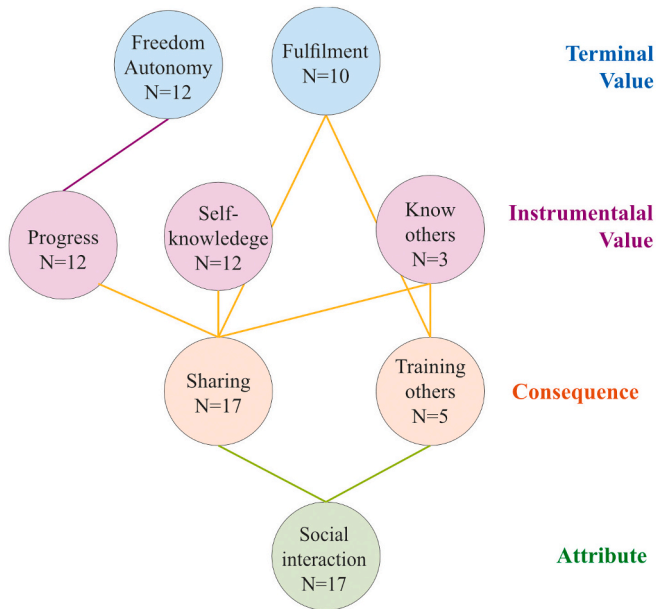


Fig. 4. Motivational pathway for the sharing category.

training others, such as in Alpine clubs or informal settings. Many respondents shared the satisfaction they derive from sharing techniques and knowledge with friends or relatives who are new to the activity. As AE01 explains: “With newcomers, it’s about sharing what I know, training them so they don’t take any risks. [...] to give them a few tips that they wouldn’t have invented themselves or that would have taken them a long time to learn. [...] It gives me great pleasure to see them, you come in, they don’t know how to do anything, and then they go out, [...] you see that they know how to do things and that they’re enjoying themselves, and that’s great fun”. Respondents highlighted that these exchanges and the act of training

others lead to a profound sense of fulfilment, emphasizing the importance of social connection in their climbing experiences.

4.2.5. Objective pathway

Finally, classic routes emerged as the main attribute of the objectives pathway (Fig. 5), mentioned by 13 of the 30 respondents. These routes are often associated with famous topographical guides, such as

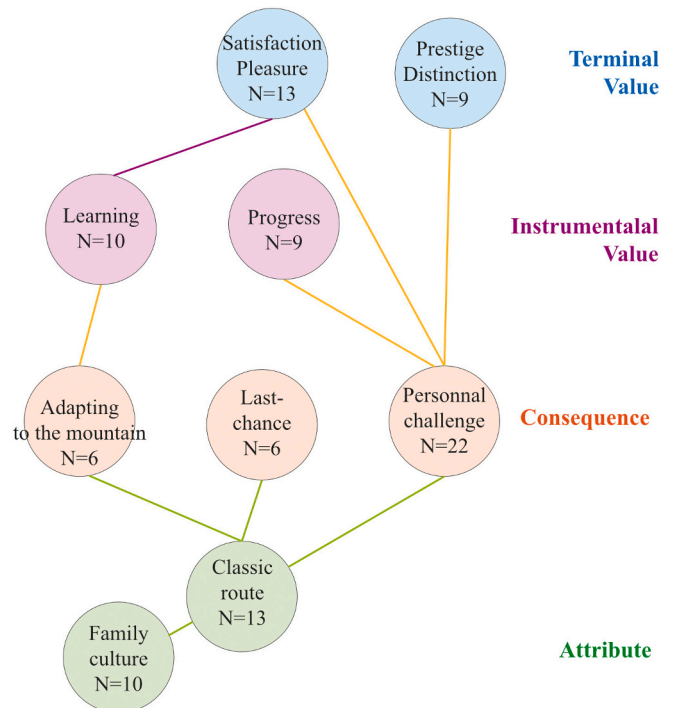


Fig. 5. Motivational pathway related to objectives.

Rebuffat's collection of the 100 finest routes (Mourey, Marcuzzi, Ravanel, & Pallandre, 2019), or stem from a family culture linked to the mountains. As AE19 remarked: "I do alpinism because it's in the family DNA. That's how it happened. It's in the order of things, we don't even ask ourselves."

Some respondents expressed a strong desire to complete classic routes as a personal challenge. For instance, they described increasing the difficulty of the routes they tackle over time as a way of experimenting and adapting to existing paths. In both cases, the instrumental values sought include learning new skills and progressing in one's practice, ultimately leading to a sense of satisfaction. The classic routes and the challenges they pose also evoke feelings of prestige for some climbers. AE8 shared: "Sometimes I think there's a certain prestige in having done it, [to say] I was there, it was a great route."

The motivational consequence of last-chance climbing also emerged in relation to classic routes. Some respondents mentioned feeling a sense of urgency to complete certain routes before they become inaccessible due to environmental changes. AE12 explained: "I was just thinking about something in relation to [...] how we choose the routes. This summer, when we were at the camp, we chose one day to do [...] a completely glacier route. [...] We had this whole discussion about, there you go, it's an opportunity to walk past big crevasses and walk all the way up a big glacier. And these are things that you may never get to do again, or you'll have less opportunity to do. And that's why we chose it. And I don't think this discussion would have happened without global warming."

4.2.6. Implication of climate change for motives

Following the laddering technique, respondents were asked whether the consequences of climate change could affect their motivation. The majority of respondents (17 out of 30) suggested that climate change does not directly impact their motivation because they can adapt through route selection and adjusting the timing of their practice. As AE01 mentioned: "It doesn't necessarily affect my motivation, but it changes my goals. We'll be doing more climbing and less playing on glaciers. It's all about adapting. You do things according to the conditions", and as AE28 states: "No, because alpinism is so varied that there's always something to do."

However, 11 of the 30 respondents reported less motivation to practise because of the increased risks associated with climbing in permafrost areas and on routes with early snow clearance. Even if some respondents find risk management satisfactory in their practice, climate change and its consequences make them feel that risk is increasing and becoming more challenging to manage. For example, AE14 expressed this concern: "Now it's getting dangerous. You get the feeling that there's a general risk that raises and can lead to accidents that are a bit random in nature. In the end, we're more exposed to objective risks that are completely unmanageable". The decrease in motivation due to increasing perceived risk is also driven by increasing feelings of fear, as reported by some respondents.

Seven respondents mention changes in the mountain landscape as a factor that reduces their motivation, mainly driven by glacier retreat. As AE14 explains: "Like I said, when you see the mountain all dried up in August, I don't feel like going there anymore". The retreat of the glaciers increases the difficulty and duration of access to the routes, a reason that for some respondents reduces motivation. AE8 illustrated: "Because it's true: if you make a mess in the scree, how long will the climb take? [...] I have to admit that it doesn't make you want to do it".

On the other hand, five respondents reported that climate change has increased their motivation to adopt environmentally friendly mobility options, such as avoiding flights to distant destinations or using shared transportation instead of personal cars. AE24 shared: "Of course, if we could get on a plane without feeling guilty and go further afield to Canada, Alaska or the Himalayas, I might be more motivated to go and see what's out there".

Finally, climbing a route before it disappears (i.e., 'last-chance climbing') was mentioned by three respondents as a motivational factor.

AE2 explained: "It increases my motivation because I still want to discover and enjoy these elements. I think that maybe we're in a time when the days of mountaineering as we know it today, or as we knew it, will soon be over". Conversely, one respondent mentioned the idea that rockfall and changes in the mountain environment increase their motivation to discover new routes. Finally, another respondent stated the idea that heatwaves can affect his motivation to do alpinism in summer "because when it's very, very hot in the mountains [...] As soon as the temperature rises, it's too much, it's less pleasant. So maybe that's the only thing that can stop me from doing big climbs in very, very hot weather" (AE30).

5. Discussion

5.1. Impact of climate change on motivational pathways

Both quantitative and qualitative results indicate that the environment is a strong motive for individuals to partake in alpinism pursuits, with wilderness and landscape being the basis of these motives. These attributes lead to values of beauty, self-determination, a sense of tranquillity, adventure and satisfaction, aligning with other studies on recreation and tourism in nature-based contexts (Kerr & Houge Mackenzie, 2012; Salim, Mayer, et al., 2023). The unique combination of solitude and challenge offered by the mountain environment amplifies these values, creating an experience that is deeply personal and transformative for many climbers.

However, our results suggest that this motivational pathway is the most vulnerable to the effects of climate change. Latent class analysis shows that the environment lovers group (class 3) are those who report the highest impact of climate change on their motivation. In addition, qualitative interviews show that landscape deglaciation and glacier retreat reduces the motivation of some respondents. In the context of glacier tourism, other studies have already shown the influence of landscape change on tourist motivation and satisfaction, for example in New Zealand (Stewart et al., 2016) or Iceland (Welling et al., 2020). As a result, climate change could directly impact the attributes of the environmental motive, with the consequence that the desired values are not (or are less) achieved. This finding should be further explored, as a study of glacier tourism in France shows that a negative evaluation of the glacier aesthetic does not affect the positive evaluation of the mountain landscape (Salim et al., 2021). More research is needed to better understand how alpinists perceive and respond to landscape change.

The environmental motive relates to the perceived risks increasing due to climate change. Since the environment lovers' segment is the one reporting the most changes in motivations, it also has the highest perception of increasing risks. As the qualitative interviews suggest that high and unmanageable risk leads to decreased motivation to climb among the respondents due to the increasing frequency and intensity of rockfall reports (e.g., Legay et al., 2021), this could conceptually be considered as a new attribute in the motivational pathway that decreases overall motivation. Such a dynamic has already been observed among mountain professionals, who develop different adaptation strategies to cope with it (Mourey et al., 2020; Rushton & Rutty, 2023).

According to the quantitative results, the second major motive of the respondents is to share experiences with other people in the mountains, which was further described in the interviews as a way to increase and build connections with others and, in some cases, train them as mentees. This is a classic motivation in outdoor recreation and tourism, especially in activities involving partnerships, such as mountaineering (Ewert et al., 2013; Pomfret & Bramwell, 2016). According to the qualitative results, climate change does not seem to influence this motive construct. This is likely because the desire for human connection and the social aspects of the activity remains relatively unaffected by environmental changes. Even as external factors such as route changes or shifting weather patterns due to climate change impact the logistics of mountaineering, the underlying social dynamics and the importance of building relationships with climbing partners remain constant.

Sport is the third motive construct for practicing mountaineering as a physical, intellectual and technical activity. As reported elsewhere, this motive is made up of the idea of engaging in challenges and pushing limits (Alexandris et al., 2009; Kerr & Houge Mackenzie, 2012), as well as getting satisfaction out of moving your body (Ewert et al., 2013). The quantitative results show that core climbers are the segment with the highest score for this motive construct, with a high score for change in their motivation due to climate change. This could be explained by changes in the nature of alpinism, with some routes becoming more difficult or technically inconsistent, with low and high difficulty mixed in the same route (e.g., due to glacier retreat) (Mourey, Marcuzzi, Ravanel, & Pallandre, 2019; Mourey, Ravanel, & Lambiel, 2022). The qualitative results report that respondents sometimes experience more difficulty finding good conditions for a given route, which increases the need for preparation and organization, ultimately affecting the intellectual nature of the activity. The choice consequence of the motivational pathway could also be affected by the consequences of climate change, leading to a decrease in the large diversity of routes cited by respondents. This reduction in mountaineers' "playground" has already been mentioned by French mountain guides (Salim et al., 2019), and could be thought of conceptually as a climate change-induced attribute that affects the motivational pathway by reducing choice and the value of freedom.

Finally, the objective motive mainly focused on the challenge and prestige of completing famous route goals. Even if in small proportion, the last-chance motive emerges both in qualitative and quantitative surveys as a motivation factor. This suggests that the disappearance of some alpine routes in the Alps, as well as the increase in difficulty of some routes (for more details see Mourey, Marcuzzi, Ravanel, & Pallandre, 2019; Mourey, Ravanel, & Lambiel, 2022), makes some climbers think about reaching their goal before they are unable to do so due to the impacts of climate change. This element, which appears in the qualitative interviews, is confirmed by the result that core climbers are the segment with the highest last-chance motive value, as well as the highest objective value. This relationship between classical route attributes and last-chance suggests a link with the prestige of doing something that could disappear, as the literature on last-chance tourism has already shown (Dawson & Lemelin, 2015; Denley et al., 2020). It is important to observe that the motive remains relatively low in importance but may indicate an emerging motive.

5.2. Theoretical contribution and practical implications

This study provides a better understanding of how climate change affects alpinists' motivations. It highlights the vulnerability of environmental motivations, showing how landscape degradation and increased risk can disrupt the values and satisfaction derived from them. By introducing risk perception as a key attribute of motivational pathways, the study extends frameworks such as means-ends chain theory to account for the impact of changing environmental conditions. In addition, the identification of the 'last-chance motive' in alpinism offers a novel perspective, demonstrating how urgency motivates participation in response to irreversible environmental change. This finding bridges the gap between adventure tourism and climate adaptation studies and provides a new perspective for understanding motivation in high-skill, high-risk contexts.

From a practical point of view, these observations suggest strategies that can be used by those involved in mountain tourism, and mountaineering. For mountain professionals such as guides, understanding the changing motivations of climbers can help to develop personalized approaches to route selection and experience design that balance safety with climbers' changing priorities. In addition, the promotion of social dynamics such as mentoring and group relationships can act as a counterbalance to the decline in environmental motivation, as this motivational pathway is unaffected by climate. More generally, an assessment of the objective risks present in the various mountain areas

visited could make it possible to objectify the influence of climate change on the risks of mountaineering routes, thus reducing the intensity of the risk perceived by the climber and guaranteeing a satisfactory mountaineering experience in a warming world.

5.3. Limits

A limitation of this study is the absence of data on the composition of the alpinist population, which precludes an assessment of the representativeness of the sample. Nevertheless, studies on gender in alpinism practices have employed Alpine Club statistics as a proxy. For instance, the data indicate that in 2010, women constituted 36 % of the members of the French Alpine Club and 26 % of those engaged in alpinism (Moraldo, 2013). In the Swiss Alpine Club, women constituted 40 % of members in 2018; however, no data are available on the proportion of alpinism practitioners (Fink, 2018). Notwithstanding the limitations, the composition of the sample, particularly in terms of gender, is consistent with that observed in other studies. Specifically, 25 % of the respondents in our sample are women, which aligns with the 26 % of women engaged in alpinism practices within the French Alpine Club (Moraldo, 2013).

The qualitative component of this study involved only 30 semi-structured interviews, limiting the depth of insight into the full diversity of alpinists' motivations and adaptations. While these interviews reached a saturation point, there is still the potential for unrepresented experiences, particularly those of climbers from underrepresented groups or different experience levels. Expanding on the qualitative findings with a quantitative survey should be a focus of future research to provide a more comprehensive understanding of how climate change affects the motivations of different demographics of climbers.

Lastly, the study primarily focuses on the direct environmental impacts of climate change, such as altered routes and increased hazards. However, it does not delve deeply into the broader, indirect effects of climate change, such as economic disruptions to the tourism industry, changes in accessibility to climbing regions, or social consequences like the shift in community dynamics among climbers. These indirect factors could also influence motivations, both in terms of participation in mountaineering and the feasibility of engaging in such activities in the future. Future studies should consider these wider impacts to gain a holistic view of how climate change shapes alpinism.

6. Conclusion

This study aimed to identify the motive constructs of recreational alpinist, explore their motivational pathways, and investigate the influence of climate change consequences on them. The results showed that the environment, sharing experiences, sport and achieving objectives are the main motivations for alpinists. Among these, the environmental motive emerged as both a strong driver and the most vulnerable to the impacts of climate change. Landscape degradation, such as glacial retreat and increased rockfall, poses a significant threat to the intrinsic value that alpinists place on the wilderness experience, potentially reducing their overall motivation. Furthermore, while the motive of sharing experiences with others appeared to be resilient to climate change impacts, the sport-related motive demonstrated some vulnerability. Changes in route conditions, increased difficulty and the need for more preparation were highlighted as consequences that could alter the intellectual and physical nature of alpinism. Climate change could lead to a reduction in the variety of routes available, which could affect the perceived freedom and satisfaction of mountaineers.

The study also identified an emerging last-chance motive, notably among core climbers, driven by the perception of the future loss of iconic routes due to environmental change. This emerging motive, although currently secondary, reflects a potential shift within the alpinist decision-making, and route choice in response to climate change. Overall, the study highlights the complex relationship between alpinism

and the environment. Future research should focus on the role of landscape perception in alpinists' motivation and satisfaction, but also on the way they choose their routes and adapt to their changing conditions. Finally, this study suggests answers to the so-called "why do people climb" question. To satisfy their needs for adventure, prestige, satisfaction and beauty, but also to help them decompress, to give them a perspective on the world and to feed them with a sense of fulfilment that is enhanced by the freedom and autonomy they find in the mountains. Reasons that are now distorted by climate change. Yet, experiencing these climate change impacts first-hand as alpinists have the potential to transform some climbers into advocates for climate action.

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CRedit authorship contribution statement

Emmanuel Salim: Writing – review & editing, Writing – original draft, Visualization, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Célian Gruet:** Writing – review & editing, Investigation, Formal analysis, Data curation. **Philipp Sacher:** Writing – review & editing, Software, Formal analysis. **Brooklyn Rushton:** Writing – review & editing, Methodology, Conceptualization. **Katherine Hanly:** Writing – review & editing, Methodology, Conceptualization.

Declaration of competing interest

This manuscript has not been published or presented elsewhere in part or entirety and is not under consideration by another journal. All study participants provided informed consent, and the study design was approved by the appropriate ethics review board. We have read and understood your journal's policies and believe that neither the manuscript nor the study violates any of these. There are no conflicts of interest to declare.

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