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# Glacier retreat and perception of climate change by local tourism stakeholders: the case of Chamonix-Mont-Blanc in the French Alps

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## Introduction

- 1 Numerous works have already underscored the important consequences of climate change for tourism activities in mountain regions (Hall *et al.*, 2005; Pröbstl-Haider *et al.*, 2019; Scott *et al.*, 2012; Steiger *et al.*, 2017). This is also the case in the Alps where resorts developed in particular around the practice of mountaineering, then around skiing, two activities that have been appreciably impacted over the last three decades by glacier retreat, the degradation of permafrost, and the increasing scarcity of natural snow. (Bourdeau *et al.*, 2020; CLIMALPTOUR, 2013; Mourey *et al.*, 2019, 2020). A number of authors also underline the difficulties for decision-makers to imagine development models other than those based on the practice of skiing (Achin and George-Marcelpoil, 2013; Bourdeau 2019; Siegrist *et al.*, 2013; Vlès, 2019). In this context, the present article focuses on the way the local population perceives climate change and whether or not it is considered as a crucial issue requiring a fundamental shift in tourism development. This question is explored by analyzing the case of the Chamonix valley, presented in this article as the section of the valley including the municipalities of Chamonix-Mont-Blanc and Les Houches, a prime location for mountaineering and skiing characterized by a glacial landscape powerfully impacted by climate change.<sup>1</sup> Firstly, we will focus on the issue of the perception of climate change and clarify our approach. We will then describe our methodology, before presenting our field of study. Finally, we will present

the empirical results of our survey of Chamonix's tourism stakeholders, then finish by putting into perspective these results in the more general context of the connections between climate issues and tourism development.

## I. Perception of climate change by local populations

- 2 According to scientific research conducted by the Intergovernmental Panel on Climate Change (IPCC), the phenomenon of climate change is a planetary problem linked to natural and anthropogenic dynamics that are global in nature. In a few decades, the climate phenomenon has become a major contemporary issue and has penetrated all spheres of societies, particularly in the west. It is omnipresent in the scientific world, in the media, and in public debates; it has infiltrated the economic sector as a potential threat and has finally led us to “*question our way of “living together”*” (De la Soudière and Tabeaud, 2009, p. 584, our translation). Faced with this major globalizing scientific narrative, the anthropological perspective proposes to understand the climatic phenomenon using local categories created by populations in defined territories (Sourdril and Garine Wichatitsky, 2019).
- 3 Its climatic manifestations, including rising temperatures, have a variety of impacts on societies around the world. Climate change is experienced differently due to unique variations of the climate in specific environments, as well as the disparity of socio-economic and cultural contexts (Crate and Nutall, 2009; Cruishank, 2006; Fiske *et al.*, 2015). Over the past few years, approaches favouring local perspectives on the issue of climate change have been the focus of growing interest within the international community, notably the idea of developing measures adapted to different situations (Jurt *et al.*, 2015).
- 4 Mountain regions around the world, including the Alps, are particularly concerned by the effects of the climatic phenomenon. On one hand, the Alps have been diagnosed according to climate models as being very sensitive to the impacts of current changes to the climate (Beniston, 2012). In addition, tourism has been clearly identified as one of the most vulnerable sectors with respect to the biophysical consequences of climate change in mountain regions (Clivaz *et al.*, 2015; Scott *et al.*, 2012; Steiger *et al.*, 2017). In the Alpine context, changes in atmospheric processes are expressed through rising temperatures, changes in precipitation, an increase in the rain/snow limit, and a reduction in the snow cover, as well as the melting of glaciers and the degradation of permafrost (Beniston, 2012; Rebetz, 2002).
- 5 These environmental changes lead to many social changes for Alpine communities and trigger the implementation of adaptation and mitigation strategies, especially as regards management of natural resources and natural risks, hydroelectric power generation, and tourism planning. In other words, all forms of societal management and nature governance are put into question by the climatic issue. Confronted with this situation, civil society and political stakeholders present a wide range of reactions and divergent positions, a spectrum encompassing fatalism, skepticism, optimism, and denial. These different attitudes depend in particular on how the climate problem is perceived, the reception of scientific predictions, the means available to deal with ecological changes, and the future projections envisaged. While the climatic phenomenon is clearly emerging as one of the greatest challenges of these next

decades for Alpine tourism regions (Clivaz *et al.*, 2015), how it is understood by local populations is not necessarily crystal clear.

- 6 In this context, the political authorities and local populations would seem to be confronted less with a rejection of climate issues than with the difficulty of local appropriation of this situation: “*The social construction of the climate problem still remains largely to be achieved at the local level*” (Brédif *et al.*, 2015, p. 68, our translation). This characteristic stems, in particular, from the fact that the understanding of climate change exhibited by western populations is mainly inspired by scientific knowledge and its media coverage (Hulme, 2009). This may well be the expression of a “*climate globalization*” phenomenon, prompting an annihilation of the subjective and “*the anthropological experience*” of climates (Aykut and Dahan, 2014, p. 52, our translation). Climate change is often perceived as a global, abstract, and distant phenomena, even though certain effects can be tangible in local environments (Elixhäuser, 2015). The fact that many consequences of climate change remain imperceptible to our sensorial apparatus makes understanding the phenomenon much more complex (Graef, 2017), and does not create a “*moral imperative*” (Markowitz and Shariff, 2012, our translation). Finally, although they are differentiated through a spatial and temporal perspective, confusions between the notions of weather and climate are frequent and can be misleading. (Meira and Gonzalez Gaudiano, 2016; Lammel *et al.*, 2012).
- 7 With regard to these characteristics, the evolution of the cryosphere is an exception because the transformation of glacial landscapes occurs very quickly and can be measured visually on the scale of a human life. In fact, the phenomenon of glacier retreat is easily linked to climate change, as a consequence of rising temperatures: “*More than many other consequences of climate change, glacier retreat also is easily understood: temperatures warm, and ice melts*” (Orlove, 2009, p. 25). Starting from this characteristic of visibility, and in view of the various premises mentioned above concerning the difficulty of appropriating the climatic phenomenon on a local scale, the anthropological approach adopted in this article aims to understand its emergence, its construction, its appropriation, and its interpretation by local tourism stakeholders in a geographical context where glaciers are omnipresent, namely the Chamonix valley.
- 8 This article is thus in line with the reflections and perspectives developed by authors from the sphere of the anthropology of climate change, a sub-disciplinary field that is itself intersected by various currents. Anthropologists’ interest in climate issues is relatively recent. It emerged in the 1980s, and accelerated in the late 1990s. (Crate, 2011). Segmented into different approaches, the reflections are focused on various themes: “*(...) we [anthropologists] analyze climate change in terms of the human systems that generate greenhouse gases, the ways in which different groups perceive and understand climate change, its varying impact on people around the world and the diverse societal mechanisms that drive adaptation and mitigation*” (Barnes *et al.*, 2013, p. 541). This “*ethnoclimatological*” research (Strauss, 2018, our translation) focuses on understanding local systems for grasping and interpreting climate phenomena throughout the world. Many anthropological surveys on climate issues in mountain regions have been conducted in the Andes (Bolin, 2009; Cometti, 2015; Orlove, 2007; Rhoades *et al.*, 2008;) or in the Himalayas (Devkota, 2013; Gagné, 2015; Vedwan and Rhoades, 2001), as well as in the Alps, primarily in Switzerland (Strauss, 2009, 2016), in Austria (Elixhäuser, 2015), and in Italy (Jurt *et al.*, 2019; Orlove *et al.*, 2019).

- 9 This article has been inspired by five analytical concepts developed by Orlove, Wiegandt, and Luckman in their book *Darkening Peaks: Glacier Retreat, Science and Society*. The approach developed by these authors is particularly relevant with regard to perspectives borrowed in our investigative work. To understand to what extent a population grasps the phenomenon of glacier retreat, they offer a reflection on the notion of *perception*, which describes how populations think about glaciers. The notion of *observation* for its part refers to scientific descriptions based on systematic measures. Then, the idea of *trends* evokes the temporal evolution of glaciers in past decades, along with their projected future. The notion of *impacts* describes the consequences of glacier retreat on surrounding communities. Finally, *responses* refer to measures taken, whether individual or collective, involving adaptation or mitigation (Orlove *et al.*, 2008, p. 4). An analysis concerning these different concepts has enabled the aforementioned authors to demonstrate that perception of glacier retreat essentially stems from the economic and cultural context: “*The editors argue that, in the end, it is the cultural and iconic power of glaciers for humans who both inhabit their presence and who live afar that will be the force to motivate action on climate change*” (Crate and Nutall, 2009, p. 19).
- 10 Inspired by this approach, we propose in this article a three-step approach. Firstly, we will focus on observations and perceptions of climate change by Chamonix valley tourism stakeholders, highlighting the sensory dimension of the phenomenon because “*Visual and sensory perceptions are key elements of the folk epistemology of climate*” (Strauss and Orlove, 2003 cited by Roncoli *et al.*, 2009, p. 90). This level also encompasses an identification of the various impacts on the region as well as the influence of media and scientific discourse regarding the climatic phenomenon in terms of local understanding of it. In a second phase, the focus will be on interpretations of climate change, i.e. the way tourism stakeholders in the valley understand, explain, and give meaning to what is happening (Cometti, 2015; Crate and Nutall, 2009; Roncoli *et al.*, 2009;). Thirdly, we will focus on responses and measures developed to confront the various consequences of the climatic phenomenon. Finally, we will discuss the results of the above-mentioned process, which seeks to understand how the climate issue is perceived by tourism stakeholders.

## II. Methodological specifications

- 11 The methodological approach of this article is based on ethnographic survey work, which is firstly expressed by the notion of “*being there*” (Geertz, 1983). It describes an immersive and experiential objective of the field of research involving the physical and prolonged presence of the researcher at his or her place of investigation so as to develop an in-depth understanding of systems of practice and meaning (Roncoli *et al.*, 2009). This research process is characterized by an inductive stance which consists in not imposing conceptual and theoretical assumptions on those participating in the investigation process. The results of this article stem from research that is part of a doctoral thesis in the completion phase, carried out by the second author under the supervision of the first. Within this framework, several months of field research was carried out in the Chamonix valley between 2016 and 2019.
- 12 This lengthy research period allowed for the creation of a network of acquaintances that made it easier to gain access to individuals, social groups, and institutions. It was also used to conduct more than 80 semi-directive interviews with scientists and

economic, political, and associative stakeholders in the region. These interviews provided an opportunity to discuss and deepen our understanding of the climatic phenomenon, to identify the challenges facing the Mont-Blanc region, and the responses required to deal with the situation.

- 13 Participatory observation could also be undertaken during this inquiry, particularly during scientific expeditions, sightseeing tours, political mobilizations, and public meetings. These research activities provided an opportunity to observe how the climate issue was collectively and politically understood by the population of the valley. The time spent with researchers, guides, and environmental educators, in the mountains and near glaciers, helped us understand how changes in the mountains and glaciers were explained and interpreted. Also, by observing scientists on the Montanvers site presenting the evolution of mountain landscapes to visitors, we could see how they approached these issues with and presented them to the general public and how they linked them to the climatic phenomenon.
- 14 Finally, the inquiry brought together a significant body of written documents, grey literature, institutional reports, technical documents, and tourism promotion brochures so as to analyze the way in which the climate issue was raised and presented by the destination in question.
- 15 The coherence of our study was not built around a "community" but rather around a phenomenon, climate change, which concerns a group of individuals with divergent interests. For this article, we deliberately focused on "tourism stakeholders," understood here as the participants in the study having a direct link with the tourism sector. Aware that in a destination such as Chamonix-Mont-Blanc, a large majority of the economic actors are associated to a greater or lesser extent with tourism activity, we have chosen those with a more direct link to the tourism sector, which in the context of the present research represents a corpus of twenty-two interlocutors, including guides, ski instructors, safety managers, tourism promotion managers, researchers involved in popularizing science, ski lift employees, hut wardens, innkeepers, and town hall officials. A large number of the selected interlocutors are from the region, and all of them without exception live in the valley year-round.

### III. Chamonix: a tourism and glacial valley

- 16 The municipalities (*communes*) of Chamonix-Mont-Blanc and Les Houches had, in 2020, about 11,500 permanent residents. The two municipalities have been amalgamated since December 2009, forming the *Communauté de Communes de la Vallée de Chamonix-Mont-Blanc* (CCVCMB), an intermunicipal public association including the municipalities of Vallorcine, Servoz, Chamonix-Mont-Blanc, and Les Houches with a population of around 13,350 inhabitants. However, according to a tourist office employee surveyed, the valley experiences a significant seasonal variation, with more than "80,000 residents during winter and around 100,000 during summer" (E.1<sup>2</sup>, our translation), a fluctuation that causes specific problems in terms of the organization of society and notably as regards water or waste management. The highest point of the Alps is Mont-Blanc at 4,810 metres in altitude; in this regard, the Chamonix valley represents a "high point" for Alpine tourism (Debarbieux, 2001, our translation) and a destination which has adopted a strategic positioning – that of "a natural resource" (E.1, our translation) – on the tourism market. Every year, several million tourists visit the valley to contemplate the

landscapes and nature, or to venture to high altitudes. Many of them congregate in Montanvers to admire *La Mer de Glace* (Sea of Ice), a spectacular glacial valley accessible by way of a rack railway. At the same time, this glacier symbolizes the impact of the climatic phenomenon on the planet as it affects the natural and landscape resources that make Chamonix-Mont-Blanc a renowned destination (Document 1). This means that resident populations of the Chamonix valley are faced with the climatic phenomenon on a daily basis and become direct witnesses without any need for sophisticated measuring tools. Because of its many glaciers visible from the villages, the Chamonix valley represents a privileged location to observe tangible consequences of the climatic phenomenon. In fact, the region is a national, even an international, symbol of the consequences of climate change. On one hand, it is regularly the subject of media coverage concerning the climate issue and, on the other, it represents a popular study area for researchers from different disciplines interested in this phenomenon.

Document 1: Mer de Glace – January 3, 2017



Alexandre Savioz – IGD/UNIL

- 17 The Chamonix valley glaciers hold an important place in the history of the region, and the many anecdotes about them reveal the special relationship that the local populations have maintained with the cryosphere over the centuries. As documented by the historian Le Roy Ladurie, during the 16th and 17th centuries the glaciers represented a major source of worry and anxiety for the valley's inhabitants, who sought divine assistance by soliciting the religious authorities of the region (Le Roy Ladurie, 2004). Blessings and processions carried out during this period appear to have been effective in their eyes, since in the Chamonix valley, and more generally in the Alps, glaciers began to retreat as of the second half of the 17th century (Le Roy Ladurie, 1967). Then, the first English travellers arrived in the region, including Windham and

Pococke, who dubbed the glacier *La Mer de Glace* (Sea of Ice) at the beginning of the 1740s. They were followed, a few years and decades later, by the arrival of other travellers, including mountaineers, scientists, artists, and naturalists such as Horace-Bénédict de Saussure. Some of them developed a much more recreational relationship with the high mountains and glaciers of the Mont-Blanc region, while for others the connection was of a more contemplative nature. The first ascent of Mont Blanc, in 1786, had an international resonance, and the reputation of the site spread and attracted an ever-increasing number of visitors during the second half of the 19th century, especially with the appearance of the Grand Tour. This phenomenon of “*Mont Blanc mania*” (Carey, 2007, p. 504) contributed to the progressive development of Alpine tourism in the valley, whose glaciers and lofty mountain took on an increasing interest for the inhabitants and economy of the valley. Between 1860 and 1890, the municipality of Chamonix started to develop the high mountain in order to “(...) *increase the number of tourists [...]. To achieve this result, the municipality, and the entire population of Chamonix alongside it, had to adapt its vision of the surrounding mountain to that of the tourist clientele*” (Debarbieux, 2001, p. 40, our translation).

- 18 After the creation of mule trails, including the pathway leading to the *Mer de Glace*, in the 1820s, the first tourist developments of the mountain were initiated with the construction of ten or so buildings, mountain lodges, and shelters, including the Hôtel du Montenvers (Debarbieux, 2001). Then, in spite of protests by the local population, railway projects were completed, including the Montenvers initiative, inaugurated in 1908. In fact, the *Mer de Glace* glacier has represented a central tourist attraction of the destination since the 18th century and continues to lure many visitors to this day: “*The rack railway still takes nearly 800,000 people to the glacier each and every year (number provided by ODIT France). Many of them get off there only to visit the Mer de Glace cave, which has been a major tourist attraction for 50 or so years*” (Cayla, 2009, p. 100, our translation). According to figures provided by the Observatoire du Mont-Blanc, the Montenvers railway was Chamonix’s most visited tourist site during the 2000-2009 period, with a peak of 960,000 visitors in 2003.<sup>3</sup> As of 2010, visits began to dwindle, with a total of 650,000 people coming to the site in 2016, and the railway surrendered its position as leader to the Aiguille du Midi cable car. However, a redevelopment and upgrading project of the Montenvers site is currently underway and should be completed by 2024; it will notably include the building of an interpretation centre focusing on glacier evolution. Those in charge of the destination are clearly integrating the theme of climate change by showcasing their “glacial heritage,”
- 19 For several decades now, the glaciers of the Mont-Blanc range have been significantly impacted by the phenomenon of climate change. This entails new risks, notably with potential serac ruptures; intraglacial, proglacial, or supraglacial lakes (Einhorn *et al.*, 2015; Magnin *et al.*, 2015; Vincent *et al.*, 2012); as well as with issues concerning the valley’s water management policies. In the region’s high mountain areas, this evolution disrupts the operation of recreational activities, including mountaineering, skiing, and hiking, which have to adapt both in terms of practice and seasonality (Cremonese *et al.*, 2019; Mourey *et al.*, 2019; Mourey and Ravel, 2017; Salim *et al.*, 2019). Finally, due to the omnipresence of the glaciers, their retreat, as a powerful visual indicator of the consequences of climate change, has become part and parcel of the daily life of valley residents.



## Document 2: Bossons Glacier moraine – July 26, 2017



Alexandre Savioz – IGD/UNIL

- 20 In fact, whereas in other places the impact of climate change often takes on an abstract and hardly perceptible character for the uninitiated, the *chamoniard* context seemed to us very singular indeed. In this valley, the climate change phenomenon is embodied, tangibly, by glacier retreat, which can be easily seen from the villages (Document 2). Given that “*The direct accessibility of glaciers to human vision has helped to make them a topic of personal and public concern*” (Orlove *et al.*, 2008, p. 5), it appears easier to address these issues in a place like Chamonix, where the effects of climate change are more visible because of this omnipresence / surrounding presence of ice (Strauss and Orlove, 2003; Strauss, 2003, 2012).
- 21 This observation is all the more credible given the powerful connection between the inhabitants of the valley and the Mont-Blanc range: “*The special symbolic and material relationship that they [residents of Chamonix] have with this lofty glacial mountain is worth much more to them than a property deed. Mont-Blanc is more than merely one of their domains. It is an essential part of their heritage*” (Debarbieux, 2001, p. 33, our translation). In summary, the Chamonix valley seems at first sight to be conducive to the development of a particular sensitivity to climate issues. People from Chamonix thus represent a “*frontline community*” (Orlove, 2019) due to their proximity to tangible effects of the climatic phenomenon. In addition, strong links exist between residents and the region’s glaciers, connections of an emotional or economic nature. It is interesting to take these various elements into account because “*The representations, sense of attachment, and economic importance of mountains and glaciers contribute to shaping the way local people respond to accounts of climate change from scientists, government agencies, and other organizations*” (Roncoli *et al.*, 2009, p. 92). This situation then invites an inquiry into the relationship of residents to the climatic phenomenon as well as to their natural

environment which, in constant evolution, is essential to their tourism-centred economic development strategies.

- 22 Authorities and elected officials from the valley have proven to be sensitive to the issue, as evidenced by the launching, on a voluntary basis, of a climate plan at the end of the 20th century. In 2009, a territorial assessment of greenhouse gas (GHG) emissions was initiated, spearheaded by a few members of the federation of municipalities. Encouraged by a national policy supporting local initiatives to fight climate change, this assessment led to a “*Plan Climat-Énergie Territorial*” (regional climate and energy plan, or PCET) in 2012, with the goal of implementing territory-wide measures to limit GHG emissions. Designed with the participation of the region’s communities and various civil society stakeholders, this climate plan was adopted voluntarily by the federation of municipalities, then by the town councils.<sup>4</sup> By way of the PCET, the CCVCMB promoted individual measures and changes in behaviour as well as public measures, particularly in the transportation and mobility, urban planning and housing, and tourism sectors. This PCET initiative therefore represents an attempt to take ownership of the climate issue on a valley-wide scale. As such, the Chamonix-Mont-Blanc destination assumed a pioneering role in the fight against climate change in mountain areas and was able to benefit from this action by promoting it through strategic communication and by obtaining a number of official recognitions for the region itself.

## IV. How do tourism stakeholders in the Chamonix valley perceive climate change?

- 23 In the previous section, we have suggested that a particular sensitivity to climate issues could develop in the Chamonix valley, especially due to the strong presence of glaciers. What is the reality in this regard? As previously mentioned, we are presenting the results of our ethnographic survey in three stages in order to answer this question.

### A. Observations, perceptions, and identifications of the impacts of climate change

- 24 By browsing the communication channels regarding the local community’s climate plan, we noted that they regularly have recourse to a common symbolic universe, in particular pictures of glacial landscapes comparing the evolution of glaciers over time (Document 3), symbolic of the ongoing impacts of climate change in the valley (CCVCMB 2012 (a-b), 2016, 2017). This characteristic is highlighted on several occasions and represents undeniable awareness. The finding resonates with the statements made during the vast majority of interviews conducted with tourism stakeholders from the valley, who are aware of the evolution of their immediate environment. The observations are mostly visual, such as the thinning of glaciers and the transformation of mountain faces as well as the acceleration of this process over the last two decades.

## Document 3: Example of the visual use of glacier evolution (from left to right: 1999, 2009, 2015)



Communauté de Communes de la Vallée de Chamonix Mont-Blanc. Environnement et qualité de l'air. Combats et solutions. Press kit. 2017, p. 10.

- 25 Aside from the thinning of glaciers, other perceptible biophysical phenomena have been evoked, such as the shortening of the winter season; the modification of precipitation as observed in the diminishing annual snowfall; the increase in temperatures resulting in hotter summers; episodes of strong winds; and more. In interlocutors' statements, all these elements are linked to the climate change phenomenon, even though some are not scientifically proven. This could stem from "*climatic over-interpretation*" of perceptions of current natural phenomena in a context where the climate issue is omnipresent in the media. Other less easily observable characteristics have also been mentioned, such as the migration of certain plant and animal species or the concentration of carbon dioxide (CO<sub>2</sub>) levels, which may especially influence the state of forest health. This information, which is more difficult to discern without a careful environmental study, may stem from the dissemination of studies carried out by the Research Centre for Alpine Ecosystems (CREA), based in Chamonix since 1996, which examines among other things the evolution of alpine environments in the context of climate change. It may also be a product of media coverage of the phenomenon, the main source of information cited by our interlocutors. On a number of occasions, the climate issue has been combined with or mistaken for another problematized environmental issue in the valley since the early 1990s, namely air quality. In fact, the latter issue was almost systematically addressed by tourism stakeholders without prompting, serving as another illustration of the difficulty in understanding the climate change phenomenon.
- 26 Most interlocutors cite economic concerns. In fact, the difficulties for skiable areas due to the lack of snow; restricted access to certain mountain areas; the implementation of adaptation measures; safety issues, including fear of an increase in natural risks and problems of access to certain high mountain areas; the transformation of landscapes; and resource management issues represent threats likely to compromise the tourist attractiveness of the valley and thus the economic future of the entire region. More rarely, for some of the people questioned, the identified impacts related to the climatic phenomenon do not represent a major threat for the valley, currently or from a short-term perspective. Certain interlocutors stress, for example, the advantageous geographical location of the Chamonix-Mont-Blanc destination compared to a large number of other tourist resorts, which are lower in altitude and therefore more vulnerable to the effects of climate change. Some testimonials expressed a certain

nostalgia for an era when glaciers reached a very low point in the valley, reflecting an emotional attachment to the mountain that is transforming before their eyes. Others, finally, relativize the effects perceived in the immediate environment and express a more global view of the phenomenon, including geographically or temporally distant consequences.

## B. Multiple interpretations and representations of climate change

- 27 Attitudes to climate change have become very politicized in recent years, and even more so since the onset of the student strike for the climate movements, starting in the fall of 2018. In the context of the Chamonix valley, although observations and perceptions of climatic consequences are, with a few exceptions, relatively homogeneous, understanding and interpreting the phenomenon may vary considerably. In order to recreate these observations and perceptions in our article, we propose to classify the different positions according to a number of “discursive registers,” which must be understood as typical ideal categories. In this sense, the “discursive registers” do not refer to categories of people but of discourse regarding the interpretation of climate change. In fact, certain interlocutors will make use of a number of registers.
- 28 These “discursive registers” stem from informal discussions and interviews conducted with Chamonix valley residents. They express specific understandings of the climatic phenomenon, its causes, and the issues related to it. Underlying them are different ideological positions and antagonistic values that are at the origin of conflicts concerning the use and representations of nature. In this context of a plurality of interpretations of the climatic phenomenon, nature becomes an issue and its use can lead to different types of confrontations, both discursive and practical. These “discursive registers” therefore crystalize through many themes, such as projects related to tourism in the valley, natural resources management, risk management, future projections for the valley’s development, the use of glaciers,<sup>5</sup> and more. These differences can cause tensions in the region, by opposing very dissimilar visions of such issues.
- 29 The first major distinction is based on the traditional opposition between “skeptical” discursive registers on one hand and “convinced” ones on the other. 1) “Skeptical” views represent only a small minority of the statements collected from tourism stakeholders interviewed and constitute, as such, a separate category. However, a few interlocutors shared a resolutely skeptical view regarding climate change, sometimes denying the existence of the phenomenon, and often denying its anthropogenic causes, while attributing the process of atmospheric warming to natural causes. The vast majority of tourism stakeholders surveyed claim to be convinced of the existence of the climatic phenomenon as well as anthropogenic responsibilities for it. However, statements by convinced interlocutors can be subdivided into different tendencies. 2) “Fatalistic” views, which express the idea that everything is already decided in advance and hence that any remedial action remains useless. This way of thinking leads to profiting from the situation while it is still possible to do so, without questioning any activity in the process. 3) “Optimistic” views, which consider that human beings have always been able to adapt to any situation and that the use of technology, in the current context of climate change, is a conceivable and relevant solution. For this

reason, the tourism sector will always find solutions so as to continue its activities. 4) Finally, “alarmist” views, which propose to use the particular situation of the Chamonix valley to raise awareness, in particular among the region’s millions of visitors. Emboldened by alternative proposals, they also denounce an existing system that is struggling to question and reinvent itself.

- 30 To illustrate how these discursive registers differ, we can take the example of the link between local environmental transformations and the climate change phenomenon. All of our interlocutors acknowledge the transformation of the valley landscape, in particular due to glacier retreat. However, the explanation for this evolution is not consensual. An interlocutor who is a “skeptic” explains that the current changes are normal processes, “*part of the natural order, in a historical and natural cycle*” (E.3,<sup>6</sup> our translation), and thus categorically denies their anthropogenic causes. An “alarmist” interlocutor is very critical of this type of “*simplistic and self-exonerating*” reasoning (E.4,<sup>7</sup> our translation) and attacks, at the same time, reflections by “fatalists” who accept “*warming without lifting a finger*,” and who adhere to what the “alarmist” describes as a “*doctrine of determinism*” (E.4,<sup>8</sup> our translation). In short, to summarize the argument of our “alarmist,” climate change is typically considered according to “*personal, ideological, or economic interests rather than scientific reflections*” (E.5,<sup>9</sup> our translation). In this regard, the discourse would be guided by selfish interests that prevail over value systems.

### C. Responses to climate change

- 31 Climate change, and notably rising temperatures, lead to many biophysical changes in alpine landscapes, as we have already seen. The context calls for measures to counter the effects of climate change. In the tourism sector, these can be adaptation strategies, i.e., individual or collective initiatives designed to reduce the vulnerability of human systems. Adaptation can represent adjustment strategies when it targets the sustainability of current activities, or transformational strategies when it seeks to change the nature of practices themselves (Bonnemains and Clivaz, 2019; Simonet, 2016). The measures can also be mitigation strategies to stabilize concentrations of GHGs in order to limit such emissions. Since 2005, the *Communauté de Communes de la Vallée de Chamonix* has guaranteed free public transportation in the valley, through a public-private partnership with the bus transport company and the French railway system (SNCF). Other transportation initiatives have been undertaken in subsequent years, including the creation of a sustainable mobility program in 2011. The adoption in 2009 of the *Plan Climat Énergie Territoriale* (territorial climate energy plan, or PCET) and its 184 measures, essentially comprising mitigation measures for the reduction of GHGs in the valley, also reflects a willingness on the part of certain stakeholders to take action with respect to the climatic phenomenon. However, it became less important in the following years, because while nearly all of those surveyed had heard about this initiative during its preparatory phase, i.e., between 2009 and 2011, and subsequently when it was adopted by the authorities in 2012, very few of them could explain what had become of it in subsequent years. Finally, in 2019, the Chamonix-Mont-Blanc destination adopted a “*Plan Climat Haute Montagne*” (high mountain climate plan), which only includes measures to adapt to the effects of climate change.
- 32 When addressing these different types of measures during interviews with tourism stakeholders, we were able to observe that the “discourse registers” described above

clearly crystallize the responses and measures that their proponents wish to see adopted. In other words, these issues represent sources of conflict, tension, and debate in the valley. Concerning the *Plan Climat*, the opinions of the interlocutors were clear-cut. For some of them, this voluntary initiative “*was only intended as a marketing ploy... To obtain a sort of label signalling a virtuous destination. But behind this, there was no real initiative whatsoever*” (E.6,<sup>10</sup> our translation). Other interviewees seem to be more convinced and highlight the positive signal sent by the Chamonix-Mont-Blanc destination to other mountain territories. A guide interviewed claimed that climatic sensitivity emerged at the same time as the climate plan project, but that such concern quickly waned: “*For a time, sensitivity concerning the evolution of the climate had become widespread in the valley and among residents of the region. And this also coincided with a more general awareness concerning the evolution of the permafrost. So, at that time, there were real reflections regarding the mountain range, its evolution, and activities occurring there, all of which had been highlighted along with the challenges identified by the climate plan. There were discussions concerning mountaineering itineraries, access to shelters, ski lift anchoring points, the snow cover in skiable areas, increased risk, and more. And for a while, I had the impression that everyone had a vested interest, especially the tourist industry, and that something was really going to take root in people’s mentalities... But this feeling didn’t last and since then... how can I say... With the years, the attitude has changed and people have a different relationship with all this; they say to themselves “we’ll adapt, we’ll see”, and today, I have the impression that that’s about as far as they’re willing to go*” (E.7,<sup>11</sup> our translation).

- 33 Another topic that is nearly systematically raised by the interlocutors is that of artificial snowmaking. For most of the interlocutors we met, it is logical and necessary to invest in mechanical snowmaking in ski areas in order to guarantee their quality. However, the opinion of other tourism stakeholders concerning this solution is less cut and dried: “*This is a subject that wonderfully illustrates the pervasive denial among valley residents with respect to climate change. We continue to invest in the installation of snow cannons while ignoring the prevailing knowledge about temperature inversions, for example... Because snow cannons are useless in hot air. This exemplifies the desire to avoid changing the model and a belief that this will be our saving grace*” (E.8,<sup>12</sup> our translation).
- 34 Despite the various critical viewpoints regarding mechanical snowmaking encountered during the survey, there is no real debate as such among Chamonix-Mont-Blanc destination stakeholders. Leaving aside the topic of mechanical snowmaking, we concluded that adaptation or mitigation measures seem relatively abstract for a large number of interlocutors. Many believe that management of the effects of climate change must be transferred to local, as well as national, public and political arenas: “*it’s up to elected officials and our minister of the environment to deal with this*” (E.9,<sup>13</sup> our translation). On the one hand, these people reference the global characteristics of the climate issue, and on the other, label it as a concern for the authorities rather than for ordinary citizens. Meanwhile, for others, this mode of reasoning represents a form of “*grotesque self-exoneration*” (E.10,<sup>14</sup> our translation). Finally, the least concerned believe that valley residents have always been able, since their arrival in the region, to muster a resilient spirit in the face of “*the vagaries of the environment*” (E.11,<sup>15</sup> our translation). For some of them, technical and technological innovations, in particular, will save the day: “*one day we will take charge of changing the precipitation and temperatures*” (E.11, our translation). Geo-engineering procedures, embodying the pinnacle of the “*optimistic*” spirit, were, however, rarely referenced during our interviews.

## Conclusion: The delicate cohabitation of tourism and climate issues at the foot of Mont-Blanc

- 35 Although climate change had already been familiar issue in the Chamonix valley for several decades, thanks in particular to the interest of researchers and a research centre that studied the phenomenon in a localized manner, it has now been formalized in public life and in the political-administrative apparatus by the will of certain members of the *Communauté de Communes* (community of municipalities). The latter have worked on a public construction of the climate problem in an attempt to locally appropriate the issue so that its importance is recognized at the scale of the entire valley. In this process, the vision of glacier retreat has played a crucial role in educating and mobilizing residents and elected officials alike (JDPMB, 2009). However, the identification of GHGs linked to the valley's activities has generated a set of paradoxical conundrums: *"A research firm was hired to assess GHG emissions in the territory. And very quickly, we realized that 80% of all emissions were linked to travel to the valley by tourist visitors. So, what can be done based on that? We've got to focus on the remaining 20%... Because, in reality, 80% of emissions are out of our hands. There are, for example, agreements signed every year with China, representing that country's commitment to send a certain number of tourists, about one million, or with India ... Then there are the day trippers on a return trip from Geneva who head back home after climbing Aiguille du Midi mountain. This may be a bit of an exaggeration, but not much"* (E.12<sup>16</sup> our translation).
- 36 Hence, the first finding derived from this territorial assessment insisted on the importance of tourism as a GHG-emitting sector in the valley while underlining the difficulty of acting at the local level. Several interlocutors denounced this finding and pointed out a contradiction between tourist activity and the adoption of environmental measures by the destination: *"The introduction of a climate plan within the framework of the tourism-economic model of the Chamonix valley illustrates the entire schizophrenic approach by those in charge of the destination"* (E.13, our translation).<sup>17</sup> In summary, the valley situation is a straight jacket: *"The problem is that there's no economic diversity in the valley. 95% of the economy is linked to tourism, so that leaves very little wiggle room"* (E.14,<sup>18</sup> our translation). Moreover, Chamonix is in a very stable economic situation, with a high level of tourist and financial inflow. Although some interlocutors recognize the excesses of the destination's tourism development model, this does not lead them to question a system from which they benefit, and whose threats, in terms of temporality, seem to them to be very remote indeed.
- 37 *"Proposing alternative or sustainable tourism is one thing but proposing an efficient and profitable model is another. Restricting our economic development while nobody else in other sectors is making the least bit of effort would be absurd for the economy of the region and useless considering the overall situation itself. We know today that the curves will probably never change or if they do, only in several hundred years..."* (E.14,<sup>19</sup> our translation).
- 38 Others are outraged at this type of thinking and at what has become mass tourism in the Chamonix valley. They propose alternatives which, without completely calling into question the current tourism model of the destination, propose the development of consciousness-raising activities, integrated into the current model:
- "We are in a zone where we can see the effects in question with our very own eyes. The media haven't convinced us; this isn't hearsay ... We just have to look around*

us. Les Bossons, the Mer de Glace, ... This kind of visual thermometer has to be used to convince more of the people more of the time, and despite what the tourism industry and lobby may claim, I believe it is our duty as citizens to do so" (E.15,<sup>20</sup> our translation).

- 39 However, the rosy economic situation of the destination makes it difficult to question its development trajectory. It may be pointed out that these two findings, i.e. the difficulty for tourism stakeholders to consider a different development model and look beyond "business as usual" and the "limited wiggle room" for local stakeholders regarding GHG emissions that mainly stem from modes of transport used by visitors to reach the location of their stay, are similar to findings for the Swiss Alps (Clivaz *et al.*, 2012).
- 40 Regarding the different biophysical changes perceptible in the environment, and therefore the issue of the visibility of the climatic phenomenon, glacier retreat is clearly the most recurring and salient phenomenon in the eyes of the tourism stakeholders surveyed. In their eyes, the glaciers have social and symbolic importance, and their retreat engenders different types of identifiable impacts. However, despite both the tangible and symbolic importance of glacier retreat in the Chamonix valley, our field survey demonstrates how difficult it is for tourism stakeholders to take ownership of the climate issue at a local level. In this sense, our case study does not confirm the hypothesis developed by Orlove and colleagues. The *Plan Climat Haute Montagne*, adopted in 2019, confirms what we have observed: it only includes climate change adaptation measures designed above all to maintain the current tourism model. These findings resonate with the reflections of Scott, Hall, and Gössling, who assert that tourism stakeholders "(...) were highly aware of the risk posed by climate change, but also highly optimistic about their capacity to negate the impacts of future climate change" (Scott *et al.*, 2012, p. 277). In Chamonix, the climate change issue is now of course an integral part of the communication and tourism offer of the destination, as evidenced by the current Montanvers redevelopment project which promises to showcase a new glacier interpretation centre by 2024. The fact remains that the strong presence of glacial landscapes, providing a bird's eye view of glacier retreat, has not fundamentally changed local tourism stakeholders' perception or understanding of the climatic phenomenon.

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## NOTES

1. The choice to focus on Chamonix-Mont-Blanc and Les Houches in this article is justified by the fact that glaciers are easily visible in these municipalities, which is not the case in Servoz and Vallorcine, the other two municipalities of the valley.
2. Interview with a tourism manager. October 2018.
3. Website of the Observatoire du Mont-Blanc – <http://observatoire.espace-mont-blanc.com/indicateurs/frequentation-sites-touristiques> - Visited on August 13, 2020.
4. Indeed, in France, only agglomerations with more than 50,000 inhabitants are legally obliged to develop this type of measure, while the Chamonix valley only has around 14,000 inhabitants.
5. In this sense, the glacier can constitute a “border object,” i.e. an “entity which serves as an interface between social worlds and stakeholders with different perspectives” and can thus be the subject of differentiated uses (Latzko-Toth, Millerand, 2015, p. 163, our translation). The glacier represents both a touristic landscape and a scientific object.
6. Interview with a tourism manager. April 2018.
7. Interview with a high mountain guide. May 2018.
8. Interview with a high mountain guide. May 2018.
9. Interview with a lodge warden. March 2019.
10. Interview with a tourism manager. October 2018.
11. Interview with a high mountain guide. September 2018.
12. Interview with a high mountain guide. September 2017.
13. Interview with a hotelier. November 2018.
14. Interview with a high mountain guide. Avril 2018.
15. Interview with a ski instructor. May 2019.
16. Interview with a tourism manager. October 2017.
17. Interview with a shopkeeper. June 2018.
18. Interview with a high mountain guide. May 2018.
19. Interview with a tourism marketing manager. June 2017.
20. Interview with a high mountain guide. May 2018.

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## ABSTRACTS

Climate change strongly impacts tourism activity in the Alps. In this context, how are these changes perceived by tourism stakeholders at the local level? According to the anthropological approach to climate change, the latter is characterized by a multitude of phenomena that generally remain imperceptible to our senses, and this makes understanding matters of climate all the more complicated. By studying the case of the Chamonix valley, characterized by a prominent presence of glaciers in the landscape, we seek to determine the

extent to which the climate issue is better understood when it materializes in tangible problems such as glacier retreat, which in the eyes of local residents constitutes a visible threat to the tourist potential of the region. Our analysis shows that this is not the case and that the significant presence of glacial landscapes does not facilitate appropriation of the climatic phenomenon by local tourism stakeholders.

## INDEX

**Keywords:** tourism, climate change, glaciers, local stakeholders, Alps, the Chamonix valley

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