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Snowmaking Development Trajectories in French Alpine Ski Resorts: The Influence of Local Specificities and Regional Support Policies

Lucas Berard-Chenu, Hugues François, Emmanuelle George and Samuel Morin

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Introduction

- 1 Snowmaking is the most widespread technical measure to limit the effects of snow variability and the impact of climate change in the ski industry (Steiger *et al.*, 2019). The growth in the use of snowmaking equipment in the European ski industry over the last few decades demonstrates this technology’s relevance to this economic sector. Its ability to ensure snow reliability in ski resorts depends on future adverse meteorological conditions caused by climate change, water availability, compliance with environmental regulations and the ability to cover the capital and operating costs of the facilities (Hock *et al.*, 2019). The succession of several winters with low snowfall in the late 1980s and early 1990s stimulated the development of snowmaking at ski resorts in the Alps (Gauchon, 2009). Technical progress in the 1990s and 2000s, combined with the reduced reliability of snow cover due to the effects of climate

change, have encouraged its deployment and use. In France, the proportion of the ski slopes covered through snowmaking was estimated at 35% in 2015 (Spandre *et al.*, 2015). This extensive growth over the last 15 years is heterogeneous. It ranges from large and very large resorts with the capacity to invest, to others, including smaller resorts, which experience more difficulties (Berard-Chenu *et al.*, 2020). Beyond the financial capabilities related to the size and business model of ski resorts, Massart *et al.* (2021) mentioned that historical contexts or local resources also influence the evolution of ski resorts' development. From technical constraints to specific needs that vary across the diversity of ski resorts, the development of snowmaking follow different paths that have been little studied.

- 2 As a first step, to clarify these issues, we conducted a study to identify the local elements, depending on ski resorts, which influence their snowmaking equipment trajectory. Although local factors steer development paths, local assets are not the only determinants of areas relying on ski tourism (Perret, 1993). In addition to the ski tourism industry's dynamics, the political context and the emergence of public support mechanisms dedicated to snowmaking investment play an important role as an incentive. In a second step, we analysed how the dependence of mountain regions on the ski industry economy has led to the implementation of a public policy of subsidies that subsidises snowmaking. Bohn & Bernardi (2019) pointed out that only a few studies on winter tourism focus on planning and policy at the regional level. Because winter tourism is highly localised, Bohn & Bernardi (2019) also stressed the relevance of tourism policy analysis at the regional level. Our study aims to show how institutional stakeholders can influence the snowmaking equipment strategy of ski resorts at the regional level, particularly through a subsidy policy. For this purpose, we focused our analysis on the policy of snowmaking support provided by the Auvergne-Rhône-Alpes *région*—as a geographically and functionally demarcated administrative structure—over the 2016–2019 period.

Material and Methods

- 3 Our work combines a local analysis and an evolutionary approach to ski resort dynamics. Several studies have highlighted the interest in and importance of studying ski resorts with reference to their local characteristics. Perret (1993) introduced a dynamic and localised analysis of ski resorts, introducing the concept of tourism local systems (TLS). If considered, the specificities of mountain areas allow a better understanding of the recompositions at work in the ski resorts. This local perception has made it possible to highlight the interaction between stakeholders managing ski resorts (Chambro & De Oliveira, 2021; Gerbaux & Marcelpoil, 2006), tourism diversification processes (Achin, 2015; François, 2007) and land and property dynamics (Fablet, 2013; Marcelpoil & François, 2009). These studies illustrate the need to include local singularities to understand the evolution of ski resorts.
- 4 The evolutionary approach is based on the concept of “path dependence” (Martin & Sunley, 2006), which refers to the effects of a given economy's reinforcement and specialisation that lead to a lock-in situation. Initially used to study the evolution of industrial regions (Grabher, 1993; Hassink, 2010), this concept has been used to study the evolution of tourism destinations (Brouder *et al.*, 2016). Alpine regions are dependent on the winter sports economy (Franch *et al.*, 2008; Pechlaner &

Tschurtschenthaler, 2003). The predominance of the ski tourism industry—although there are other promising tourism positionings—contributes to the development of common values among stakeholders, favouring the reinforcement of the ski tourism industry (Bausch & Gartner, 2020). Bonnemain (2015) highlighted the difficulty for local stakeholders in Tarentaise (France) to think beyond the existing ski tourism model, while Clivaz *et al.* (2016) noted a similar phenomenon in Switzerland. Reinforcing mechanisms may consist of support by public authorities to maintain economic attractiveness (Bohn & Bernardi, 2019; Falk & Steiger, 2018). The role of French public authorities in the development of destinations (Bensahel & Donsimoni, 1999) or in the diversification of the tourism supply in mountainous regions (Achin & George, 2019) has been documented previously. However, in recent years, very few studies focused on local authorities' support for snowmaking. Our work provides a situational analysis of the policy of local authorities in favour of snowmaking in the French Alps. Through the case study of the policy of the Auvergne-Rhône-Alpes *région* (NUTS-2 level), we show how public policy influences the trajectories of snowmaking equipment in ski resorts.

- 5 We used a mixed method to conduct the study combining different data sources. Firstly, we conducted and processed semi-structured interviews in the Savoie département (NUTS-3, part of Auvergne-Rhône-Alpes *région*) between October 2019 and September 2020. Secondly, we made an inventory of policies supporting snowmaking and analysed financial data: investments and subsidies granted by the Auvergne-Rhône-Alpes and Sud *régions* (NUTS-2). We conducted interviews among 20 large and very large ski resorts in Savoie: resort categories differentiated according to the typology of *Domaines Skiables de France*, the national organisation for French ski resorts. Not only does the number of surveyed ski resorts guarantee a diversity of situations, but its focus on large and very large ski resorts also targets the resorts most involved in the development of snowmaking (Spandre *et al.*, 2016). In France, ski lifts are a public service and under the jurisdiction of local authorities. Local authorities may choose to manage their ski lifts or to delegate their operations to private entities. Among our sample of 20 ski resorts, 15 were managed by private stakeholders (see Table 5 in the Appendix). To determine the effect of local specificities in the development of snowmaking, we also interviewed local authority stakeholders (n=15), mainly mayors. Our interview had a threefold thematic structure: i) the evolution of the ski resort's snowmaking coverage and the constraints experienced, ii) the relationships between the ski resorts' stakeholders regarding development choices for snowmaking, and iii) the role of snowmaking support policies in investment strategies. Concerning the study of support policies, we carried out an in-depth analysis of the snowmaking investments' support policy implemented between 2016 and 2020 by the Auvergne-Rhône-Alpes *région*. On this occasion, we conducted interviews with elected regional representatives and regional officials. Table 4 in Appendix presents the detailed list of the interviewees' attributes.

Results

The development of snowmaking considering local specificities and constraints

- 6 The development of snowmaking depends primarily on spatial configurations and constraints related to the location and local climate of ski resorts. One of the first criteria mentioned by the interviewees is the quality of the natural snow cover, perceived as variable from one ski resort to another. Snowmaking reinforces or compensates snowfalls seen as less favourable than in other ski resorts: “This effort that we have made [in snowmaking] is because our area is the driest sector of the Northern Alps, so we have no choice but to increase snowmaking” (interviewee #38). By contrast, some operators indicated that the reliability of quite good quality natural snow is used to explain the initial reluctance of certain ski resorts to invest in snowmaking. Some sectors within the ski areas are more difficult to equip because of their characteristics. As explained by an operator, wind adds complexity to snow gun installations, mostly slope-side poles, especially in high-altitude sectors: “We have few snow guns because we have to admit that at some elevation like ours there is a lot of wind and adequately placing a snow gun is a challenge” (interviewee #30). The operators also mention water as a resource, the availability or scarcity of which constrains the development of snowmaking. As an operator commented, its abundance and ease of access explain the boom or, by contrast, the delay in the coverage of ski areas: “About snowmaking, we started late, because we simply didn’t have any water supply” (interviewee #22).
- 7 Water scarcity can force operators to make large investments to capture or store the resource. On average, the investment cost for a water reservoir is equivalent to 760 k€ (source: Montagne Leaders investment data 1997–2018, see Berard-Chenu *et al.*, 2020). The operators, apart from the financial stakes involved, remain subject to the geographical constraints of their ski areas: an operator explained that “To date, we have not found a site in our area in which we could launch the construction of a new reservoir” (interviewee #42), thus restricting his snowmaking extension projects. Furthermore, in addition to snowmaking, the water supply in the mountains is often used for multiple purposes (Gerbaux *et al.*, 2020). Ski area operators have to contend with other uses of water, including hydropower. The proximity of ski resorts to hydropower facilities eases the expansion of the snowmaking coverage and increases the instantaneous production capacity. Several operators mentioned water withdrawals from hydropower facilities. These withdrawals represent, on a five-year average, 20% of the water supply for snowmaking in Savoie (Direction départementale des territoires de la Savoie, 2020). The main hydropower operator in this area (interviewee #52) confirms these practices and points out that it is authorised to supply water for snowmaking. The regulatory agencies have restricted the volumes allocated to snowmaking to not exceed 1% of the volumes intended for hydropower (DREAL Auvergne-Rhône-Alpes, 2019).
- 8 The ski lift operators also mention that they have to deal with the characteristics of the locations of ski resorts. Their snowmaking in ski resorts is also shaped by previous development choices. For example, the elevation difference between ski resorts in Savoie and Haute-Savoie (two *départements*, NUTS-3, in the northern French Alps)

illustrates the specificities confronting the operators: the average minimum elevation of ski resorts in Haute-Savoie is 1,400 metres above sea level, which is 250 metres lower than in Savoie. In Haute-Savoie, more developments of ski resorts occurred in the immediate vicinity of existing villages where tourism practices were already underway before the boom of ski tourism (Larique, 2006), while in Savoie, ski resorts were mainly built *ex nihilo*, at a higher elevation. The operators in Haute-Savoie therefore generally develop snowmaking at lower altitudes than in Savoie. Nonetheless, the minimum elevation threshold for the deployment of snowmaking is a subject of debate among tourism stakeholders. Many interviewees reject an elevation criterion and regret the definition of a threshold. As an elected regional representative commented: “We must not say to ourselves..., as some people do in Savoie, that the [production of] snow is only possible above 1500 metres. That doesn’t make sense (interviewee #11). Based on our interviews, similar to the findings of George-Marcelpoil & François (2012), we find a contradiction in the management of ski resorts: on the one hand, a growing trend towards management at a local scale and, on the other hand, the maintenance of a more uniform and sectoral approach. Several operators emphasised the intrinsic particularities of each ski resort, since each resort has its own history, its topographical specificities, its own management of ski slopes and therefore its own particular snowmaking deployment and operation strategy.

- 9 The local stakeholders involved in the management of the ski resorts and the way they intervene are not only specific to each ski resort but also influence each resort’s equipment trajectory. The role played by certain key stakeholders in the ski resort (e.g., operations manager, mayor or local entrepreneur) obviously influences the snowmaking strategy. Some operators were pioneers, while others were more reluctant and delayed snowmaking development in their ski resorts. As an operator explains: “Our ski area manager at the time was almost against snowmaking because, according to him, we were at sufficiently high elevation and always had enough [of natural snow]” (interviewee #20). On the part of the local authorities, the mindset has changed. The operators mention their delegating authorities’ (i.e., the local authorities) awareness of the need to invest in snowmaking: “Ten years ago, the local elected politician still only wanted ‘cable’, something that could be seen, that was the priority. Now is to also have an operating insurance for this equipment” (interviewee #25).
- 10 In this context, some delegating authorities prescriptively act towards their delegates. Snowmaking is subject to the influence of both political stability and the often asymmetrical relationships between public and private stakeholders, including the delegating authorities and the delegated operators (Gerbaux & Marcelpoil, 2006). Snowmaking is a governance issue of ski resorts: the location of snow guns and the identification of crucial sectors to be equipped with snowmaking constitute a form of the “geopolitics” of ski resort management. All ski resort stakeholders (i.e., hotelkeepers, restaurant owners or ski schools) are mindful of the development of snowmaking. The departments in charge of producing snow (internal departments of the ski lift operator) sometimes find themselves to be under the influence of these actors, as indicated by a snowmaking manager: “Three years ago we had difficulties in April, we started to close the slopes and we had to justify ourselves [...] when you have pressure from socio-professional groups you don’t show off” (interviewee #26). In addition to specifying technical and economic criteria, the delegating authority can play a regulatory role, even by intervening to support projects that the ski lift operators refused to implement. Local authorities acknowledge that they have financed

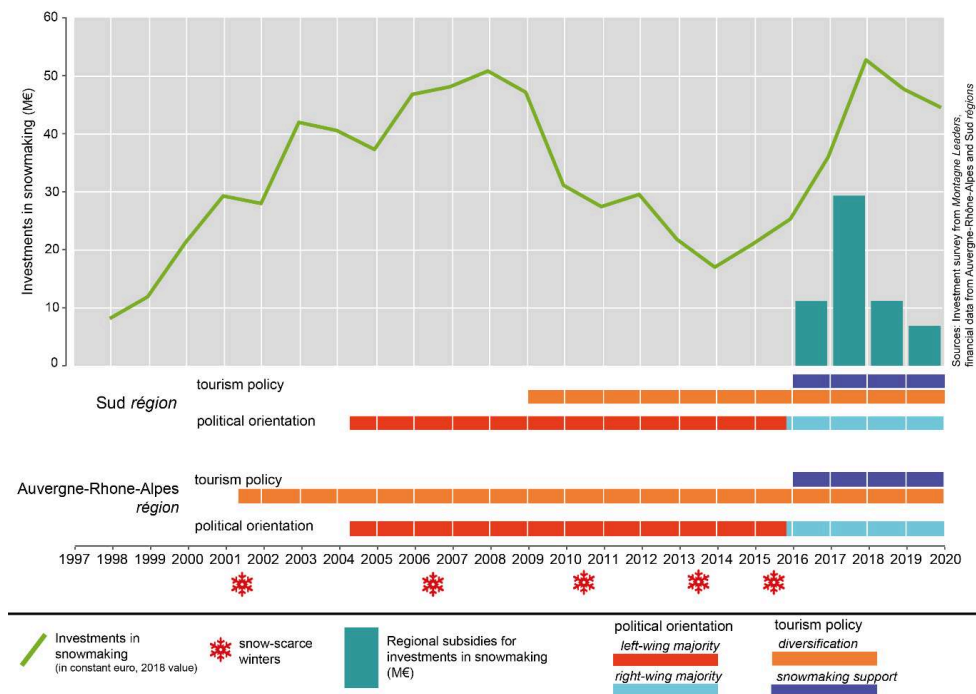
investment to equip some sectors of their ski resort with snowmaking. As a local official stated: “To agree on the business model with the operator, the local authority had to bear 1.5 million euros of investment, that was the condition” (interviewee #9). The constitution of stakeholder coalitions, similar to the real estate dynamics of ski resorts highlighted by Fablet (2013), can lead to the emergence of snowmaking equipment projects. Power relationships, the balance of power and the divergent interests of the various stakeholders (Chambru & De Oliveira, 2021) explain the different development trajectories of snowmaking equipment in ski resorts.

- 11 Snowmaking therefore develops in different ways, depending on the specific characteristics of each ski resort and the links between the different stakeholders. In addition to the involvement of local authorities, regional institutions also influence the equipping of resorts through their public policies.

Snowmaking: The Object of Regional Public Policies in the Alps

- 12 In the past, ski resorts have regularly benefited from the financial support of public authorities. The *départements* (NUTS-3), such as Savoie, have historically been committed to winter tourism (François & George-Marcelpoil, 2012). Snowmaking has become a public policy issue for local authorities. Figure 1 shows the evolution of investments in snowmaking (1997–2019) and the regional subsidies granted between 2016 and 2019 in the French Alps. It therefore depicts the development of policies supporting snowmaking from 2016 onwards, related to political changeovers in both the Auvergne-Rhône-Alpes and Sud *régions*. These supportive policies take the form of subsidy allocations for snowmaking investments, which at the respective times represented a change in step that contrasted with previous support schemes, mainly orientated towards tourism diversification (Achin & George, 2019). Figure 1 shows that the total subsidies granted by the *régions* to the Alpine region over the 2016–2019 period amount to nearly 60M€. The average subsidy rate is 30%. Other public support schemes have been added to the support provided by the *régions*, amongst others, those that have been included in policies in Haute-Savoie *département* since 2008, in Isère since 2016 and in Savoie during the 2007–2013 period.

Figure 1: Evolution of investments in snowmaking (1997–2019) and subsidies granted by local authorities from 2016 to 2019 in the French Alps



- 13 The policy implemented by the Auvergne-Rhône-Alpes *région* highlights the ability of ski tourism stakeholders to open a “policy window” (Kingdon, 1995) on the subject of snowmaking. The conditions for opening this window of opportunity are met when, simultaneously, (1) a problem is recognised, (2) a public policy solution exists, and (3) the political context favours change. In line with this notion, Table 1 details the application of these criteria to the ski tourism industry in Auvergne-Rhône-Alpes. The influence of ski tourism industry stakeholders has resulted in the placement of snowmaking on the political agendas of candidates and, once elected, of politicians in Auvergne-Rhône-Alpes. In 2016, the new political leadership of this *région* implemented an action plan for the mountainous areas that included a specific section on financial support for snowmaking equipment.

Table 1: The opening of a policy window regarding snowmaking at the scale of the Auvergne-Rhône-Alpes *région*

Kingdon's notions	Description of the events	The snowmaking case study in Auvergne-Rhône-Alpes
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<i>problem stream</i>	The way a problem is recognised by stakeholder groups and how it emerges in public opinion.	<p>A snow-scarce winter in 2006/2007</p> <p>An awareness of the vulnerability of ski resorts to snowfall variability, as well as a growing recognition of climate change impacts by ski lift operators.</p> <p>The Rolland report (2006) on the loss of competitiveness of French ski areas compared to their European competitors.</p> <p>The idea that France is lagging behind Italian and Austrian competitors in snowmaking</p>
<i>political stream</i>	Composed of the public mood, pressure group campaigns, election results, partisan or ideological distributions in the assembly of elected representatives, and changes of administration.	<p>The change of the political majority in December 2015, along with a change of the mountain tourism policy</p> <p>The affirmation of actors promoting the ski tourism industry in the regional executive (e.g., the appointment of the former President of the French National Ski Instructors' Union as a special "Mountain" advisor to the regional political leader)</p> <p>Inter-regional competition with the Sud <i>région</i> on the extent of support provided to mountainous regions</p>
<i>policy stream</i>	The available set of policy proposals. These proposals depend on legislative and regulatory frameworks, technical feasibility and the value systems of the stakeholders.	<p>The incentive scheme for investments made by ski lift operators</p> <p>The regional subsidy policy: 30% grant rate with a €600,000 threshold per project.</p> <p>Subsidy policies have been tested at this level in the Savoie (2007–2013) and Haute-Savoie (since 2008) <i>départements</i>.</p>

- 14 Regarding snowmaking, our analysis shows a strong convergence between the views of elected local and regional officials and those of the ski tourism industry. The ski lift operators share a common perception concerning the perceived delay of in the development of snowmaking equipment in France compared to their European competitors. The referent subjects are often Italians and Austrians: "The Austrian ski resorts or those in the north of Italy are at the cutting edge in terms of snowmaking, they are still the references" (interviewee #34) and "There is an obvious delay in France compared to our competitors, Italian or Austrian, that is for sure, since they have a rate of equipping their ski resorts that varies between 70% and 100% and we are very far from that" (interviewee #40). These considerations, highlighted by *Domaines Skiables de France* in its communication documents (Domaines Skiables de France, 2020), are evident amongst both regional and local elected representatives. Table 2 lists the interviewees who mentioned that France was lagging behind its European competitors in terms of snowmaking equipment. The near-unanimous rhetoric among ski lift operators about snowmaking is also present among elected regional and local representatives. A mayor of a ski resort said: "The Dolomites are the benchmark;

Austria is behind with a snowmaking coverage rate of 60% while we are still struggling at 35–40%” (interviewee #2). On the subsidy policy, an elected regional representative explains that “we [the ski resorts of the Auvergne-Rhône-Alpes *région*] were particularly under-equipped for snowmaking, unlike those who are our European competitors in the ski industry. So, we lacked snowmaking and risked a distortion of competition” (interviewee #13). The perception of snowmaking as a decisive factor in the competition between European ski resorts is shared up to the level of political decision makers in the Auvergne-Rhône-Alpes *région*.

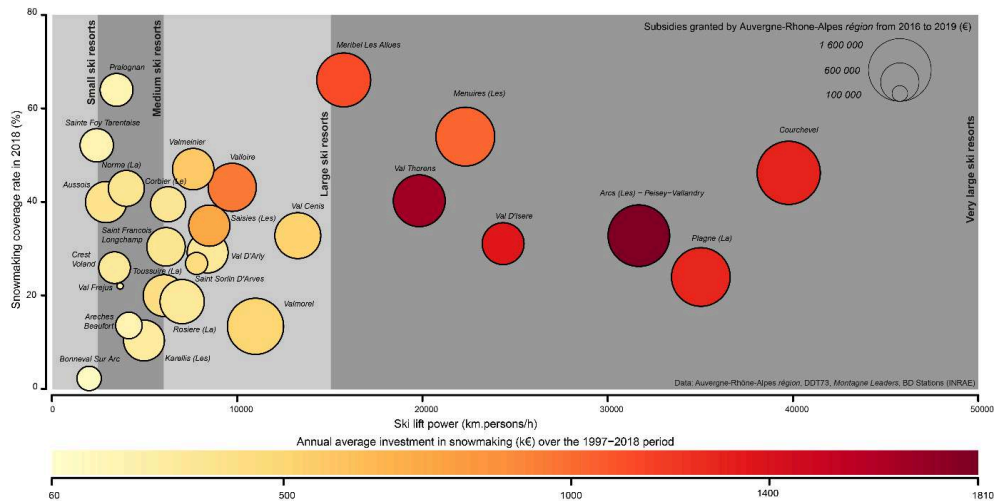
Table 2: Mentions of shortcomings in the French ski industry as opposed to European competitors in snowmaking equipment, according to the different category of stakeholders

Category of stakeholders	Number of interviewees who mentioned French shortcomings in snowmaking (Total number of interviewees)
Ski lift operators	26 (30)
Local communities	8 (11)
Snowmaking companies	3 (3)
Regional communities	3 (4)
Resort developers	0 (2)
Water supply providers	0 (2)

- 15 While it is still too early to assess the impact of this support policy, particularly in the context of the major disruptions of the tourism industry caused by the Covid-19 pandemic since 2020, we can nevertheless highlight several effects. This action plan was mainly dedicated to the expansion of the covered areas in ski resorts that already host snowmaking facilities. Indeed, of the 148 projects that received grants from the Auvergne-Rhône-Alpes *région* between 2016 and 2019, more than half involved extensions to existing snowmaking networks. The construction of water reservoirs accounts for 10% of the projects, even though these reservoirs receive 18% of the subsidy amount (see Table 3 in the Appendices). Finally, half the projects that received grants had incurred investment costs exceeding €850,000. The snowmaking investment projects of the ski lift operators that we interviewed all benefited from these subsidies. This policy of snowmaking support, without an elevation or size threshold, targeted all resorts. As an elected regional representative explained: “This action plan does not exclude anyone, it is not reserved for the most fragile and does not exclude the large ski resorts”. However, he agrees that the large ski resorts have benefited from the scheme: “We realised that the small resorts had difficulty accessing investments even with our 30% support” (interviewee #13). A regional official mentioned the technical complexity of the grant application as a reason for the lower participation of smaller ski resorts. The applications contained ten documents, including a development plan, a

financing plan, authorisation certificates for the work, and information on the snowmaking management. Figure 2 illustrates the ability of the largest ski resorts in Savoie to seize these subsidies opportunities.

Figure 2: Relationship between subsidies received from the Auvergne-Rhône-Alpes *région* for snowmaking in a panel of 27 ski resorts in Savoie and their past investment dynamics, size and snowmaking coverage rate



- 16 In the Auvergne-Rhône-Alpes *région*, access to subsidies for large ski resorts has often resulted in windfall gains. It is noted that although ski lifts operators made investments with public support, these investments were planned and would have been made eventually, with or without subsidies. For most operators, these subsidies have allowed them to accelerate their investment programs: “I have not done things that I would not have done without; but [the subsidies] have allowed us to accelerate our investment plan” (interviewee #27). Some interviewees commented that this support also helped them strengthen their investment choices among the ski resort stakeholders: the subsidies being perceived as a wide-scale political and institutional validation of the snowmaking project.

Conclusion

- 17 Several factors explain the different paths taken by ski resorts in their development of snowmaking. Firstly, the ski resorts are dependent on their location. Geographical and climatic specificities, in particular access to a water supply and the configuration of ski areas, play a fundamental role. Thus, the location of ski resorts strongly determines their capacities to develop snowmaking. Secondly, the past development choices of ski resorts influence present and future possibilities for developing snowmaking. In addition to using and maintaining the existing facilities that ski resorts have to contend with, ski resorts’ stakeholders also influence the development of snowmaking. Thus, local characteristics and governance methods are decisive elements in understanding the snowmaking equipment trajectories of ski resorts.
- 18 Our study, through an analysis of the policy of the Auvergne-Rhône-Alpes *région*, shows that public authorities play a central role in the development of snowmaking. The close links between public authorities and economic actors foster public intervention in the

ski tourism industry. A “policy window” has opened that allows local authorities the opportunity to provide support for snowmaking. Since ski lift operators often make snowmaking investments by themselves (Bohn & Bernardi, 2019), the extent of this public intervention is unprecedented in Europe. Although local public authorities have financially supported ski resorts in Austria (Falk & Steiger, 2018, 2020) and in Italy (Joly & Ungureanu, 2018), there was no analysis of public policies supporting snowmaking up to the present point in time. In the case of Auvergne-Rhône-Alpes, the large ski resorts have benefited from the support scheme with windfall gains, because the scheme allowed them to reduce their investment costs and accelerate their investment plans. The support policy, through subsidies, contributed to reinforcing mountainous regions’ orientation towards the ski tourism industry. Local public policies may emphasise an economic lock-in with ambivalent effects on mountain regions. On the one hand, highly specialised investments, such as those in snowmaking, may strengthen the competitiveness and attractiveness of the French ski tourism industry. On the other hand, the support provided by institutional stakeholders may also prevent changes or restructuring of the existing regional economy, in ways similar to situations that Grabher (1993) or Hassink (2005, 2010) identified and described in other industrial contexts. One of the risks involved is a “maladaptation” situation (Schipper, 2020), where the strengthening of the ski tourism industry may prove ineffective or even counterproductive. Maladaptation could prevent mountainous regions from adapting in a more profound way to large-scale changes, particularly those related to the future impacts of climate change.

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APPENDIXES

Table 3: Overview of snowmaking projects granted by Auvergne-Rhone-Alpes région over the 2016–2019 period

Category of projects	Number of projects	Subsidies (M€)
extensions to existing snowmaking networks	88	26.0
Improvement to existing snowmaking networks	42	10.3
water reservoirs	15	8.1
New snowmaking networks	3	0.7
<i>Total</i>	<i>148</i>	<i>45.1</i>

Table 4: List of participants interviewed with their group affiliation and position held

No.	Category	Position	Gender
1	Local communities	Mayor	m
2	Local communities	Mayor	m
3	Local communities	Elected local representative	m
4	Local communities	Mayor	f
5	Local communities	Mayor	m

6	Local communities	Elected local representative	m
7	Local communities	Mayor	m
8	Local communities	Mayor	m
9	Local communities	Local official	m
10	Local communities	Local official	m
11	Local communities/Regional communities	Mayor/elected regional representative	m
12	Local communities	Mayor	m
13	Regional communities	Elected regional representative/Mayor	m
14	Regional communities	Regional official	m
15	Regional communities	Elected regional representative	m
16	Resort developers	Chief operating officer	m
17	Resort developers	Ski resort development manager	m
18	Ski lift operators	CEO	m
19	Ski lift operators	Snowmaking manager	m
20	Ski lift operators	Assistant snowmaking manager	m
21	Ski lift operators	Snowmaking manager	m
22	Ski lift operators	Chief operating officer	m
23	Ski lift operators	CEO	m
24	Ski lift operators	CEO	m
25	Ski lift operators	CEO	m
26	Ski lift operators	Snowmaking manager	m
27	Ski lift operators	Chief operating officer	m
28	Ski lift operators	CEO	m
29	Ski lift operators	Chief operating officer	m
30	Ski lift operators	CEO	m
31	Ski lift operators	Chief operating officer	m
32	Ski lift operators	Snowmaking manager	m

33	Ski lift operators	CEO	m
34	Ski lift operators	CEO	m
35	Ski lift operators	Snowmaking manager	m
36	Ski lift operators	CEO	m
37	Ski lift operators	Snowmaking manager	m
38	Ski lift operators	Chief operating officer	m
39	Ski lift operators	CEO	m
40	Ski lift operators	CEO	m
41	Ski lift operators	Marketing director	m
42	Ski lift operators	Chief operating officer	m
43	Ski lift operators	CEO	m
44	Ski lift operators	Snowmaking manager	m
45	Ski lift operators	Marketing director	m
46	Ski lift operators	CEO	m
47	Ski lift operators	Corporate social responsibility manager	m
48	Snowmaking companies	Marketing director	m
49	Snowmaking companies	Research and development director	m
50	Snowmaking companies	Marketing director	m
51	Water supply providers	Manager	m
52	Water supply providers	Manager	m

Table 5 : Characteristics of the ski resorts surveyed from Savoie

Ski resort	Ski lift power (km.pers/h)	Size	Massif	Min. elevation(m)	Max. elevation(m)	Mean elevation (m)	Management type
Les Saisies	8433	Large	Beaufortain	1200	2052	1739	Public
Val d'Arly	8345	Large	Beaufortain	960	2053	1506	Private

St Sorlin d'Arves	7746	Large	Grandes-Rousses	1496	2590	2028	Private
Val Cenis	13212	Large	Haute-Maurienne	1300	2737	1927	Semipublic
Les Arcs	31699	Very large	Haute-Tarentaise	810	3220	2019	Private
La Rosière	6969	Large	Haute-Tarentaise	1150	2572	2033	Private
Tignes	25814	Very large	Haute-Tarentaise	1550	3459	2443	Private
Val d'Isère	24371	Very large	Haute-Tarentaise	1786	3197	2381	Private
Le Corbier	6363	Large	Maurienne	1380	2377	1865	Private
Toussuire	6148	Large	Maurienne	1279	2367	1940	Private
Valloire	9631	Large	Maurienne	1408	2530	1951	Semipublic
Valmeinier	7718	Large	Maurienne	1500	2579	2019	Semipublic
Courchevel	39787	Very large	Vanoise	1259	2919	2094	Semipublic
Les Menuires	22331	Very large	Vanoise	1389	2845	2189	Private
Meribel	15767	Very large	Vanoise	612	2701	1878	Private
Orelle	5217	Large	Vanoise	890	3242	2294	Private
La Plagne	35044	Very large	Vanoise	1200	3167	2061	Private
St-François Longchamp	6405	Large	Vanoise	1394	2514	1904	Private
Val Thorens	19844	Very large	Vanoise	1825	3186	2501	Private
Valmorel	11005	Large	Vanoise	1210	2401	1762	Private

ABSTRACTS

The specificities of mountain tourism areas and regional public policies influence the snowmaking equipment trajectories of ski resorts in the French Alps. Based on interviews among 20 ski resorts in Savoie (Northern French Alps) and data from regional policy of subsidies for snowmaking investments, this work analyses the drivers affecting the paths taken by ski resorts in their development of snowmaking. Access to water, climatic constraints and the expectations of local tourism stakeholders drive the development of snowmaking in each ski resort. The dependence of mountain tourism areas on the winter sports economy has led to the implementation of support policies for snowmaking by institutional actors. This study presents an overview of support policies in France and shows, through the case of the Auvergne-Rhône-Alpes region (NUTS-2), that between 2016 and 2019 subsidies have benefited the extension of snowmaking coverage in the largest ski resorts. This support from institutional stakeholders is one of the characteristics that illustrates a phenomenon of mountain tourism areas' path dependence on the winter sports industry.

Les spécificités des territoires touristiques de montagne et les politiques publiques régionales orientent les trajectoires d'équipement en production de neige des stations de ski des Alpes françaises. Sur la base d'entretiens auprès de 20 stations de ski de Savoie et de données de la politique régionale de subventionnement pour l'investissement dans la production de neige, ce travail analyse les facteurs qui influencent les trajectoires prises par les stations de ski en matière de développement de la production de neige. L'accès à l'eau, les contraintes climatiques et les attentes des partenaires touristiques locaux sont des facteurs qui orientent, à l'échelle de chaque station, le développement de la production de neige. La dépendance des territoires de montagne à l'égard de l'économie des sports d'hiver a conduit à la mise en place par les acteurs institutionnels de politiques de soutien en faveur de la production de neige. Cette étude présente un état des lieux des politiques de soutien en France et montre au travers du cas de la région Auvergne-Rhône-Alpes qu'entre 2016 et 2019, le subventionnement a largement bénéficié à l'extension de la couverture en production de neige des plus grandes stations. Ce soutien des acteurs institutionnels est une des caractéristiques qui illustre un phénomène de dépendance au sentier des territoires de montagne vis-à-vis de l'industrie des sports d'hiver.

INDEX

Keywords: ski tourism industry, path dependence, snowmaking, regional policy, tourism system

Mots-clés: Tourisme, sports d'hiver, dépendance au sentier, production de neige, politique régionale, système touristique

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