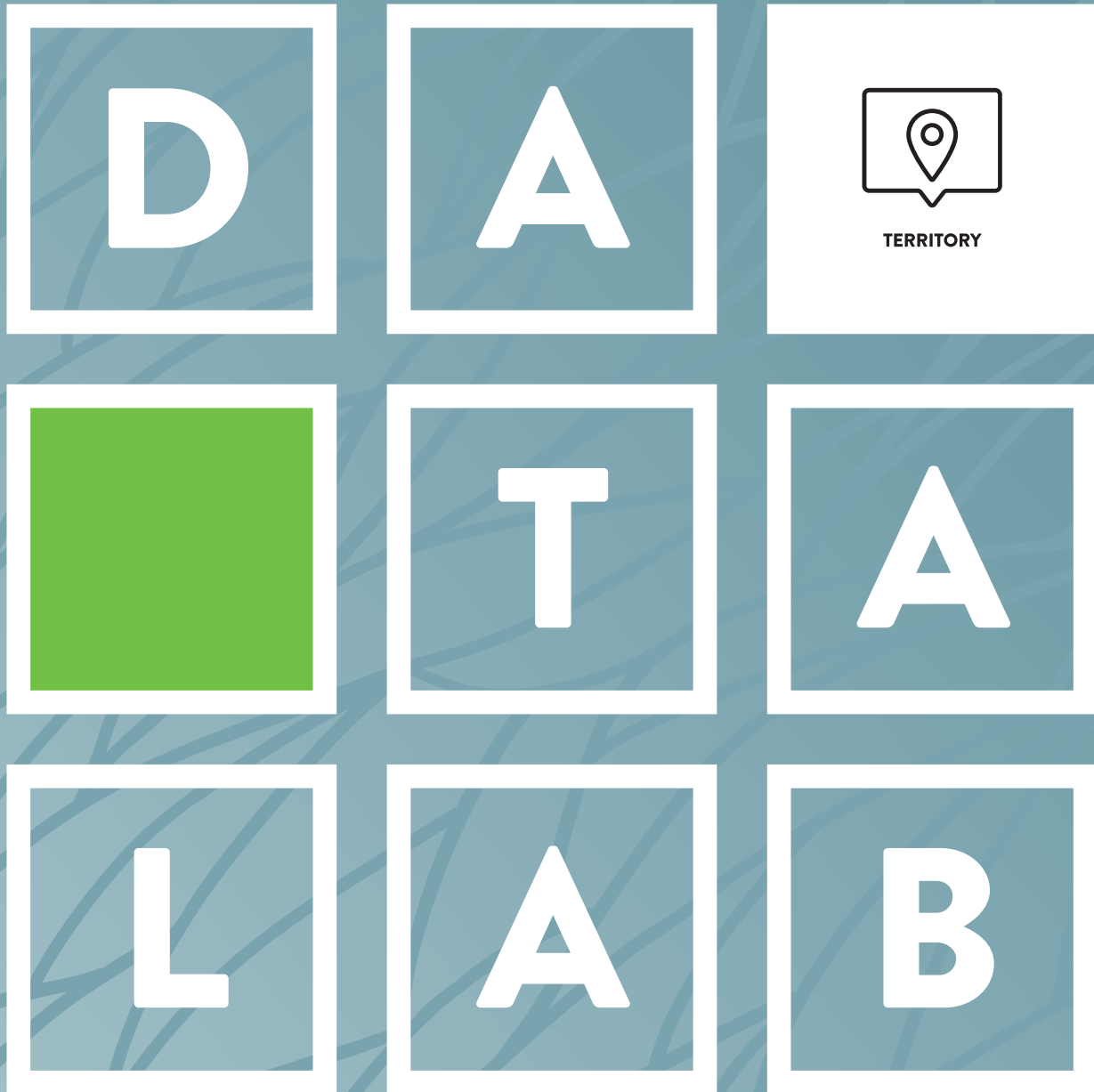




General Commission for Sustainable Development

Environmental atlas

of ski resorts and municipalities
with ski resorts

APRIL 2019

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foreword



ki resorts are a major cornerstone of the mountain tourism economy in winter. Yet, in the last few years doubt has been cast on their development, particularly in the context of climate change.

As part of the studies carried out by the Data and Statistical Studies Department (SDES) on the pressure and impact of human activity on the environment, this publication examines the problems facing winter tourism using a regional approach.

This was done using an atlas consisting of a broad range of databases, which shows the regional characteristics of and the environmental impact on each mountain range associated with the development of winter mountain tourism and ski resorts, grouped into the main topical areas.

This publication is accompanied by a working document setting out the methodology and the statistical processing carried out for this atlas.

— **Sylvain Moreau**

HEAD OF THE DATA AND STATISTICAL STUDIES DEPARTMENT (SDES)

Introduction



introduction

Winter sports resorts appeared in France in the first half of the 20th century in the Alps, and within a few decades they became a driver of the mountain tourism economy and a core economic activity for a number of regions.

The development of winter sports resorts in France boomed between 1964 and 1977 with the introduction of snow plans [Delorme, 2014]. In addition to the economic benefits, this activity provided an opportunity for the regions involved to open up, especially owing to the development of numerous main roads that connected the municipalities where these resorts were located (*see definitions*).

Faced with the decline in farming, winter tourism kept communities in business and helped counteract rural depopulation.

With time, however, the environmental impact gradually brought this development model into question. Today, the effects of climate change (reduced snow cover, increased risk of natural disasters, etc.) are putting the winter sports economy at risk.

In its 2018 annual report [Court of Auditors, 2018], the Court of Auditors emphasized the need to gradually regenerate municipalities with ski resorts and, in a number of regions, recommended that this activity should be abandoned.

SKI RESORTS: VARIABLE LEVELS OF DEVELOPMENT BETWEEN MOUNTAIN RANGES

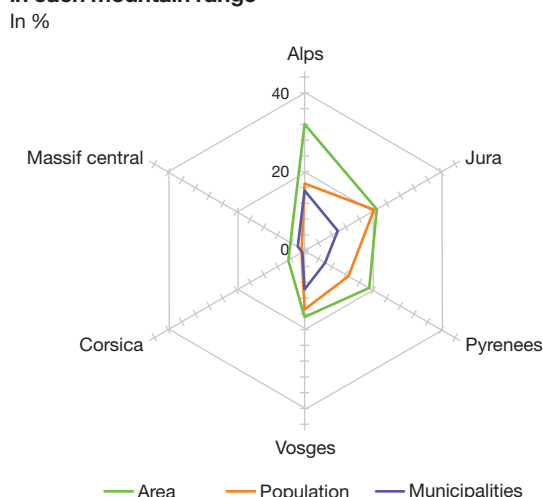
Ski resorts are unevenly distributed throughout France. Although there are municipalities with ski resorts throughout mainland France, the vast majority of them are located in the Alps, followed by the Pyrenees, the Massif central, the Jura, the Vosges and, finally, Corsica (*map 1*).

The space occupied by ski resorts in each mountain range also varies considerably. In the Alps, 15% of mountain municipalities have ski resorts (*figure 1*). In the Pyrenees, the Jura and the Vosges, municipalities with ski resorts, although smaller in number, nevertheless account for a substantial proportion in terms of area and population. On the other hand, in terms of mountain ranges, the space occupied by municipalities with ski resorts in the Massif central and Corsica is proportionally less significant.

Not all ski resorts are the same: the number of cable cars and ski lifts, the number of skiers who can be transported and the rated power of machinery affect the extent of the skiing area and the number of skiers. Domaines skiabiles de France [French Skiing Areas], a professional chamber of ski resort operators, breaks ski resorts into four categories, based on their size. This size is defined by the sum of the *vertical transport feet per hour (VTF/H) ratings* of cable cars and ski lifts installed in a resort. This indicator is obtained by multiplying the hourly rate of flow of skiers by the height difference.

This indicator is used to identify municipalities with large-scale facilities; these are mainly located in the northern Alps. On the other hand, mountain municipalities with ski resorts located in low altitude mountain ranges (Jura, Vosges, the Massif central) have a reduced number of cable cars and ski lifts overall, with a lower VTF/H rating.

Figure 1: space occupied by municipalities with ski resorts in each mountain range



Highlights: in the Alps, municipalities with ski resorts account for 15% of all mountain municipalities, 17% of the population and 32% of the area of the region.

Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

PRESSURE AND IMPACT ON THE ENVIRONMENT LINKED SPECIFICALLY TO BOTH TOURISM AND THE SEASONS

The development of ski resorts results in two types of environmental impact: direct impact caused by the construction of sports facilities (e.g. deforestation and earthworks in the mountains to develop ski slopes and install cable cars, ski lifts and snow machines) and indirect impact linked to the development of tourist accommodation facilities (consumption of space with the development of main roads and construction of tourist accommodation, catering facilities, shops, etc.).

In peak season the operation of these facilities also exerts increased pressure on natural resources (increased demand for water and electrical power, increased waste production, etc.).

introduction

Map 1: municipalities with ski resorts in 2017



Note: municipalities with ski resorts have been classified according to the sum of the vertical transport feet per hour (VTF/H) ratings of their operational cable cars and ski lifts. These are distributed in four groups: low VTF/H (< 2500 km.skiers/h), moderate VTF/H (between 2500 et 6000 km.skiers/h), high VTF/H (between 6000 and 15,000 km.skiers/h) and very high VTF/H (> 15,000 km.skiers/h).

Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

introduction

The scale of environmental services thus need to be adapted to absorb the additional output (waste collection management, waste treatment and wastewater treatment plants). In addition, excessive pressure on resources can lead to conflict between usage for tourist activities and services for the resident population.

The consequences of climate change now compound these environmental issues. With the increasing frequency of winters without snow, the issue of adapting ski resorts is now a core concern for mountain regions. In its annual report [Court of Auditors, 2018], the Court of Auditors emphasized the increasing vulnerability of ski resorts and the need to develop for a future where snow sports are no longer their only resource.

ANALYZING THE STATE OF THE ENVIRONMENT IN SKI RESORTS: A SENSITIVE EXERCISE

In order to study the state of the environment in ski resorts, two databases have been compiled listing resorts on the one hand and, on the other hand, municipalities with ski resorts. In addition, these databases have been supplemented with tourism and environmental data.

Pressure on soils is assessed using two indicators: the first is land use in municipalities with ski resorts, so as to study the composition of these areas; the second is soil sealing in ski resorts, so as to study the impact of ski resort development on soils.

The **impact on demand for drinking water** is also studied. In the absence of reliable data on water consumption on a municipal scale, an analysis of fresh water abstraction for drinking water supplies in municipalities with ski resorts has been prioritized.

With regard to **electricity consumption**, the study focuses on consumption by the residential and service sectors (excluding Corsica, where these data are unavailable). These two sectors include household consumption (homes, including second homes) and consumption by services (particularly

including commercial tourist accommodation, catering and leisure infrastructures).

The **impact of sports facilities** for skiing is also analyzed on the basis of the characteristics of cable cars and ski lifts and their development.

Finally, the **impact on biodiversity** has been observed by analyzing the interaction between ski resorts and protected areas and by studying the interaction between ski resorts and remarkable natural environments identified by type 1 natural areas of ecological, flora and fauna interest (known as ZNIEFF in French).

The issue of waste has not been studied in this atlas, as infra-departmental data on volumes collected and treatment methods could not be collected.

AN ATLAS TO PROVIDE KNOWLEDGE, UNDERSTANDING AND A BASIS FOR ACTION

In total, 309 ski resorts and 405 municipalities with ski resorts distributed throughout all the mountain ranges have been identified. The methodology applied and the statistical processing carried out are described in a working document [Gauche M., Kraszewski M., 2019] published by the SDES.

The results of this work are set out in the form of an atlas showing the environmental portraits of each mountain ski area. Each portrait includes contextual data to describe the mountain area (topographical, demographic and tourism data, etc.) along with summary data and tourism and environmental indicators.

To provide an overview, the results for ski resorts and municipalities with ski resorts in each mountain range are compared with those for other mountain municipalities in France.

part 1

The Alps



Characteristics of the mountain area

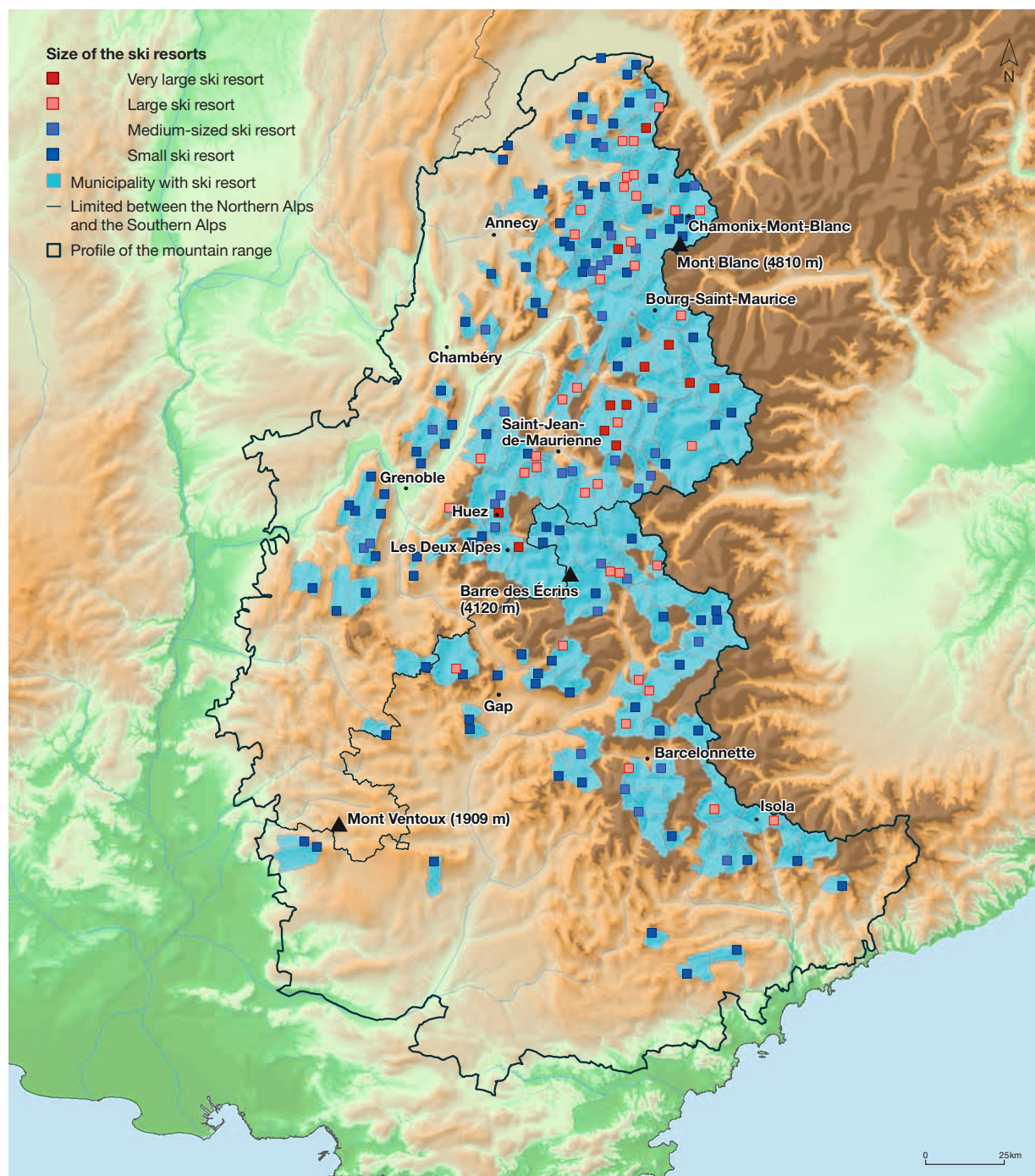


Aerial view of the Alps

AREA	POPULATION	ALTITUDE
3,686,260 ha	1,718,940 inhabitants	Average altitude of the municipalities: 957 m
1456 municipalities (2532 ha/municipality on average)	1181 inhabitants/ municipality on average	Average altitude of the highest municipality: 2727 m
	47 inhabitants/km²	

part 1: the Alps

Map 2: ski resorts and municipalities with ski resorts in the Alps in 2017



Note: municipalities are classified according to the sum of the vertical transport feet per hour (VTF/H) ratings of their operational cable cars and ski lifts. They are divided into four groups: small resorts (VTF/H < 2500 km.skiers/h), medium-sized resorts (VTF/H between 2500 and 6000 km.skiers/h), large resorts (VTF/H between 6000 and 15,000 km.skiers/h) and very large resorts (VTF/H > 15 000 km.skiers/h).

Sources: BDTOPO®; CGET; ©OpenStreetMap; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Ski resorts and municipalities with ski resorts

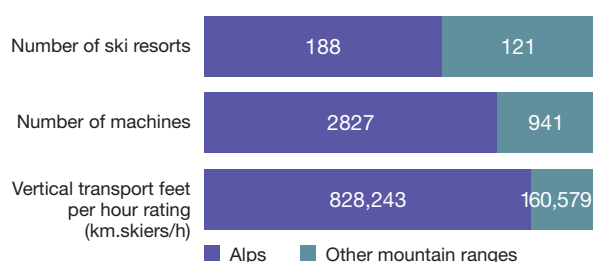
SKI RESORTS

The Alps have 188 ski resorts in total, accounting for more than half of the resorts located in France.

These ski resorts and the municipalities supporting them are mainly located in the northern part of the mountain range where, historically, France's first resorts were developed.

With activities mainly focusing on Alpine skiing, these resorts have more than 2800 cable car lines/ski lifts for a vertical transport feet per hour rating of almost 830,000 km.skiers/h.

Figure 2: characteristics of ski resorts in the Alps in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

The area covered by Alpine ski resorts is estimated at almost 224,000 ha, i.e. 6% of the Alpine mountain area.

In general, these ski resorts are quite extensive. On average, they cover an area exceeding 1200 ha per resort.

Figure 3: area covered by ski resorts in the Alps in 2017

Land area covered by ski resorts	223,657 ha
Average area of ski resorts	1216 ha
Proportion of the mountain area	6 %

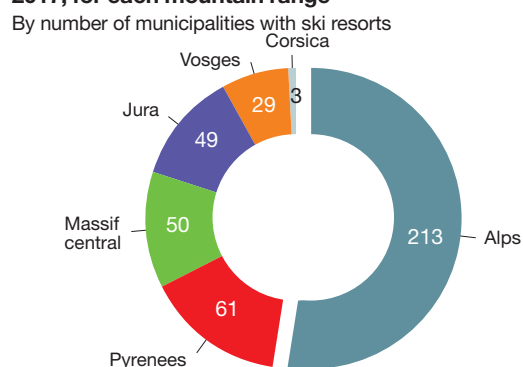
Note: owing to a lack of data, the area covered by 4 resorts could not be estimated.
Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

MUNICIPALITIES WITH SKI RESORTS

Municipalities with ski resorts have at least one cable car/ski lift line or one cross-country skiing facility.

More than half of the municipalities in France with ski resorts are located in the Alps. There are 213 of these municipalities.

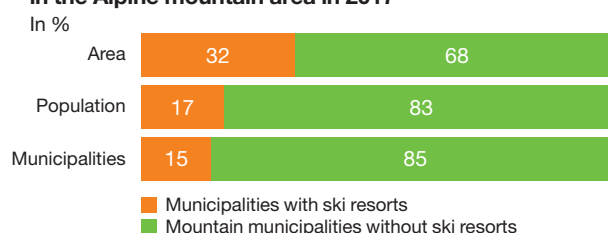
Figure 4: distribution of municipalities with ski resorts in 2017, for each mountain range



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

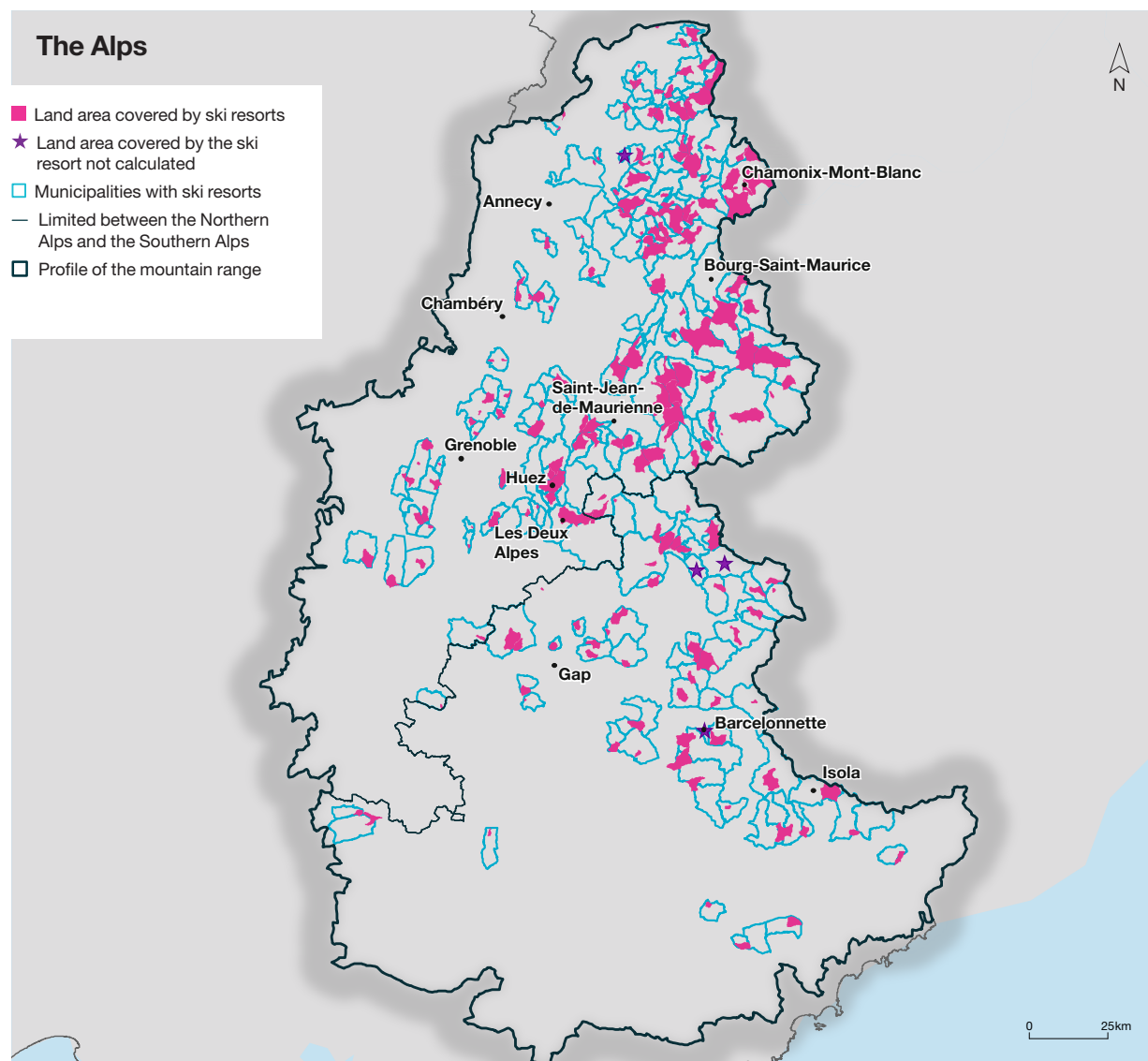
Municipalities with ski resorts occupy a substantial area of the Alps. They cover 1.2 million hectares, i.e. one third of the mountain area. They account for 15% of Alpine mountain municipalities and 17% of the population lives there all year round.

Figure 5: space occupied by municipalities with ski resorts in the Alpine mountain area in 2017



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Map 3: municipalities with ski resorts and land area covered by ski resorts in the Alps in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

Land area covered by ski resorts

The land area covered by resorts is the estimated surface area of the ski resorts. Their profile was calculated on the basis of the area covered by geo-localized cable cars and ski lifts and from the location of surrounding tourist accommodation facilities and buildings in the ski resort.

Tourism

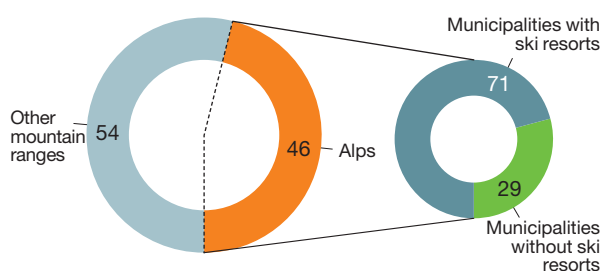
ACCOMMODATION CAPACITY AND TOURIST NUMBERS

With more than 2.5 million beds in 2017, the Alps are the mountain range with the greatest tourist accommodation capacity. This area accounts for almost half of all beds in the mountain tourism industry.

More than 70% of these tourist beds are located in municipalities with ski resorts, showing the significant position occupied by this tourism activity.

Figure 6: tourist accommodation capacity of mountain municipalities in the Alps in 2017

In %

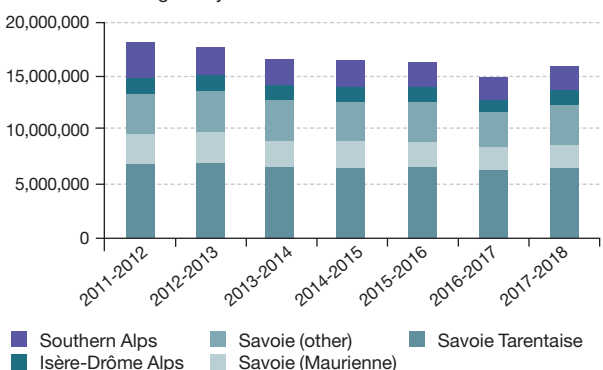


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

During the 2017-18 season, municipalities with winter sports resorts in the Alps registered almost 16 million overnight stays, i.e. 86% of the total number of overnight stays in mountains during the winter. More than half of these overnight stays are located in the Northern Alps, mainly in the Tarentaise valley.

Figure 7: fluctuations in the number of overnight winter tourism stays in municipalities in the Alps with winter sports resorts

Number of overnight stays



Note: municipalities with winter sports resorts defined by Insee as having ski equipment among their permanent facilities or classified as "tourist municipalities" by the Tourism Code.

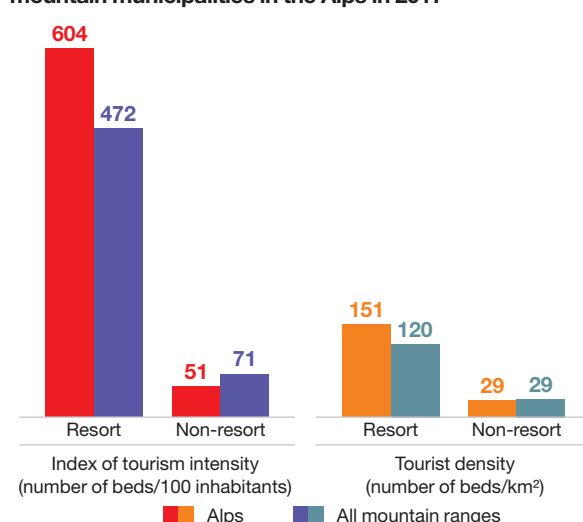
Sources: Insee-CRT-DGE, surveys on the number of stays in tourist accommodation

PRESSURE FROM TOURISM

In the Alps, variations in population associated with tourism, expressed by the index of tourism intensity, are substantially higher in municipalities with ski resorts than in the rest of the mountain area. On average, the population is 7 times greater in the tourist season.

The average index of tourism intensity in municipalities with ski resorts in the Alps is also substantially higher than the average for municipalities with ski resorts throughout the whole of France.

Figure 8: index of tourism intensity and tourist density in mountain municipalities in the Alps in 2017



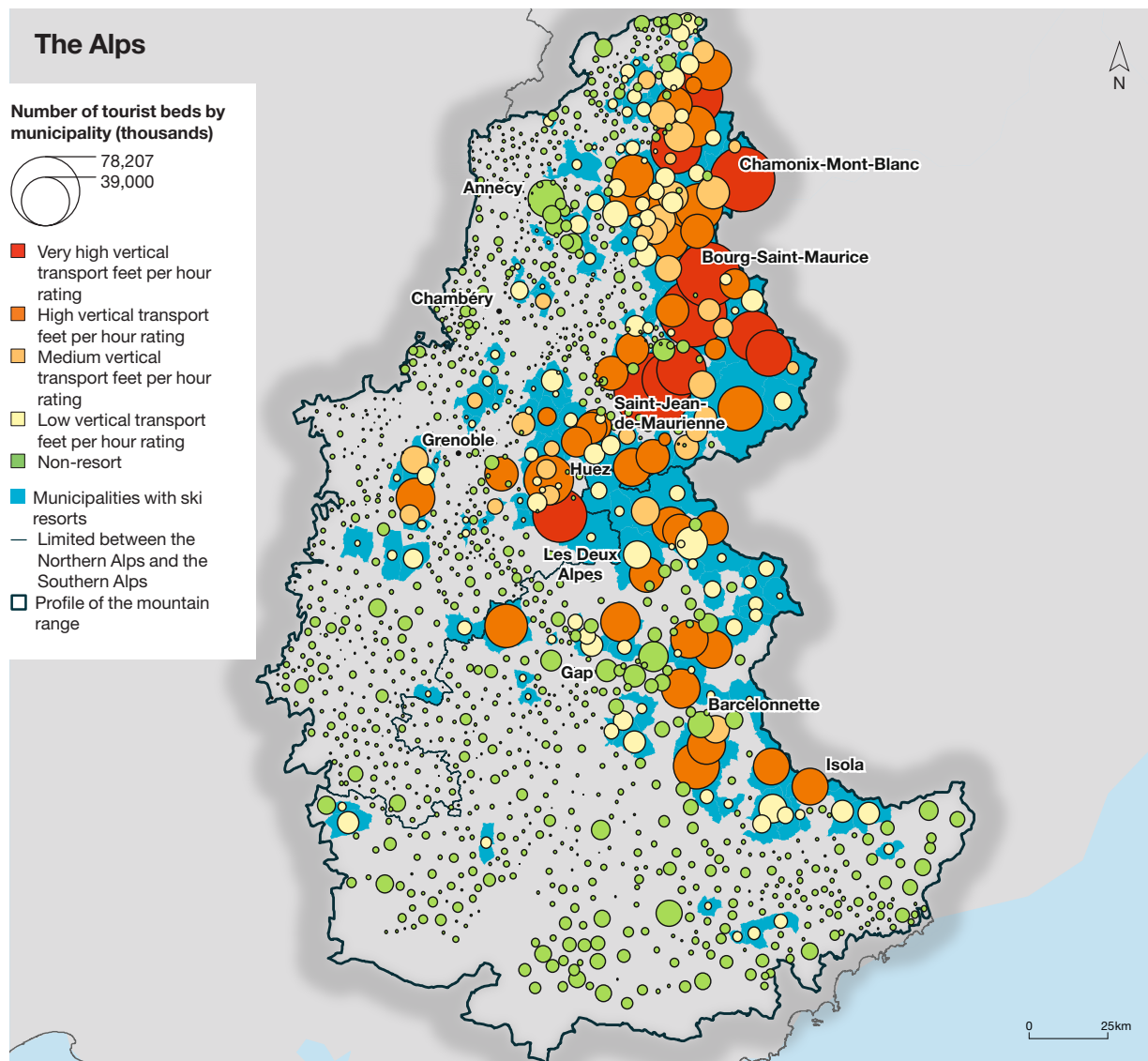
Highlights: on average, municipalities with ski resorts in the Alps have an index of tourism intensity of 604 beds per 100 inhabitants and a tourist density of 151 beds per km².

Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

With 151 beds per km² on average, tourist density is five times higher in municipalities with ski resorts in the Alps than in other mountain municipalities in the mountain range, suggesting a high level of urban planning for tourism.

The tourist density in municipalities with ski resorts in the Alps is also higher in this mountain range than the average for municipalities with ski resorts in the whole of France.

Map 4: tourist accommodation capacity of mountain municipalities in the Alps in 2017

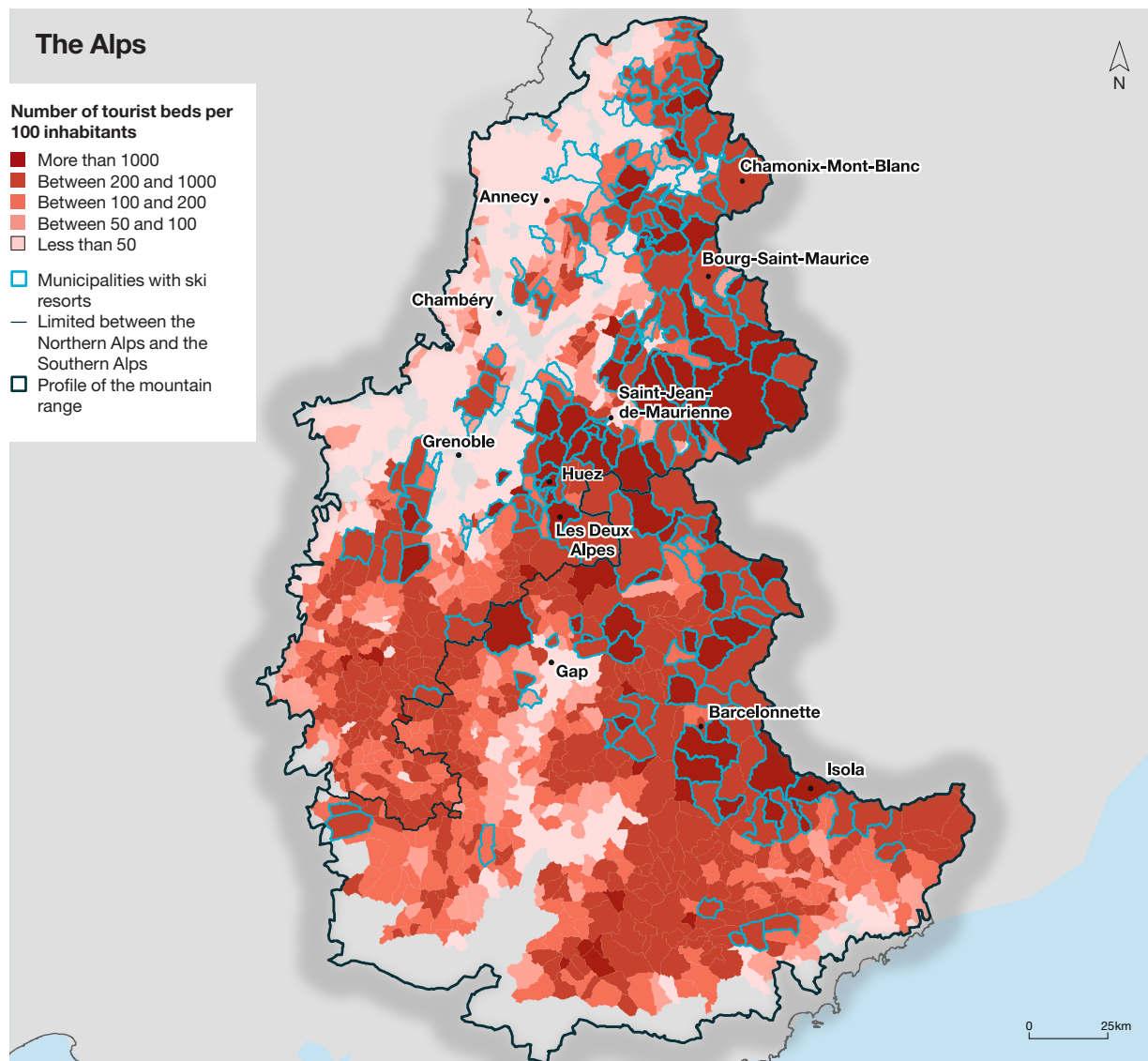


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Tourist accommodation capacity

Tourist accommodation capacity defines the number of tourist beds located in a municipality. This indicator includes tourist beds in paid accommodation facilities (hotels, camping sites, holiday residences, holiday villages, youth hostels, sports centers, etc.) and in non-paid accommodation facilities (second homes). Private tourist accommodation (Airbnb type) is not taken into consideration. The ratios defined by Insee (National Institute of Statistics and Economic Studies) have been used to estimate the number of tourist beds for hotels (two beds per room), camping sites (three beds per camping pitch) and second homes (five beds per second home).

Map 5: index of tourism intensity of mountain municipalities in the Alps in 2017

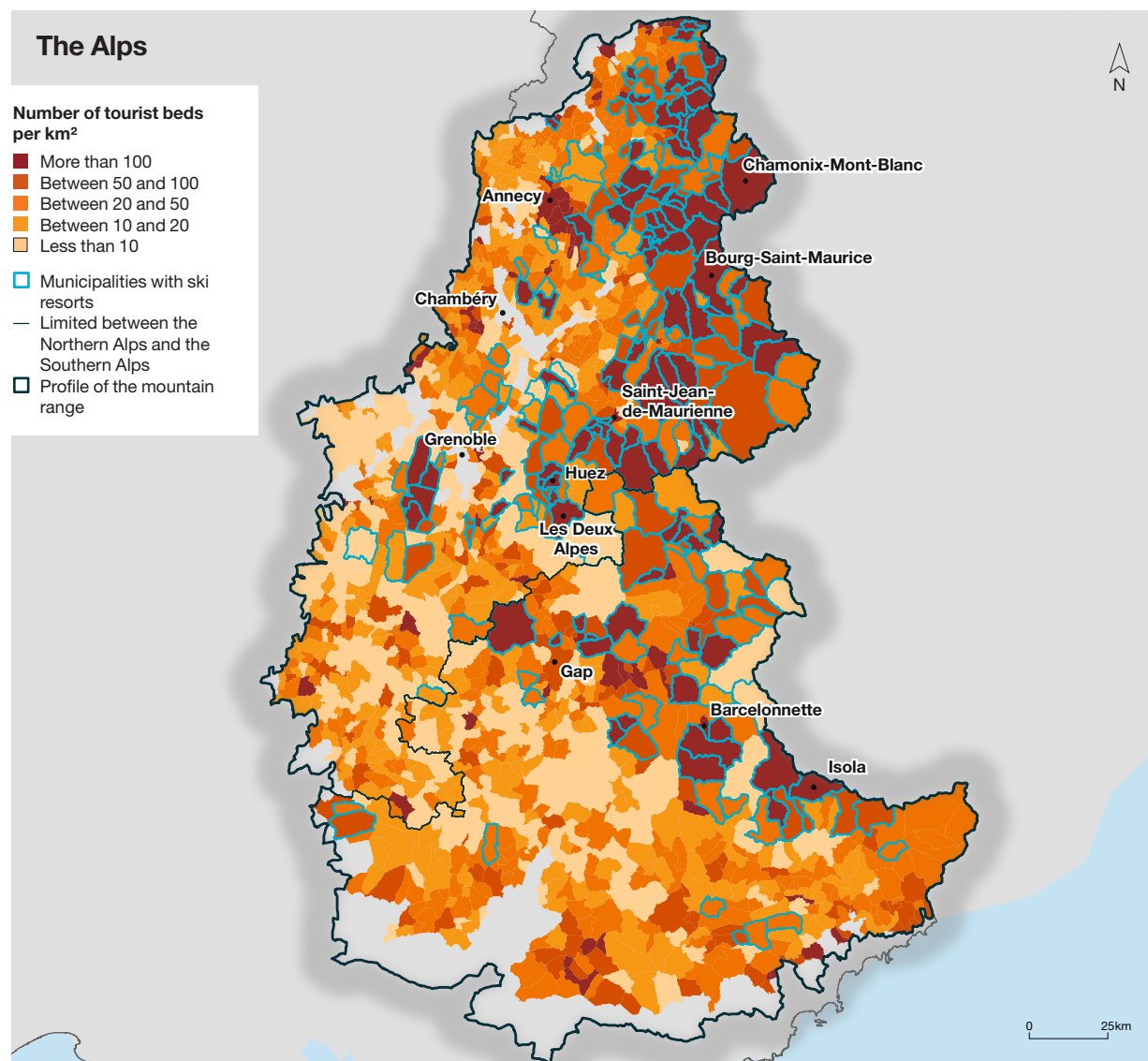


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Index of tourism intensity

The index of tourism intensity is an indicator of tourist pressure or tourist intensity. This is the ratio of the number of tourist beds in a given area to its resident population. This indicator expresses the theoretical capacity of an area to increase its population in terms of accommodating tourists. An index equal to 100 means that the area has a tourist accommodation capacity equivalent to its permanent population and could therefore double its population.

Map 6: tourist density of mountain municipalities in the Alps in 2017



Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Tourist density

Tourist density is the ratio between the number of tourist beds in a region and its area. This indicator is used to estimate the spatial concentration of tourist accommodation in a given region.

Land use

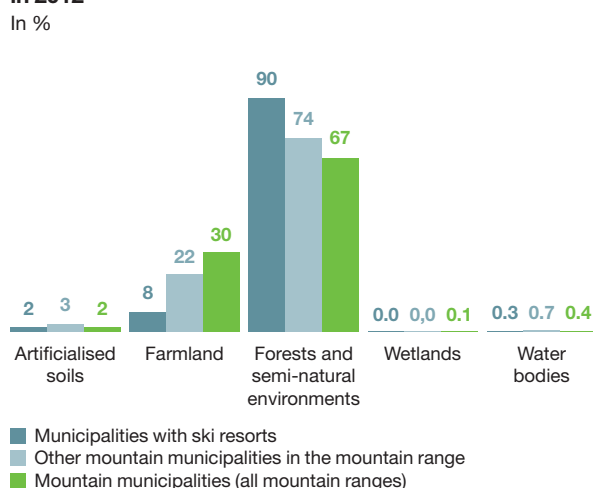
LAND USE

Alpine areas have higher proportions of mainly forests and grassland than other mountain ranges, particularly in municipalities with ski resorts.

On the other hand, the proportion of agricultural land is significantly lower than in all mountain ranges. On average, it is less than 10% in municipalities with ski resorts.

The proportion of developed land is very similar to that of all mountain municipalities and is still two times less than the national average.

Figure 9: land use in mountain municipalities in the Alps in 2012

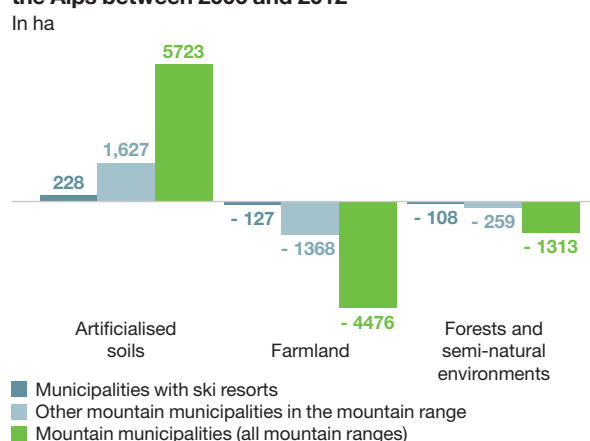


Highlights: in 2012, on average, 8% of the area of municipalities with ski resorts in the Alps consisted of agricultural land.

Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn; EU-SDES, CORINE Land Cover. Processing: SDES

The development of land use in municipalities with ski resorts in the Alps follows the same trends as the rest of the mountain area. Developed areas are increasing, while agricultural land is decreasing. Forest and grassland areas are also decreasing, but in lower proportions.

Figure 10: trends in land use in mountain municipalities in the Alps between 2006 and 2012



Highlights: between 2006 and 2012, the area of developed land increased by 228 ha in municipalities with ski resorts in the Alps, while 127 ha of agricultural land disappeared.

Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn; EU-SDES, CORINE Land Cover. Processing: SDES

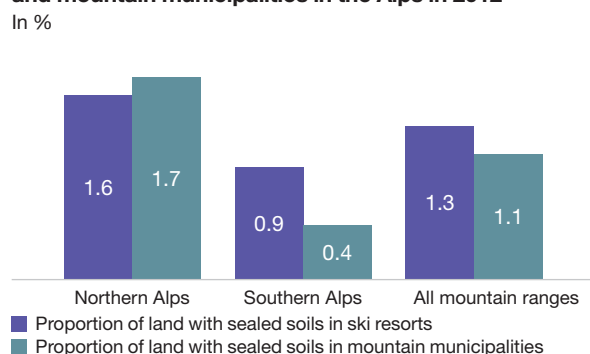
SOIL SEALING

Soils are sealed more in the mountain region of the Alps than in the average of mountain municipalities in France. The proportion of land with sealed soils also exceeds the national average (1.3%).

The northern part of the mountain range is particularly affected by this trend. In this area, the proportion of land with sealed soils in ski resorts is similar to the proportion for all municipalities.

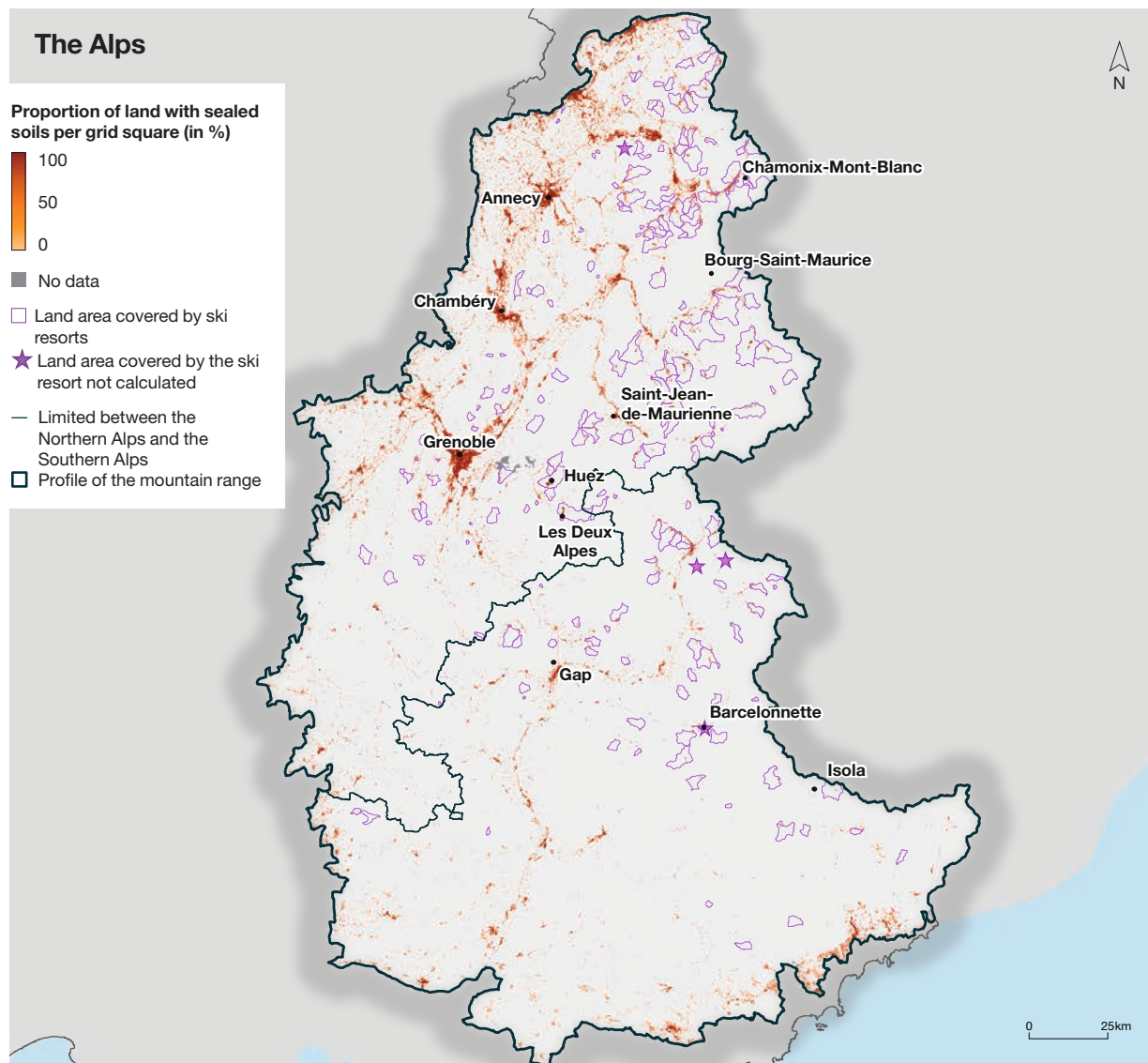
In the southern part of the mountain range, the proportion of land with sealed soils is substantially lower. However, it is two times higher on average in ski resorts than in other mountain municipalities in this region.

Figure 11: proportion of land with sealed soils in ski resorts and mountain municipalities in the Alps in 2012



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Map 7: proportion of land with sealed soils in ski resorts and mountain municipalities in the Alps in 2012



Note: the "high-resolution" layer that was used maps the percentage of sealed soils in pixels measuring 20 m x 20 m.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Soil sealing

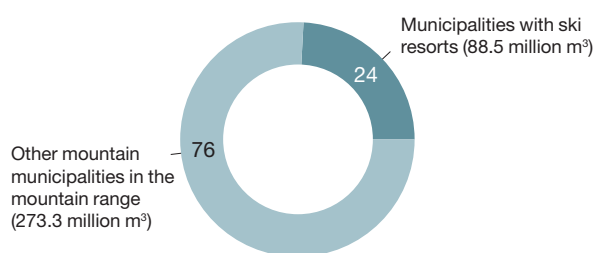
Soil sealing is defined as permanent coverage of the ground with a material that is impermeable to water and air. This can be the result of the construction of roads, buildings or car parks. Sealed soils irreversibly lose their ecological functions, particularly in terms of water storage, and thus notably create the risk of mudslides and water run-off that could lead to flooding.

Drinking water

VOLUMES OF FRESH WATER ABSTRACTED FOR DRINKING WATER SUPPLIES IN THE REGION

Almost a quarter of water volumes in the Alps abstracted for drinking water supplies come from municipalities with ski resorts. This accounts for more than 88 million m³.

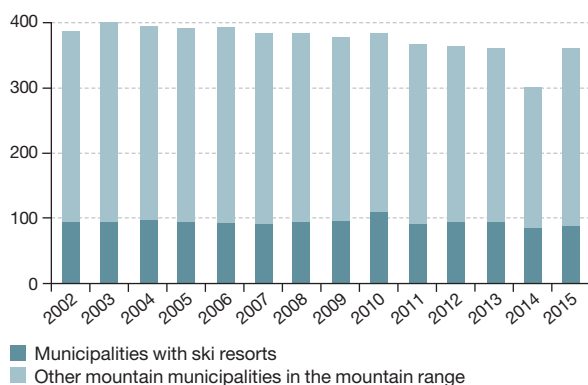
Figure 12: samples of fresh water abstracted for the drinking water supply in mountain municipalities in the Alps in 2015
In %



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Between 2002 and 2015, the volume of water abstracted for drinking water supplies diminished throughout the mountain area. This reduction is less marked in municipalities with ski resorts (-8%) than in other Alpine municipalities (-15%).

Figure 13: trends in fresh water abstracted for the drinking water supply in mountain municipalities in the Alps
In millions of m³

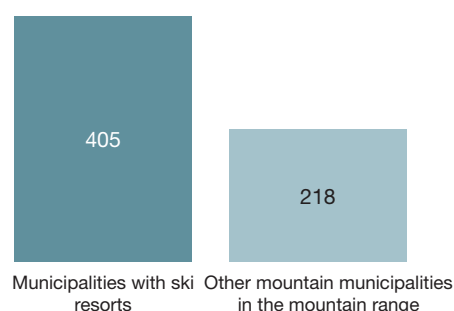


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

WATER ABSTRACTED FOR DRINKING WATER IN RELATION TO THE MUNICIPALITIES AND THE POPULATION

In the Alps, abstracted water volumes, in relation to the number of municipalities, are almost twice as high in ski resorts than in municipalities without ski resorts.

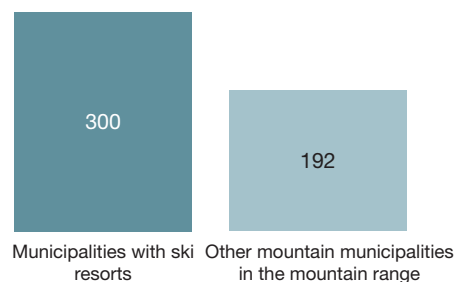
Figure 14: fresh water abstracted for drinking water supplies in the Alps in 2015 by mountain municipality
In thousands of m³ per municipality



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

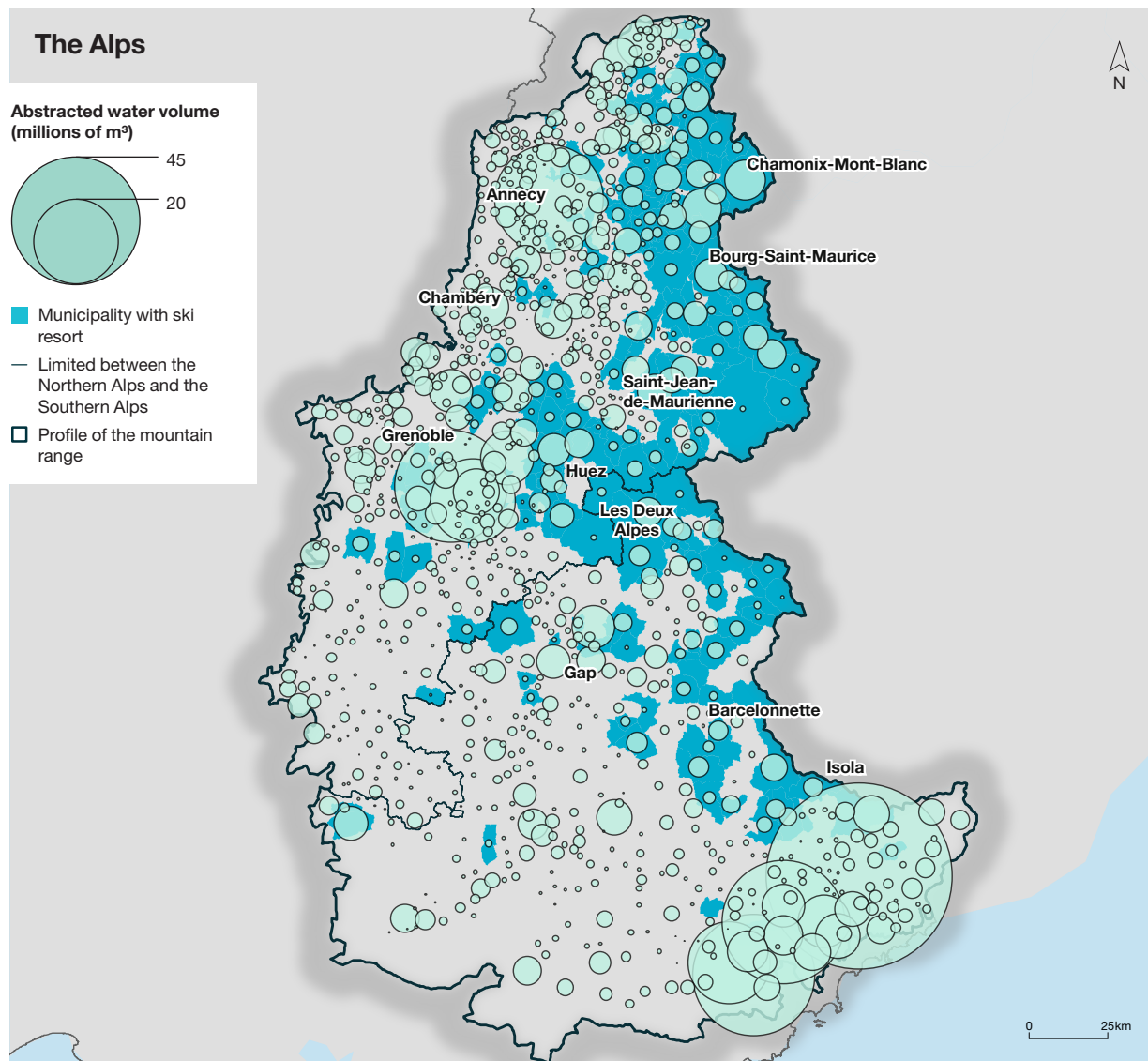
In relation to the number of inhabitants, there are also significant disparities between water volumes abstracted for drinking water supplies in municipalities with ski resorts and those in other mountain municipalities in the Alps. On average, volumes are as high as 300 m³ per inhabitant in municipalities with ski resorts, versus 192 m³ per inhabitant in other Alpine mountain municipalities.

Figure 15: fresh water abstracted for drinking water supplies in the Alps in 2015 per inhabitant
In m³ per inhabitant



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Map 8: fresh water abstraction for the drinking water supply in mountain municipalities in the Alps in 2015



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Fresh water abstracted for the drinking water supply

Fresh water abstracted for the drinking water supply is equal to the quantities of water taken for the production of drinking water. The abstraction location is not necessarily the consumption location. Some water abstracted in a municipality may be intended for supplying adjacent areas.

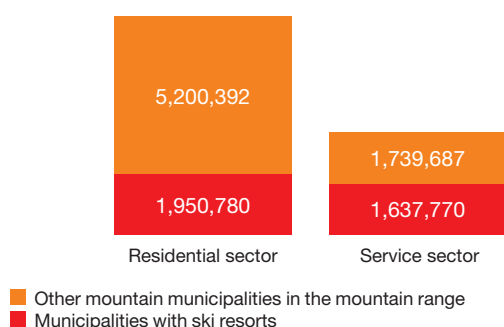
Electricity

ELECTRICITY CONSUMPTION IN MUNICIPALITIES WITH SKI RESORTS

In the Alps, more than one quarter of the electricity consumed by the residential sector and almost half the electricity consumed by the service sector originates from municipalities with ski resorts. In total this accounts for consumption exceeding 3.5 million kWh.

Figure 16: electricity consumption in the residential and service sectors in mountain municipalities in the Alps in 2016

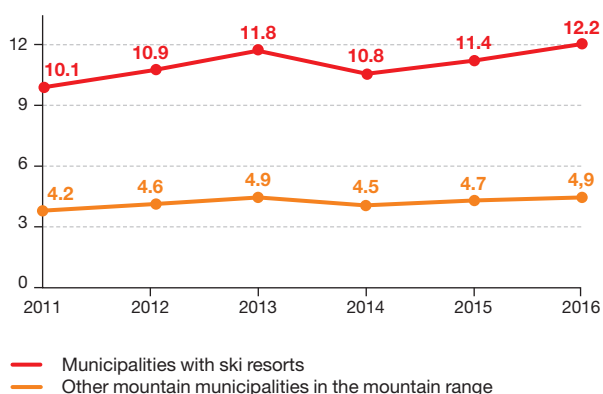
In kWh



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Figure 17: trends in electricity consumption in the residential and service sectors in the Alps per inhabitant

In kWh per inhabitant



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

In relation to the number of inhabitants, the accumulated electricity consumed by the residential and service sectors is 2.5 times higher on average in municipalities with ski resorts in the Alps than in other municipalities in the region.

Between 2011 and 2016, consumption also increased at a higher rate in municipalities with ski resorts, with an increase of 20%, compared to 15% in other Alpine municipalities.

ELECTRICAL POWER OF CABLE CARS AND SKI LIFTS

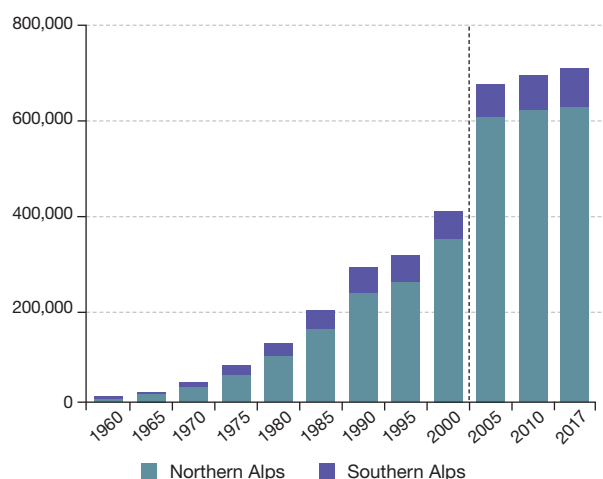
The electrical power of cable cars and ski lifts in the Alps accounts for more than 90% of the total electrical power of machinery located in ski resorts throughout France.

In 50 years, the electrical power of cable cars and ski lifts has increased substantially. The greatest increases occurred between 1980 and 2000.

Between 2005 and 2017 the increase in usable electrical power continued, but at a slower rate (+6%), particularly in the northern part of the mountain range (+4%). In the southern part, the increase has continued at a constant rate (+18% throughout the observed period).

Figure 18: trends in the installed electrical power rating of cable cars and ski lifts in municipalities with ski resorts in the Alps

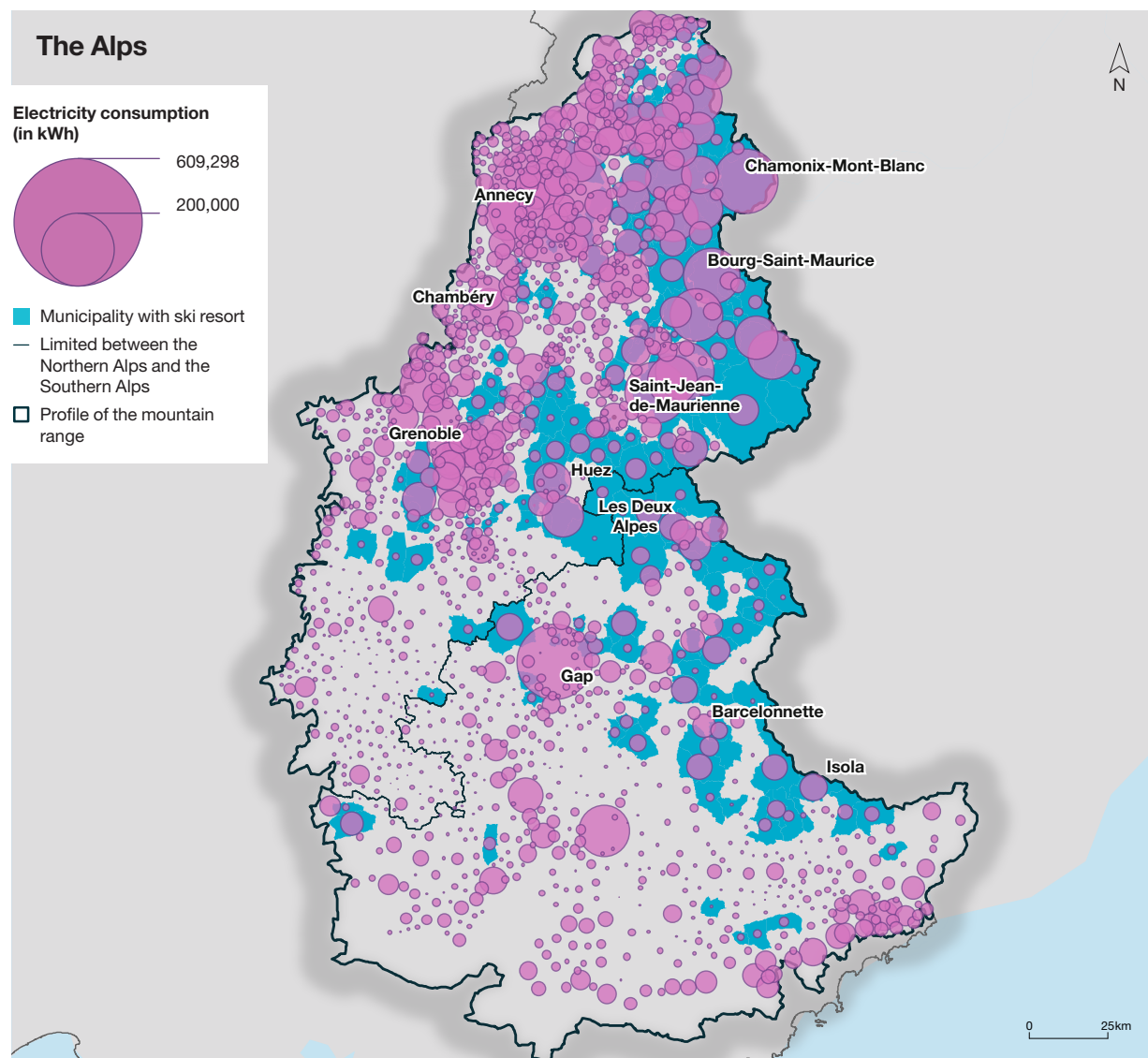
In kWh



Note: break in the series in 2005.

Sources: CGET; STRMTG, Cairn. Processing: SDES

Map 9: electricity consumption in the residential and service sectors in mountain municipalities in the Alps in 2016



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Electricity consumption in the residential and service sectors

The residential sector corresponds to household electricity consumption The service sector corresponds to electricity consumption for service activities (shops, tourist accommodation, catering, offices, leisure infrastructures, etc.).

Biodiversity

INTERACTION BETWEEN SKI RESORTS AND PROTECTED AREAS

Three quarters of ski resorts in the Alps are located in protected areas. They cover almost 89,000 ha.

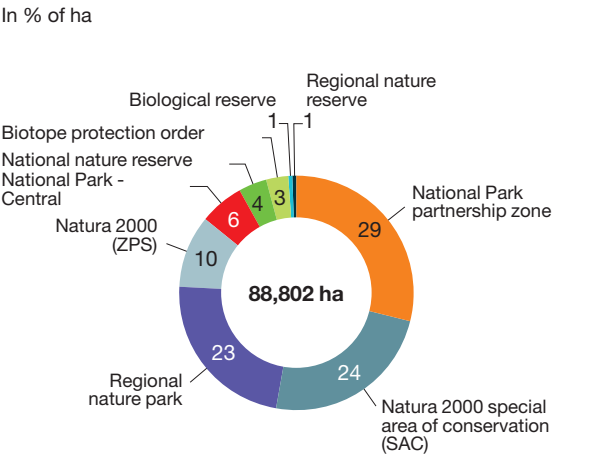
Figure 19: proportion of ski resorts overlapping protected areas in the Alps in 2017



Note: resorts of which the land area covered could not be calculated are not included.
Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

In terms of area, national parks, Natura 2000 sites and regional nature parks are the main protected areas affected by overlap with ski resorts.

Figure 20: protected areas overlapping ski resorts in the Alps in 2017 by type of protection

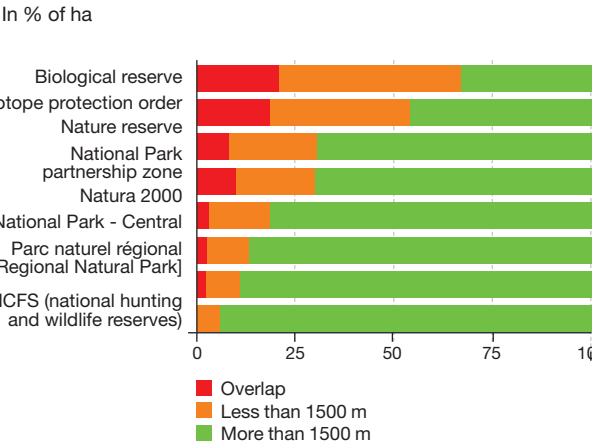


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap ; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

However, in relation to the total surface area of overlap or close proximity, small-sized protected areas that are strictly protected are the first to be affected by interaction with ski resorts.

In this respect, more than half of the area of the affected biological reserves and zones under biotope protection orders overlaps with a ski resort or is located less than 1500 m from a ski resort.

Figure 21: distribution of the surface area of protected areas located less than 1500 m from a ski resort in the Alps in 2017 in relation to their distance from the resort

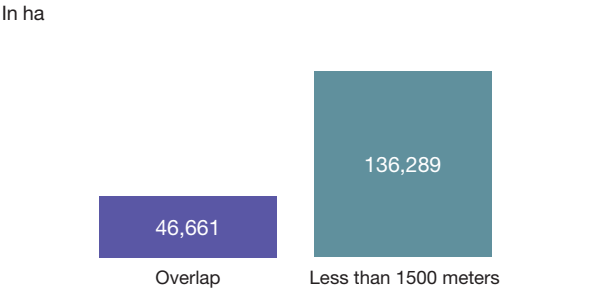


Highlights: 21% of the area of biological reserves located less than 1500 m from a ski resort overlaps a ski resort.
Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

INTERACTION BETWEEN SKI RESORTS AND REMARKABLE NATURAL SITES: CASE OF TYPE 1 ZNIEFF (NATURAL AREAS OF ECOLOGICAL, FLORA AND FAUNA INTEREST)

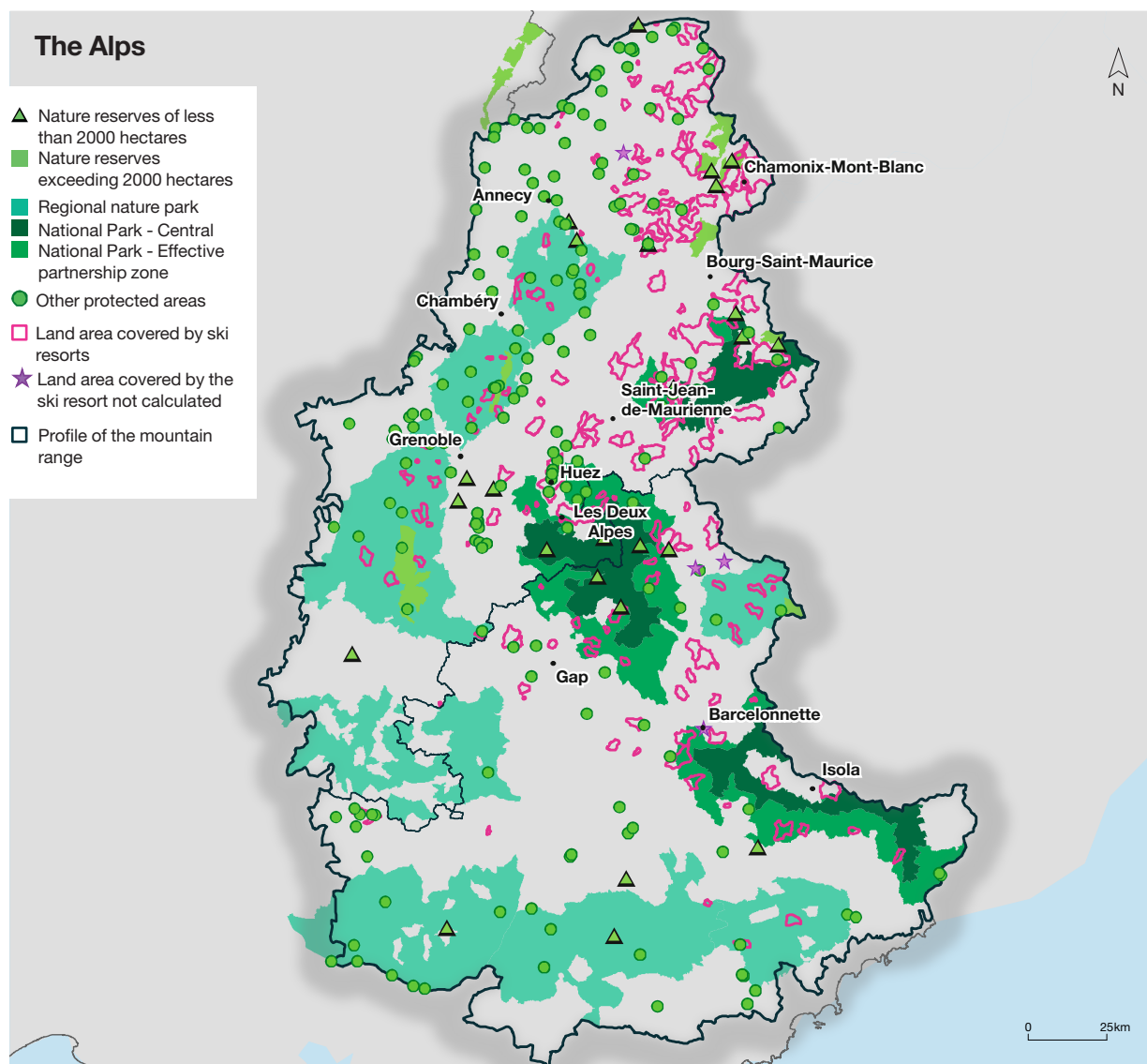
In 2017, almost 183,000 ha of type 1 ZNIEFF areas were located less than 1500 m from an alpine ski resort, of which 26% of the area overlapped.

Figure 22: area covered by type 1 ZNIEFF in the Alps in the vicinity of a ski resort in 2017



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (February 2017 update). Processing: SDES

Map 10: interaction between ski resorts and protected areas (excluding Natura 2000 sites) in the Alps in 2017

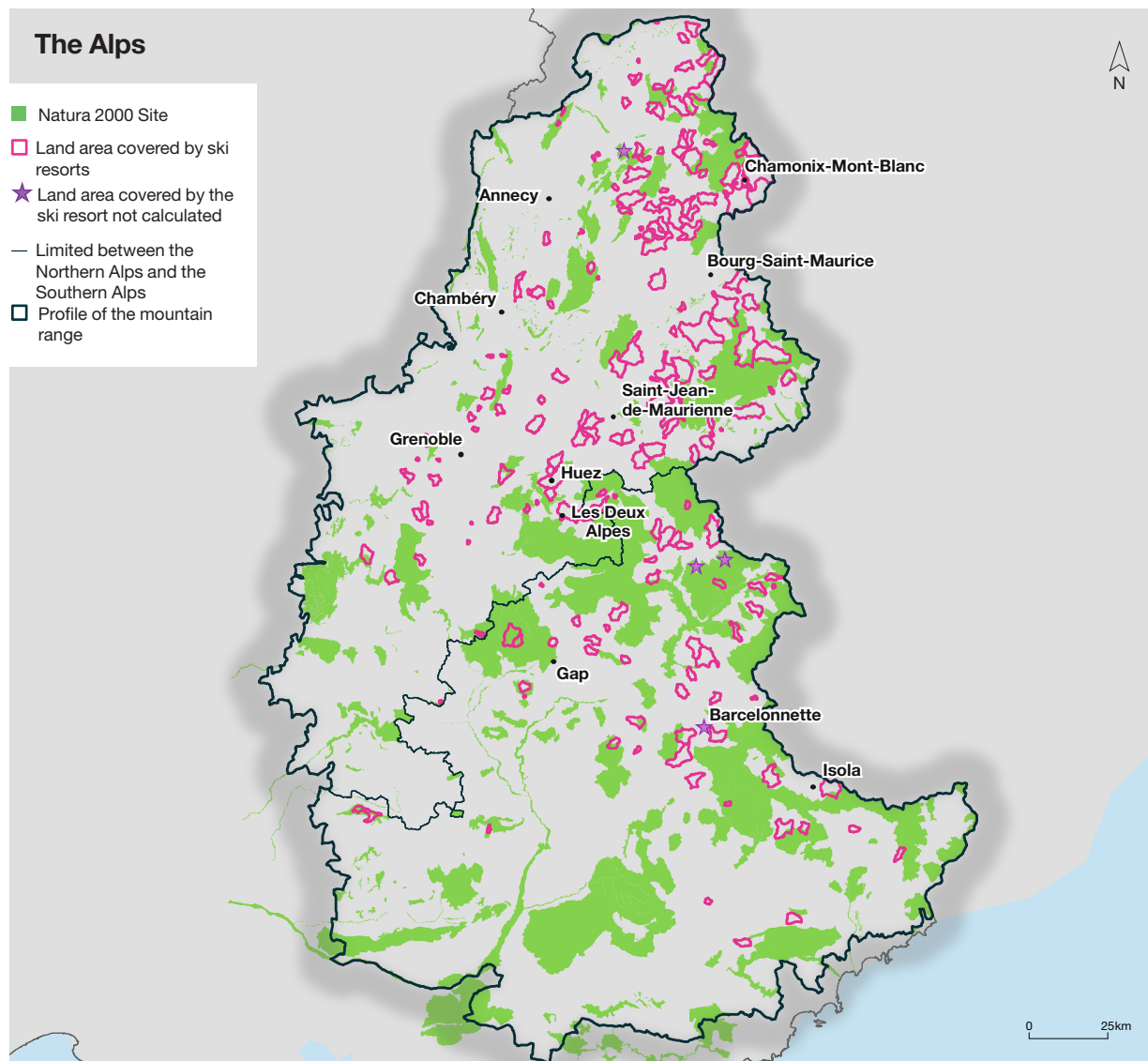


Sources: BDTOP®©, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "protected areas" (February 2017 update). Processing: SDES

Protected areas (excluding Natura 2000)

The protected areas taken into account (excluding Natura 2000 sites to improve readability) include regulatory provisions referred to as strict protection systems based on prohibiting or limiting certain human activities (central areas of national parks, national nature reserves, regional nature reserves, prefectural biotope decrees, biological reserves, national hunting and wildlife reserves). They also include contractual management arrangements (national park partnership zones, regional nature parks). The latter are less strict than regulatory provisions. They combine natural heritage conservation and local development and are based on voluntary partnership on the part of local communities.

Map 11: interaction between ski resorts and protected areas (Natura 2000 sites) in the Alps in 2017

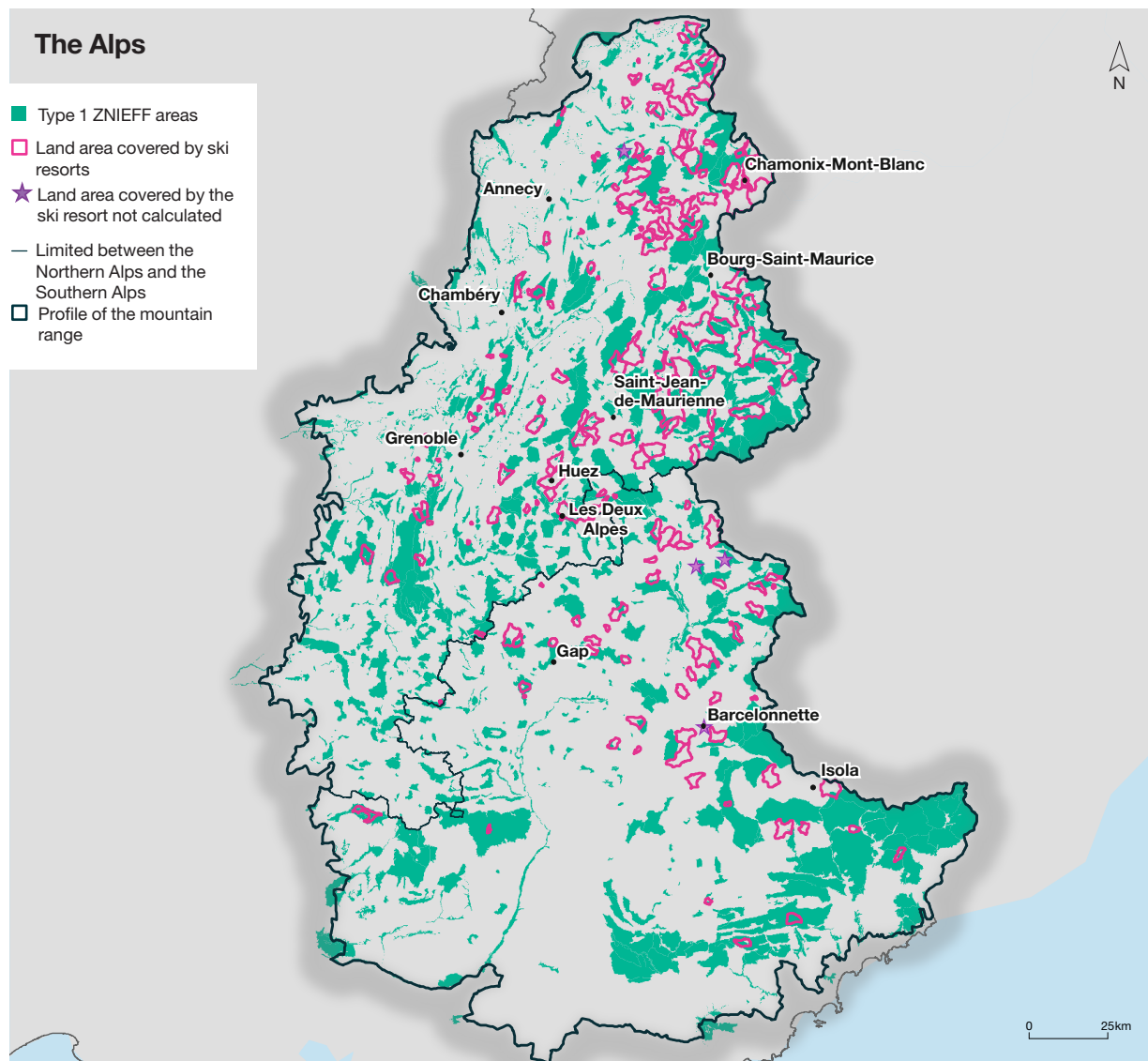


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Natura 2000" (December 2017 update). Processing: SDES

Protected areas: Natura 2000 sites

The Natura 2000 network is a European-level conservation system: it includes special protected areas (SPA) under the "Birds" directive and special areas of conservation (SAC). The purpose of the latter is to conserve habitats and animal species (excluding birds) and plant species of community interest under the "Habitats, Fauna and Flora" Directive.

Map 12: interaction between ski resorts and type 1 ZNIEFF areas in the Alps in 2017



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (March 2017 update). Processing: SDES

Type 1 ZNIEFF areas

The purpose of the list of natural areas of ecological, fauna and flora interest (ZNIEFF) is to identify remarkable natural or semi-natural environments in France that have high biological capacity and are in a good state of conservation. This knowledge tool, which does not in itself provide protection for these areas, indicates a wealth of biodiversity in the area concerned.

Type 1 ZNIEFF areas are sectors of major biological or ecological interest defined by the presence of species and environments that are rare, remarkable or characteristic of the national or regional natural heritage.

part 2

The Pyrenees



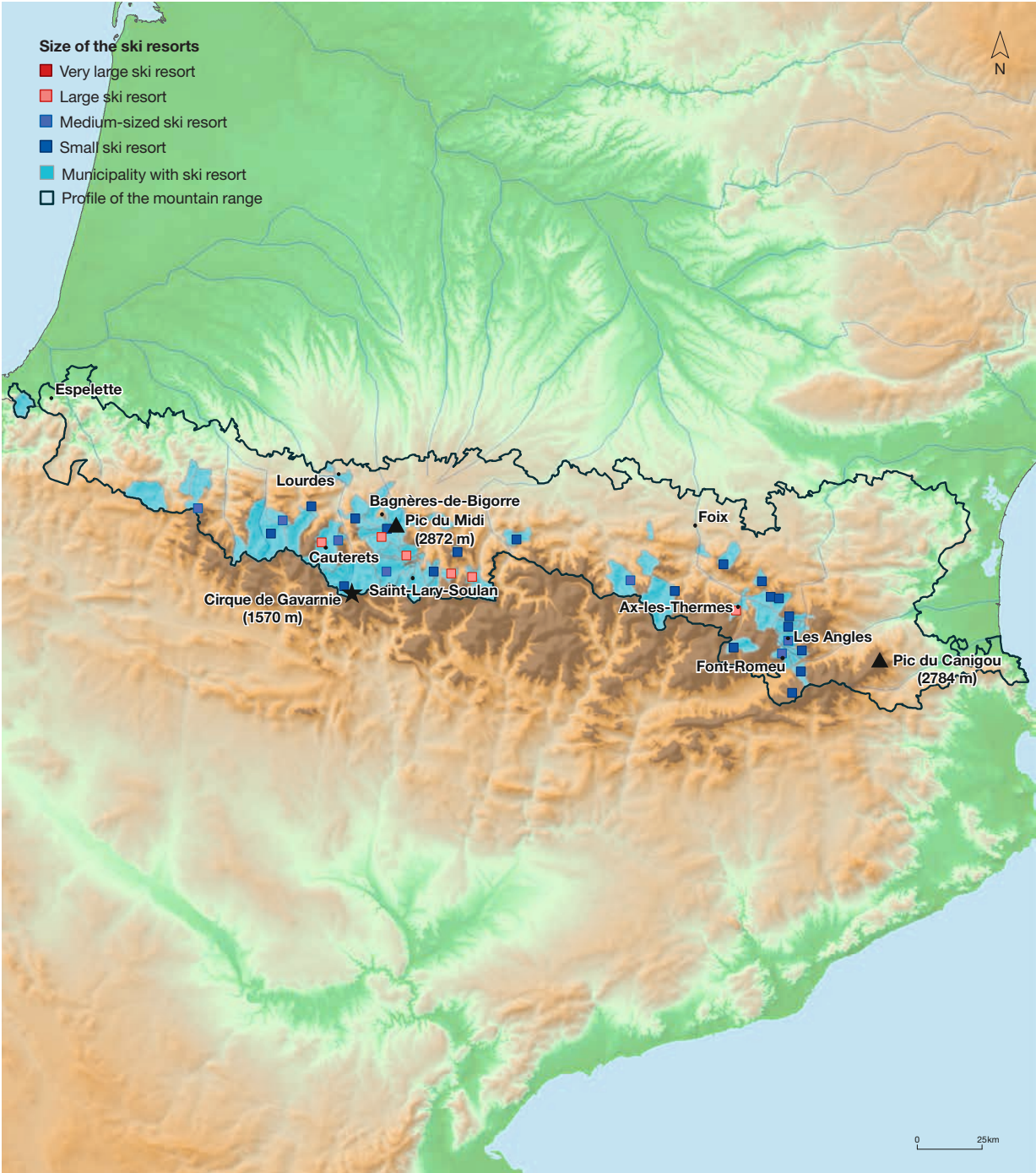
Characteristics of the mountain area



Aerial view of the Pyrenees

AREA	POPULATION	ALTITUDE
1,580,638 ha	370,558 inhabitants	Average altitude of the municipalities: 827 m
955 municipalities (1655 ha/municipality on average)	388 inhabitants/ municipality on average	Average altitude of the highest municipality: 2191 m
	23 inhabitants/km ²	

Map 13: ski resorts and municipalities with ski resorts in the Pyrenees in 2017



Note: municipalities are classified according to the sum of the vertical transport feet per hour (VTF/H) ratings of their operational cable cars and ski lifts. They are divided into four groups: small resorts (VTF/H < 2500 km.skiers/h), medium-sized resorts (VTF/H between 2500 and 6000 km.skiers/h), large resorts (VTF/H between 6000 and 15,000 km.skiers/h) and very large resorts (VTF/H > 15,000 km.skiers/h).

Sources: BDTOPO®; CGET; ©OpenStreetMap; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Ski resorts and municipalities with ski resorts

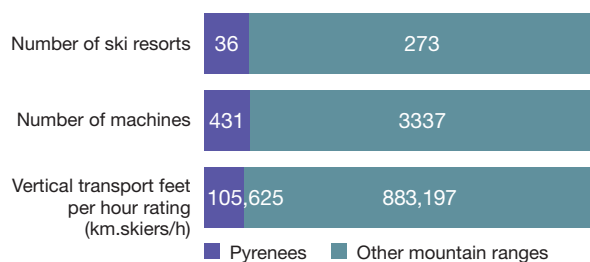
SKI RESORTS

With a total of 36 ski resorts, the Pyrenees are the second-largest skiing mountain range in France.

These ski resorts and their municipalities are mainly located in the southern part of the mountain range along the Spanish border.

With activities mainly focusing on Alpine skiing, these resorts have more than 400 cable car lines or ski lifts for a vertical transport feet per hour rating of almost 106,000 km.skiers/h.

Figure 23: characteristics of ski resorts in the Pyrenees in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

The area covered by Pyrenean ski resorts is estimated at almost 37,000 ha, i.e. 2.3% of the mountain area of the Pyrenees.

In general, these ski resorts are quite extensive. On average they cover an area of almost 1200 ha per resort

Figure 24: area covered by ski resorts in the Pyrenees in 2017

Land area covered by ski resorts	37,047 ha
Average area of ski resorts	1158 ha
Proportion of the mountain area	2.3 %

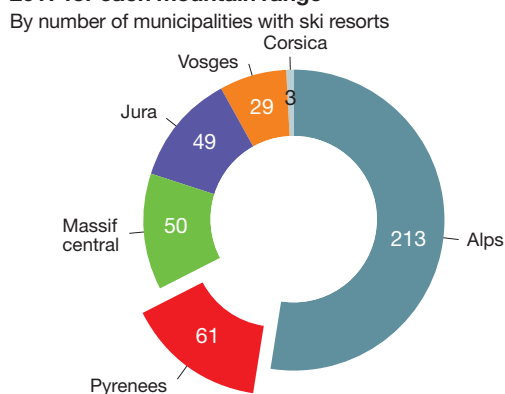
Note: owing to a lack of data, the area covered by 4 resorts could not be estimated.
Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

MUNICIPALITIES WITH SKI RESORTS

Municipalities with ski resorts have at least one cable car/ski lift line or one cross-country skiing facility.

In total, 61 municipalities in the Pyrenees have one or more ski resort(s), i.e. 15% of all municipalities with ski resorts in France.

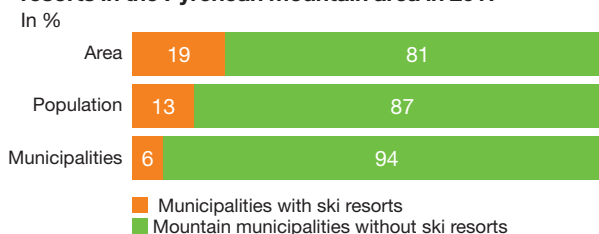
Figure 25: distribution of municipalities with ski resorts in 2017 for each mountain range



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Municipalities with ski resorts occupy a substantial area of the Pyrenees. They extend over an area of 300,000 hectares, i.e. almost 20% of the mountain area. They account for 6% of mountain municipalities in the Pyrenees and 13% of the population lives there all the year round.

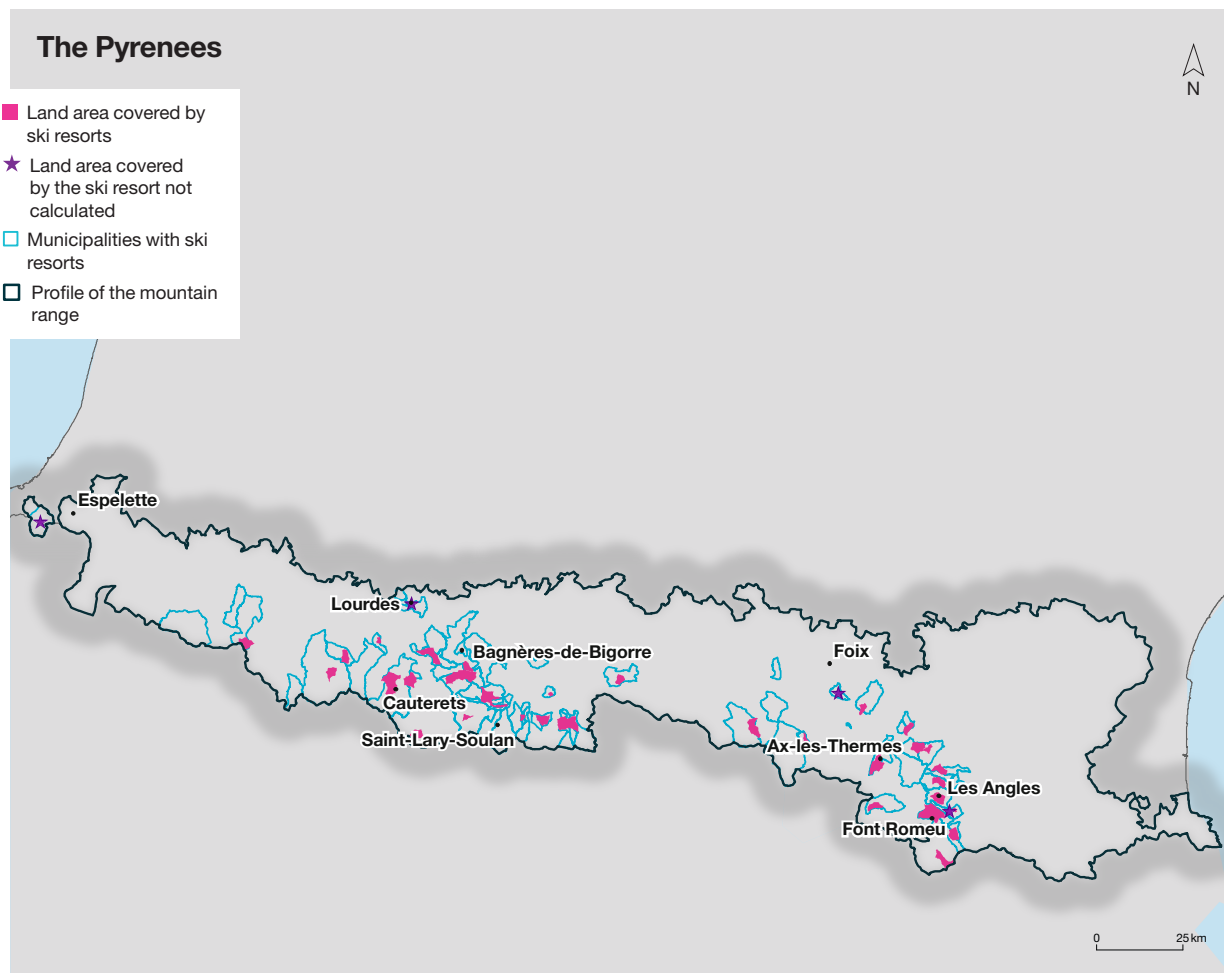
Figure 26: space occupied by municipalities with ski resorts in the Pyrenean mountain area in 2017



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

part 2: the Pyrenees

Map 14: municipalities with ski resorts and land area covered by ski resorts in the Pyrenees in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

Land area covered by ski resorts

The land area covered by resorts is the estimated surface area of the ski resorts. Their profile was calculated on the basis of the area covered by geo-localized cable cars and ski lifts and from the location of surrounding tourist accommodation facilities and buildings in the ski resort.

Tourism

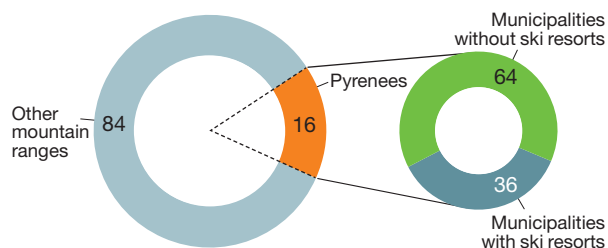
ACCOMMODATION CAPACITY AND TOURIST NUMBERS

In 2017 the Pyrenean mountain area had a tourist accommodation capacity of more than 880,000 beds.

More than one third of these tourist beds are located in municipalities with ski resorts, while the remaining two thirds are located outside ski resorts.

Figure 27: tourist accommodation capacity of mountain municipalities in the Pyrenees in 2017

In %

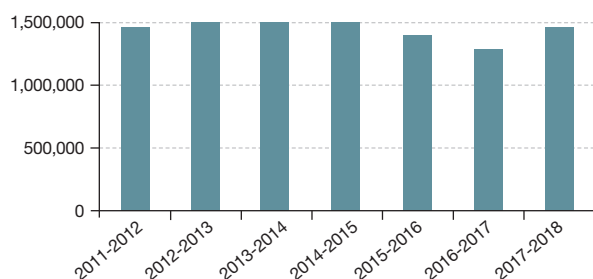


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

During the 2017-18 season, municipalities with Pyrenean winter sports resorts counted more than 1.5 million overnight stays. This turnover has been fairly constant since 2011, with the exception of the 2015-16 and 2016-17 seasons, when the number of overnight stays diminished substantially.

Figure 28: fluctuations in the number of overnight winter tourism stays in municipalities with winter sports resorts in the Pyrenees

Number of overnight stays



Note: municipalities with winter sports resorts defined by Insee as having ski equipment among their permanent facilities or classified as "tourist municipalities" by the Tourism Code.

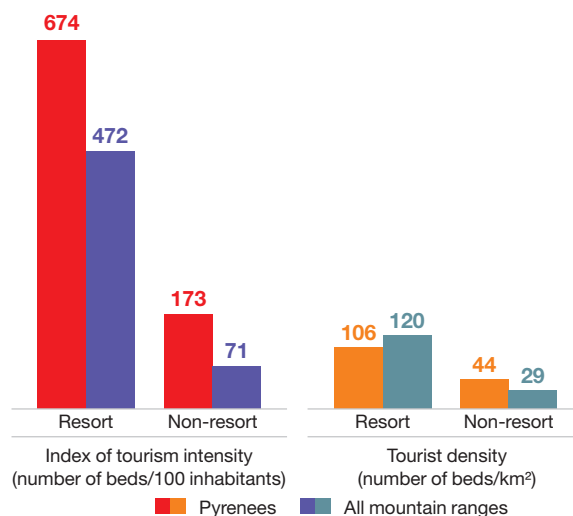
Source: Insee-CRT-DGE, surveys on the number of stays in tourist accommodation

PRESSURE FROM TOURISM

In the Pyrenees, variations in population associated with tourism, expressed by the index of tourism intensity, are substantially higher in municipalities with ski resorts than in the rest of the mountain area. On average, the population is 8 times greater in the tourist season.

The index of tourism intensity in municipalities with ski resorts in the Pyrenees is also higher in this mountain range than the average for municipalities with ski resorts in France as a whole.

Figure 29: index of tourism intensity and tourist density in mountain municipalities in the Pyrenees in 2017



Highlights: on average, municipalities with ski resorts in the Pyrenees have an index of tourism intensity of 674 beds per 100 inhabitants and a tourist density of 106 beds per km².

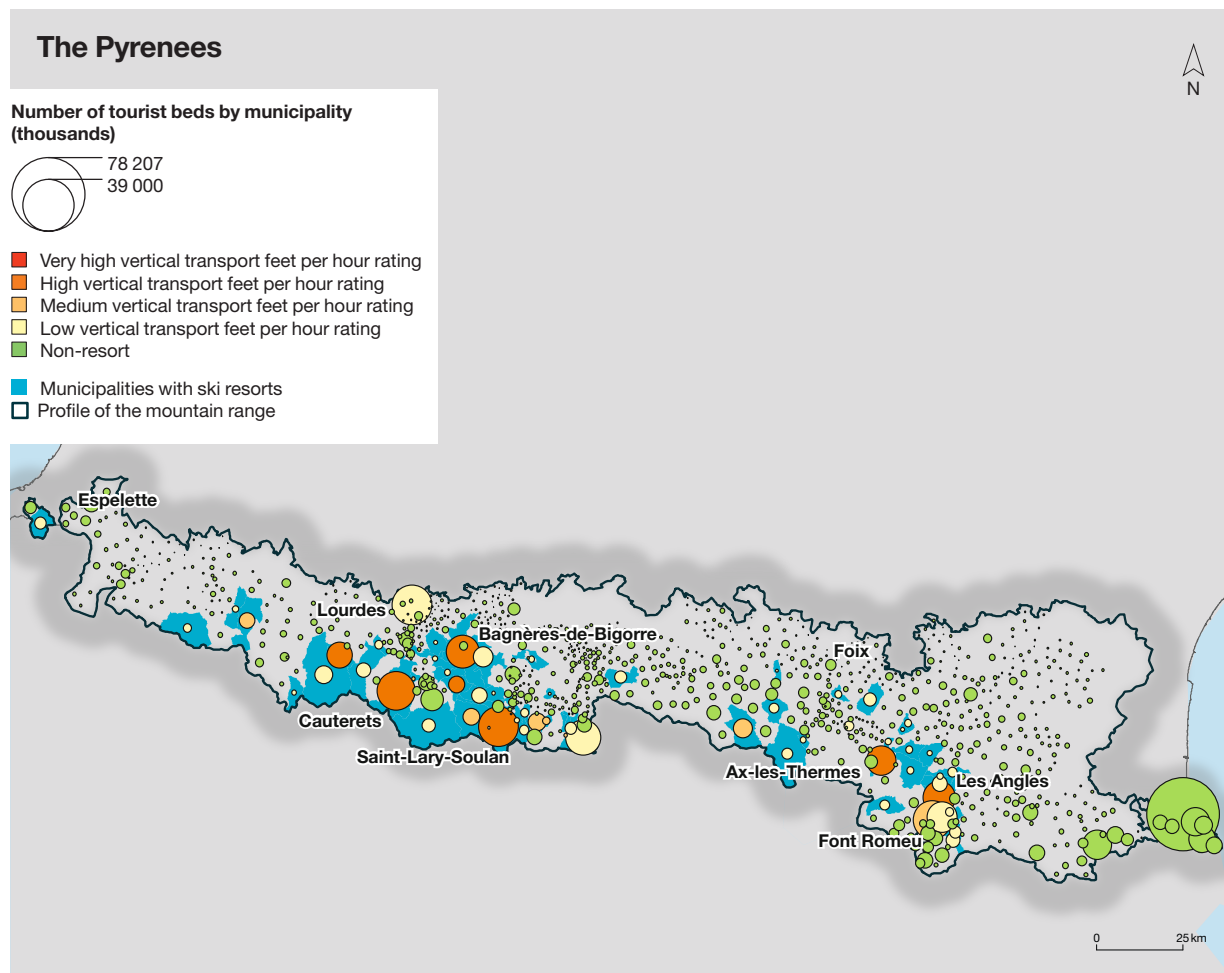
Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

With 106 beds per km² on average, tourist density is 2.5 times higher in municipalities with ski resorts in the Pyrenees than in the other mountain municipalities in this mountain range, suggesting a high level of urban planning for tourism.

On average, tourist density in municipalities with ski resorts in the Pyrenees is lower than in municipalities with ski resorts in France as a whole.

part 2: the Pyrenees

Map 15: tourist accommodation capacity of mountain municipalities in the Pyrenees in 2017



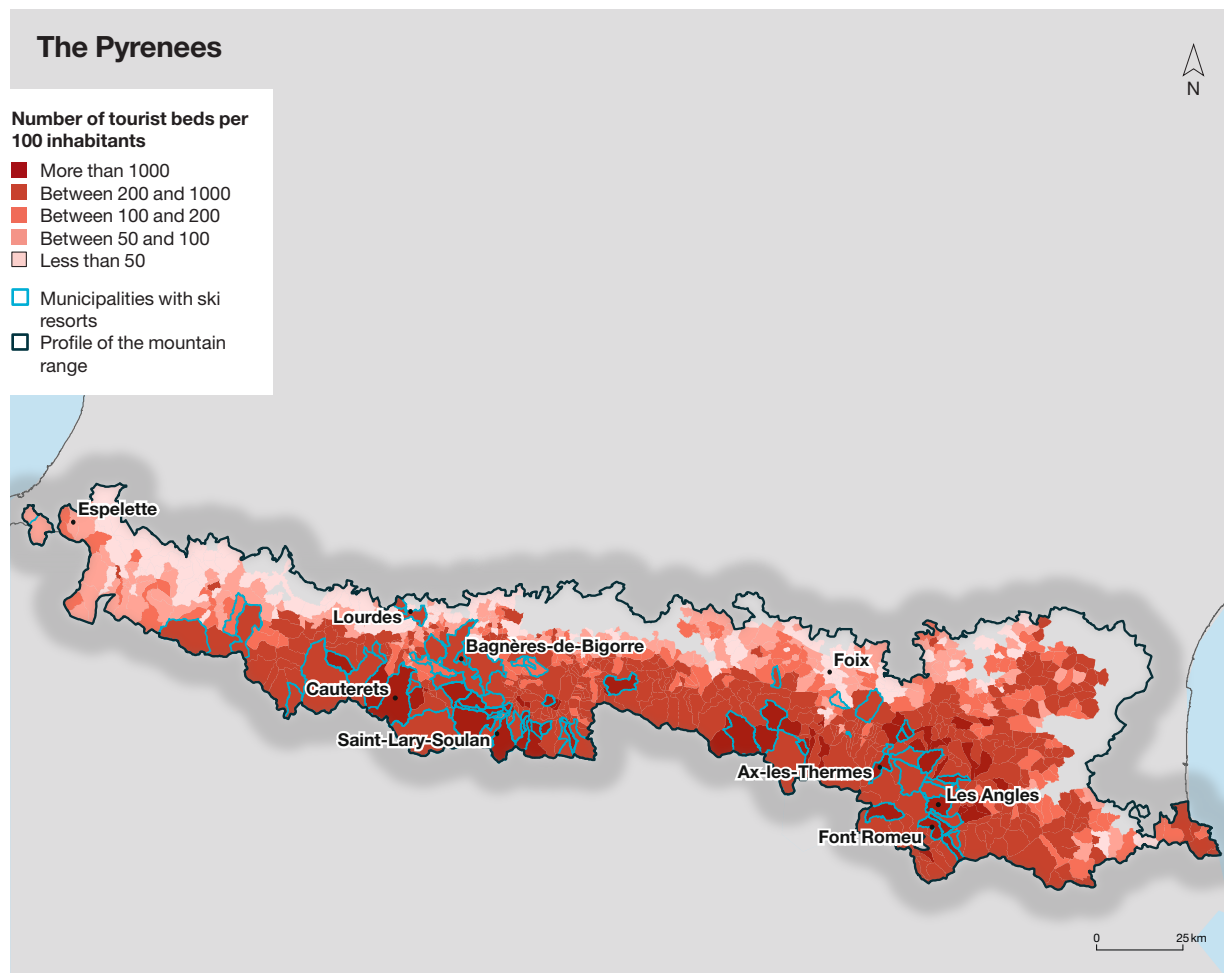
Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Tourist accommodation capacity

Tourist accommodation capacity defines the number of tourist beds located in a municipality. This indicator includes tourist beds in paid accommodation facilities (hotels, camping sites, holiday residences, holiday villages, youth hostels, sports centers, etc.) and in non-paid accommodation facilities (second homes). Private tourist accommodation (Airbnb type) is not taken into consideration. The ratios defined by Insee have been used to estimate the number of tourist beds for hotels (two beds per room), camping sites (three beds per camping pitch) and second homes (five beds per second home).

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Map 16: index of tourism intensity of mountain municipalities in the Pyrenees in 2017



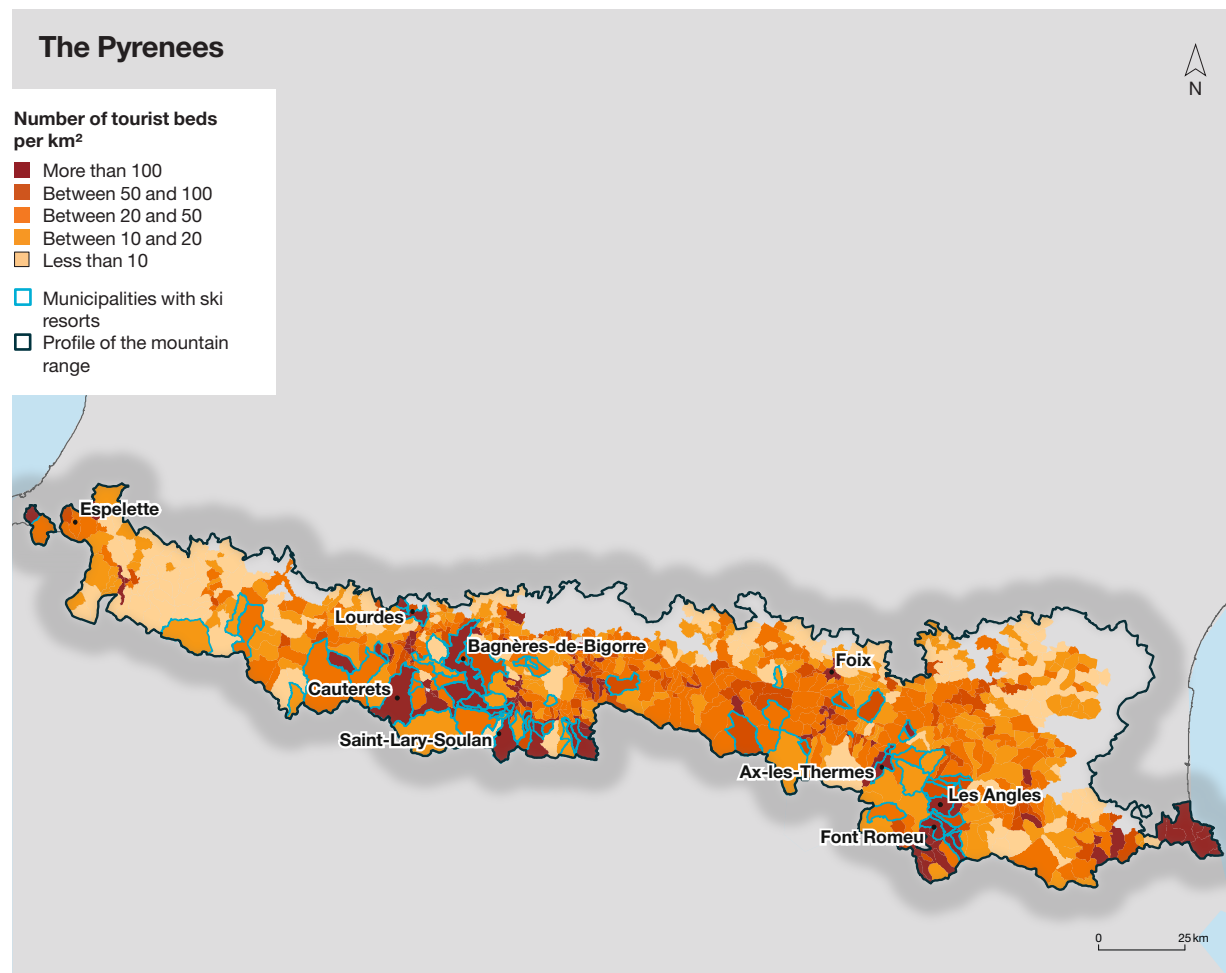
Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Index of tourism intensity

The index of tourism intensity is an indicator of tourist pressure or tourist intensity. This is the ratio of the number of tourist beds in a given area to its resident population. This indicator expresses the theoretical capacity of an area to increase its population in terms of accommodating tourists. An index equal to 100 means that the area has a tourist accommodation capacity equivalent to its permanent population and could therefore double its population.

part 2: the Pyrenees

Map 17: tourist density of mountain municipalities in the Pyrenees in 2017



Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Tourist density

Tourist density is the ratio between the number of tourist beds in a region and its area. This indicator is used to estimate the spatial concentration of tourist accommodation in a given region.

Land use

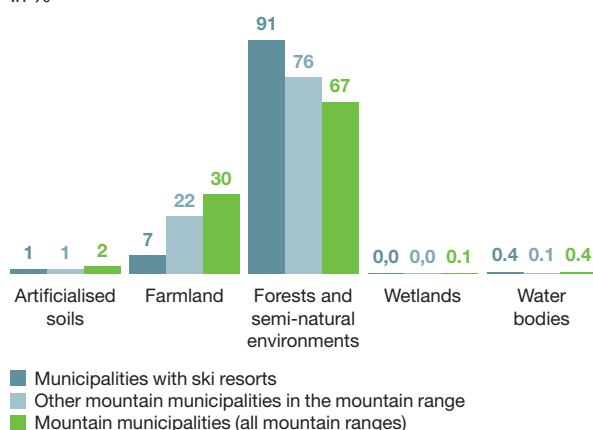
LAND USE

Pyrenean areas are mainly composed of forests and grassland in higher proportions than in other mountain ranges, particularly in municipalities with ski resorts.

On the other hand, the proportion of agricultural land is lower than that of all mountain ranges. On average, it is less than 7% in municipalities with ski resorts.

The proportion of developed areas is very similar to that of all mountain municipalities and is still four times less than the national average.

Figure 30: land use in mountain municipalities in the Pyrenees in 2012
In %

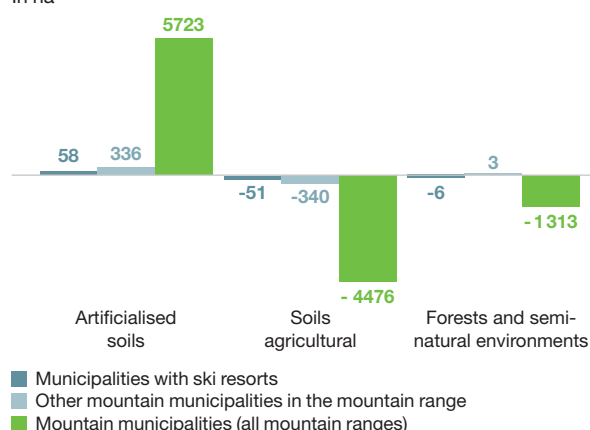


Highlights: on average, 7% of the area of municipalities with ski resorts in the Pyrenees consisted of agricultural land in 2012.
Sources: CGET; STRMTG, Cairn, Ministry of Sport, RES; EU-SDES, CORINE Land Cover. Processing: SDES

The development of land use in municipalities with ski resorts in the Pyrenees follows the same trends as in the rest of the mountain area. Developed areas are increasing, while agricultural land is decreasing substantially.

The situation is more stable for forest and grassland areas which are not undergoing substantial change, both in municipalities with ski resorts and in the rest of France.

Figure 31: trends in land use in mountain municipalities in the Pyrenees between 2006 and 2012
In ha



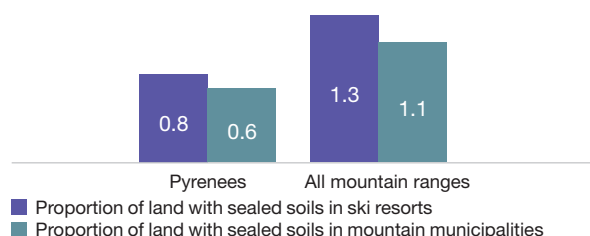
Highlights: between 2006 and 2012, the area of developed land increased by 58 ha in municipalities with ski resorts in the Pyrenees, while 51 ha of agricultural land disappeared.
Sources: CGET; STRMTG, Cairn, Ministry of Sport, RES; EU-SDES, CORINE Land Cover. Processing: SDES

SOIL SEALING

Soil sealing in the Pyrenean mountain area is almost two times lower than the average for mountain municipalities in France.

On average, soil sealing in ski resorts is significantly higher than in all the municipalities in the Pyrenees. However, this proportion is still substantially less than average for ski resorts on a national scale.

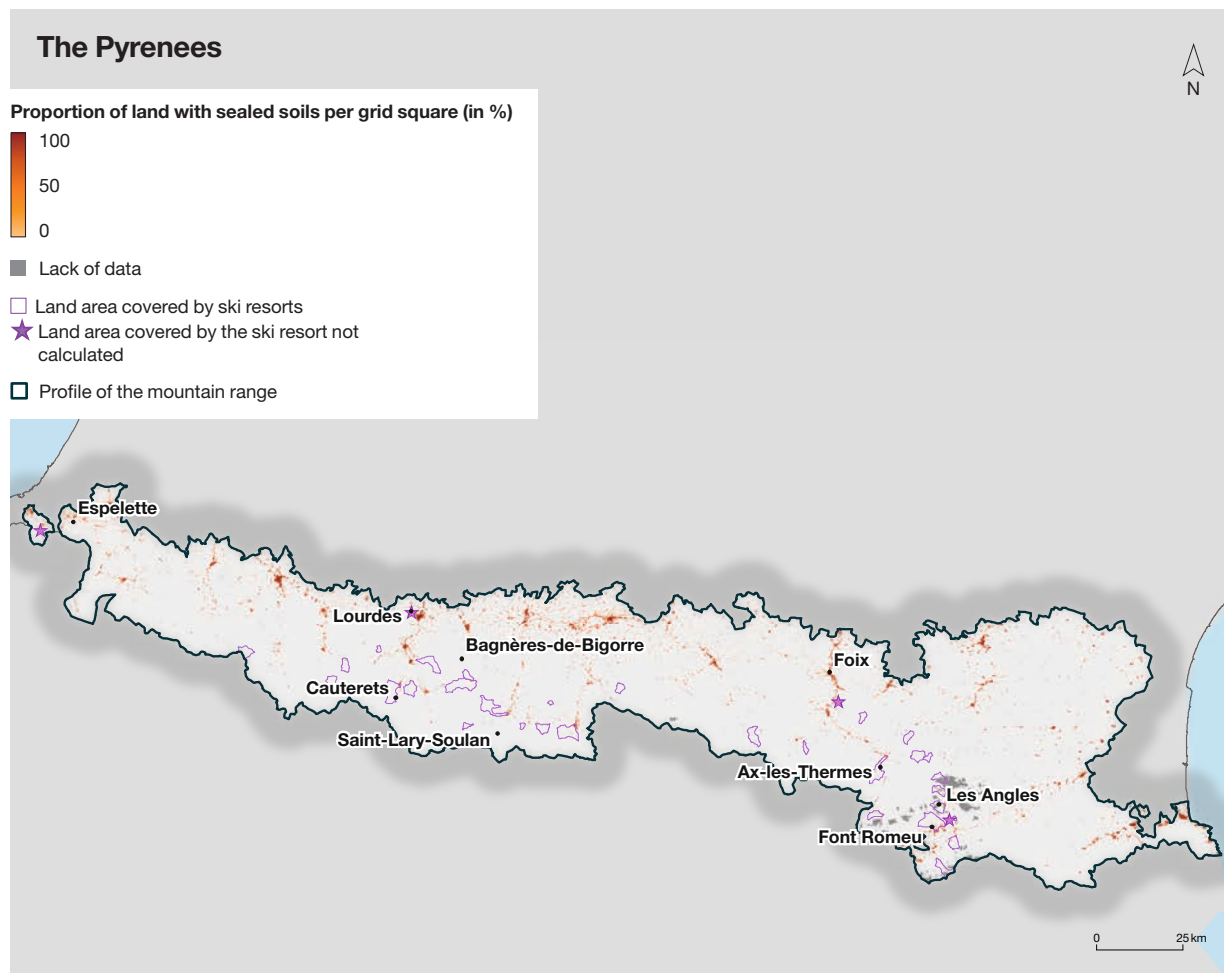
Figure 32: proportion of land with sealed soils in ski resorts and mountain municipalities in the Pyrenees in 2012
In %



Sources: BDTOP@, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

part 2: the Pyrenees

Map 18: proportion of land with sealed soils in ski resorts and mountain municipalities in the Pyrenees in 2012



Note: the "high-resolution" layer that was used maps the percentage of sealed soils in pixels measuring 20 m x 20 m.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Soil sealing

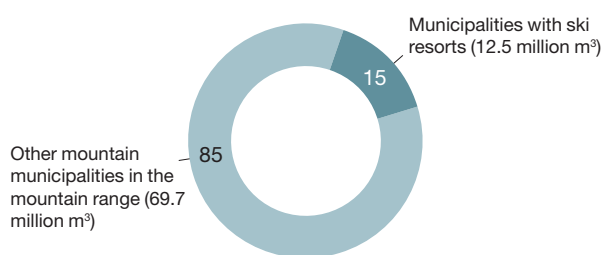
Soil sealing is defined as permanent coverage of the ground with a material that is impermeable to water and air. This can be the result of the construction of roads, buildings or car parks. Sealed soils irreversibly lose their ecological functions, particularly in terms of water storage, and thus notably create the risk of mudslides and water run-off that could lead to flooding.

Drinking water

VOLUMES OF FRESH WATER ABSTRACTED FOR DRINKING WATER SUPPLIES IN THE REGION

A total of 15% of water volumes in the Pyrenees abstracted for drinking water supplies comes from municipalities with ski resorts. This accounts for more than 12 million m³.

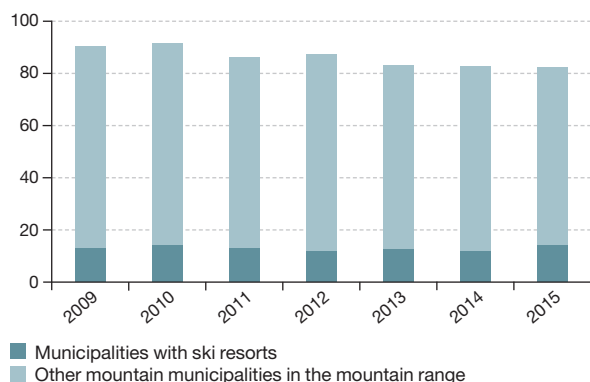
Figure 33: fresh water abstracted for the drinking water supply in mountain municipalities in the Pyrenees in 2015
In %



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. **Processing:** SDES

Between 2009 and 2015, water abstraction for drinking water supplies diminished by 10% throughout the entire mountain area. However, this trend is accompanied by a progression that differs between municipalities with ski resorts, where water abstraction is constant, and other Pyrenean mountain municipalities, where water abstraction is diminishing (-11% over the observed period).

Figure 34: trends in fresh water abstracted for the drinking water supply in mountain municipalities in the Pyrenees
In millions of m³

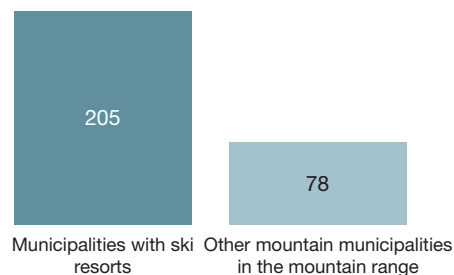


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. **Processing:** SDES

WATER ABSTRACTED FOR DRINKING WATER IN RELATION TO THE MUNICIPALITIES AND THE POPULATION

In the Pyrenees, abstracted volumes in relation to the number of municipalities involved are almost three times higher in municipalities with ski resorts than in those without them.

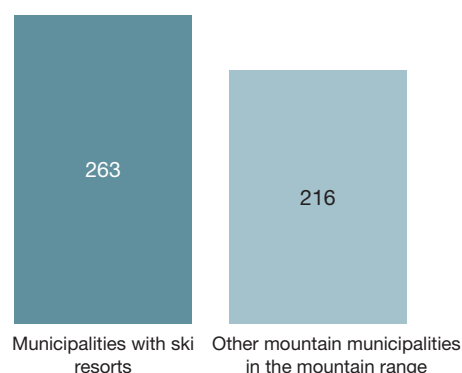
Figure 35: fresh water abstracted for drinking water supplies in the Pyrenees in 2015 by mountain municipality
In thousands of m³ per municipality



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. **Processing:** SDES

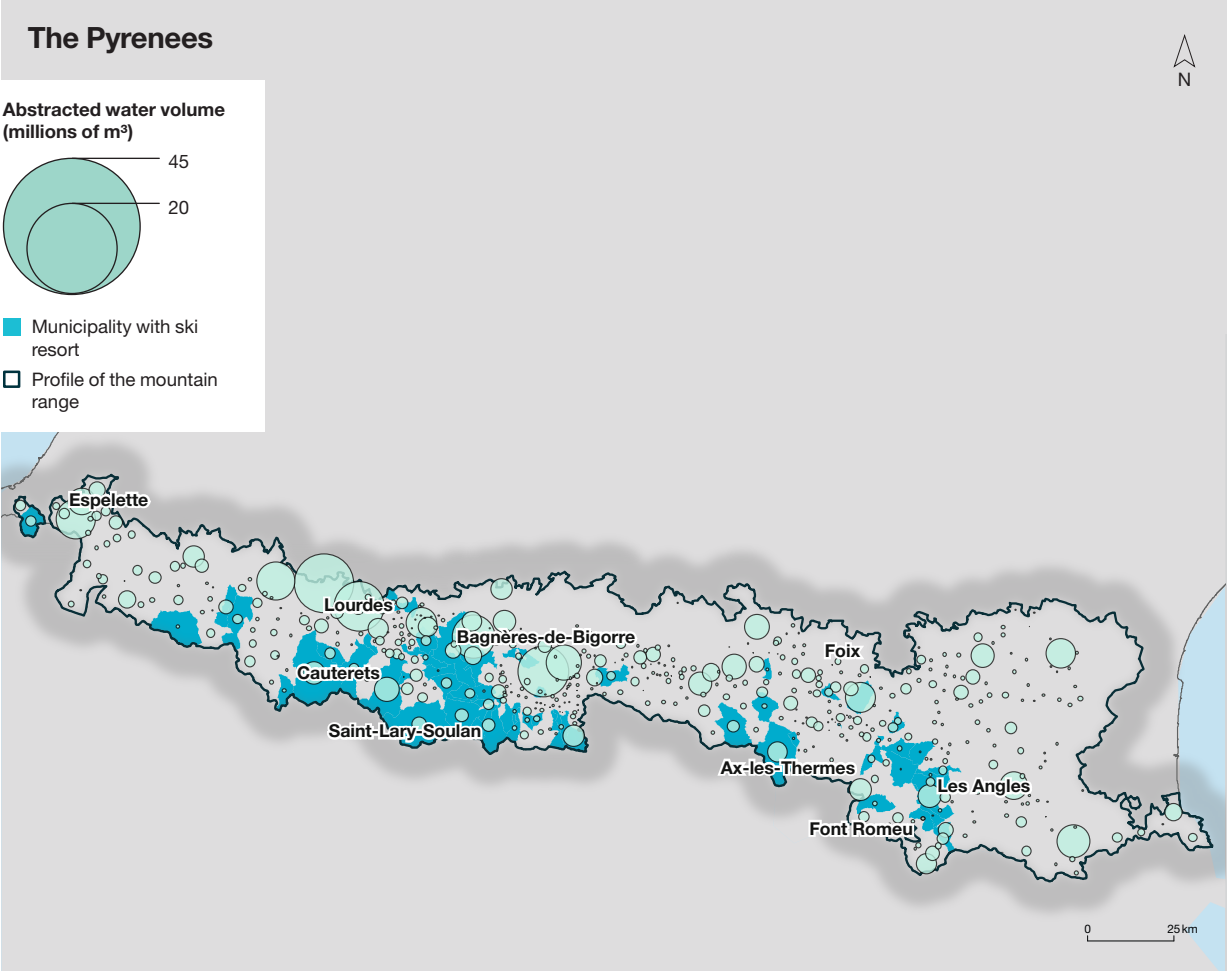
In relation to the number of inhabitants, divergences in abstracted water volumes between municipalities with ski resorts and other mountain municipalities in the Pyrenees also exist, but they are less marked. On average, abstracted water amounts to 263 m³ per inhabitant in municipalities with ski resorts, versus 216 m³ per inhabitant in the other municipalities in this mountain range.

Figure 36: fresh water abstracted for drinking water supplies in the Pyrenees in 2015 per inhabitant
In m³ per inhabitant



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. **Processing:** SDES

Map 19: fresh water abstraction for the drinking water supply in mountain municipalities in the Pyrenees in 2015



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Fresh water abstracted for the drinking water supply

Fresh water abstracted for the drinking water supply is equal to the quantities of water taken for the production of drinking water The withdrawal location is not necessarily the consumption location. Some water abstracted in a municipality may be intended for supplying adjacent areas.

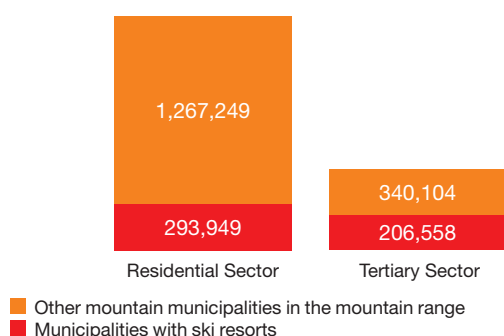
Electricity

ELECTRICITY CONSUMPTION IN MUNICIPALITIES WITH SKI RESORTS

In the Pyrenees, almost 20% of electricity consumed by the residential sector and almost 40% of electricity consumed by the service sector originates from municipalities with ski resorts. In total, this accounts for consumption exceeding 500,000 kWh.

Figure 37: electricity consumption in the residential and service sectors in mountain municipalities in the Pyrenees in 2016

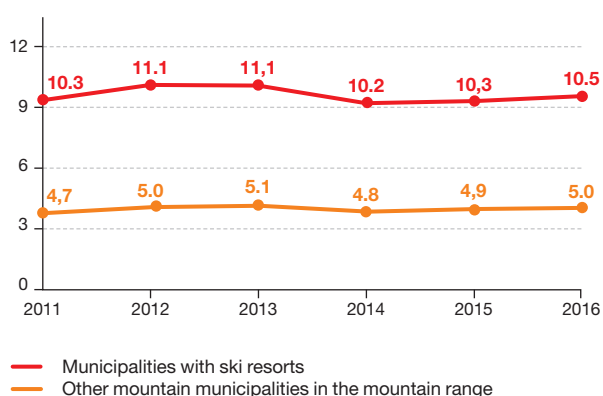
In kWh



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Figure 38: trends in electricity consumption in the residential and service sectors in the Pyrenees per inhabitant

In kWh per inhabitant



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

In relation to the number of inhabitants, the accumulated electricity consumed by the residential and service sectors is two times higher on average in municipalities with ski resorts in the Pyrenees than in other municipalities in the region.

Between 2011 and 2016, consumption followed the same trend in municipalities with ski resorts and in other mountain municipalities in this mountain range, showing a slight increase.

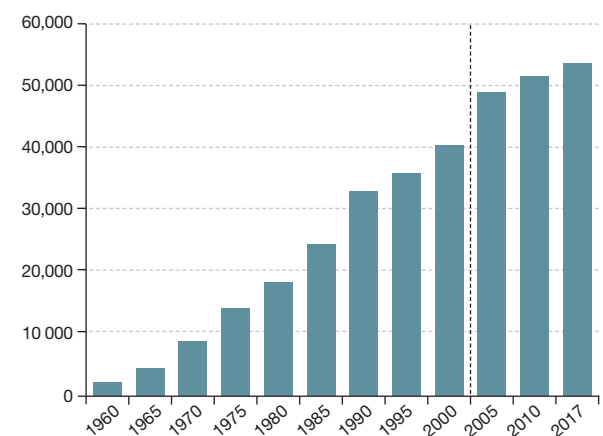
ELECTRICAL POWER OF CABLE CARS AND SKI LIFTS

In fifty years, the electrical power of cable cars and ski lifts in the Pyrenees has increased substantially. The greatest increases occurred between 1970 and 1990, when the electrical power almost quadrupled.

Between 2005 and 2017, the increase in usable electric power of cable cars and ski lifts was more moderate (+10%) but still continued.

Figure 39: development of the installed electrical power of cable cars and ski lifts in municipalities with ski resorts in the Pyrenees

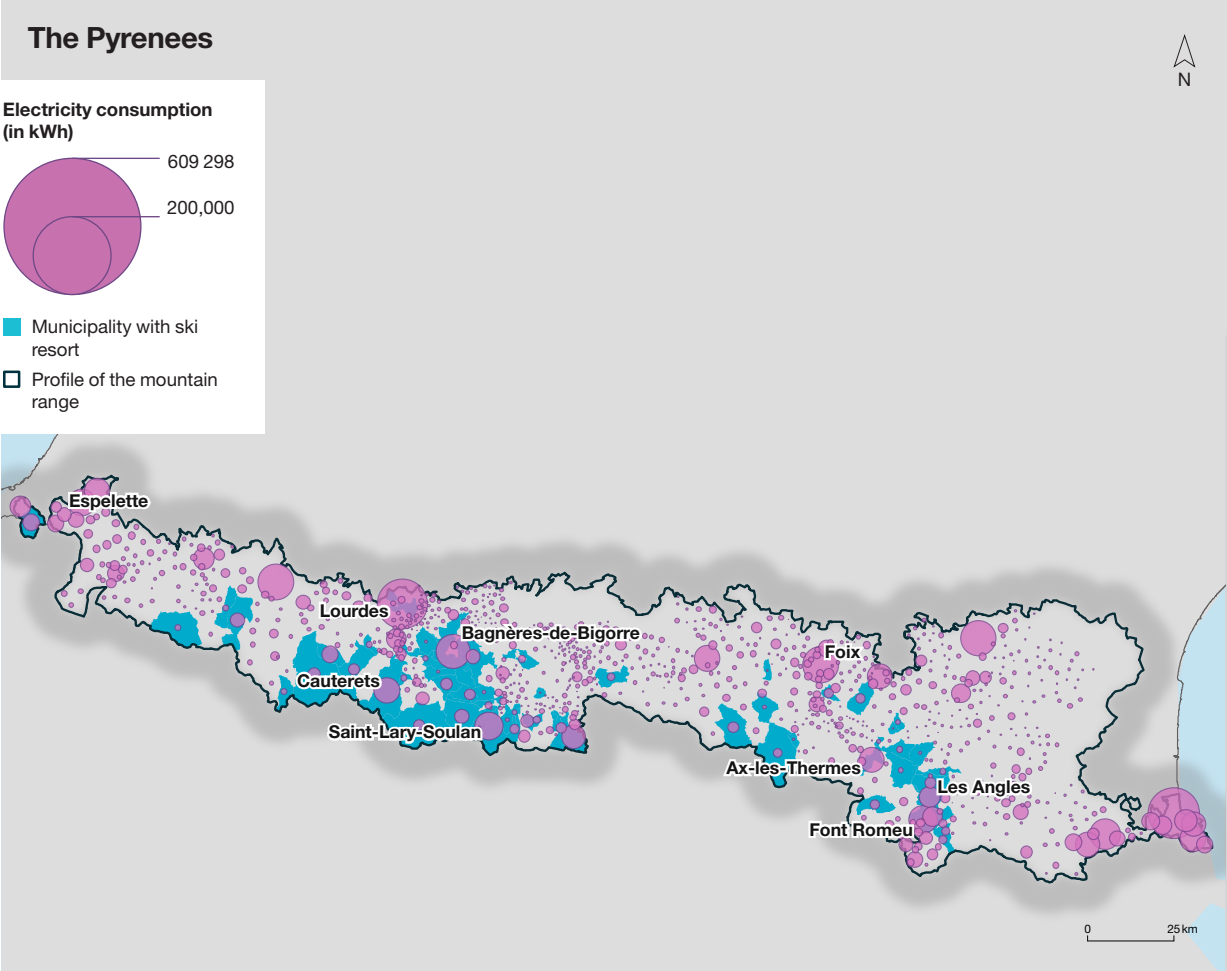
In kWh



Note: break in the series in 2005.

Sources: CGET; STRMTG, Cairn. Processing: SDES

Map 20: electricity consumption in the residential and service sectors in mountain municipalities in the Pyrenees in 2016



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Electricity consumption in the residential and service sectors

The residential sector corresponds to household electricity consumption The service sector corresponds to electricity consumption for service activities (shops, tourist accommodation, catering, offices, leisure infrastructures, etc.).

Biodiversity

INTERACTION BETWEEN SKI RESORTS AND PROTECTED AREAS

In total, more than eight out of ten ski resorts in the Pyrenees are located in protected areas. The overlap covers an area of almost 49,000 ha.

Figure 40: proportion of ski resorts overlapping protected areas in the Pyrenees in 2017

In %



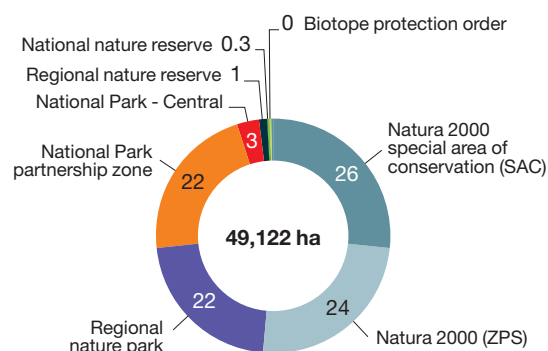
Note: resorts of which the land area covered could not be calculated are not included.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

In terms of surface area, Natura 2000 sites, regional nature parks and national park partnership zones are the main protected areas affected by overlap with ski resorts.

Figure 41: protected areas overlapping ski resorts in the Pyrenees in 2017 by type of protection

In % of ha

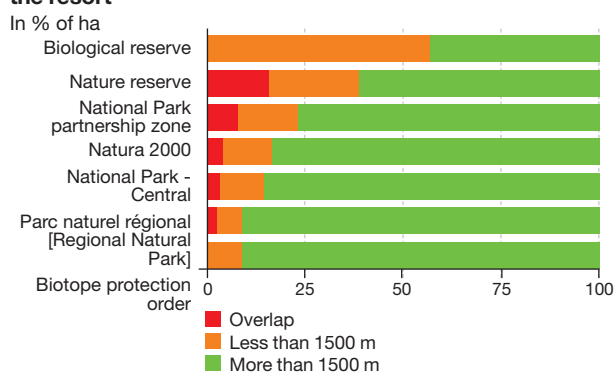


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

However, in relation to the total area of overlap or close proximity, nature reserves and small-sized strictly protected areas are the first to be affected by interaction with ski resorts.

In addition, the biological reserves involved are also particularly affected, with more than half of their area located less than 1500 meters from a ski resort.

Figure 42: distribution of the surface area of protected areas located less than 1500 m from a ski resort in the Pyrenees in 2017 in relation to their distance from the resort



Highlights: 16% of the area of national nature reserves located less than 1500 meters from a ski resort overlaps with a ski resort.

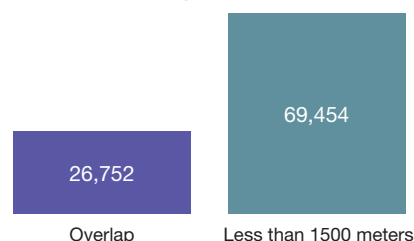
Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

INTERACTION BETWEEN SKI RESORTS AND REMARKABLE NATURAL SITES: CASE OF TYPE 1 ZNIEFF (NATURAL AREAS OF ECOLOGICAL, FLORA AND FAUNA INTEREST)

In 2017, more than 96,000 ha of type 1 ZNIEFF areas were located less than 1500 m from a Pyrenean ski resort, of which 28% of the area overlapped.

Figure 43: surface area covered by type 1 ZNIEFF areas in the Pyrenees in the vicinity of a ski resort in 2017

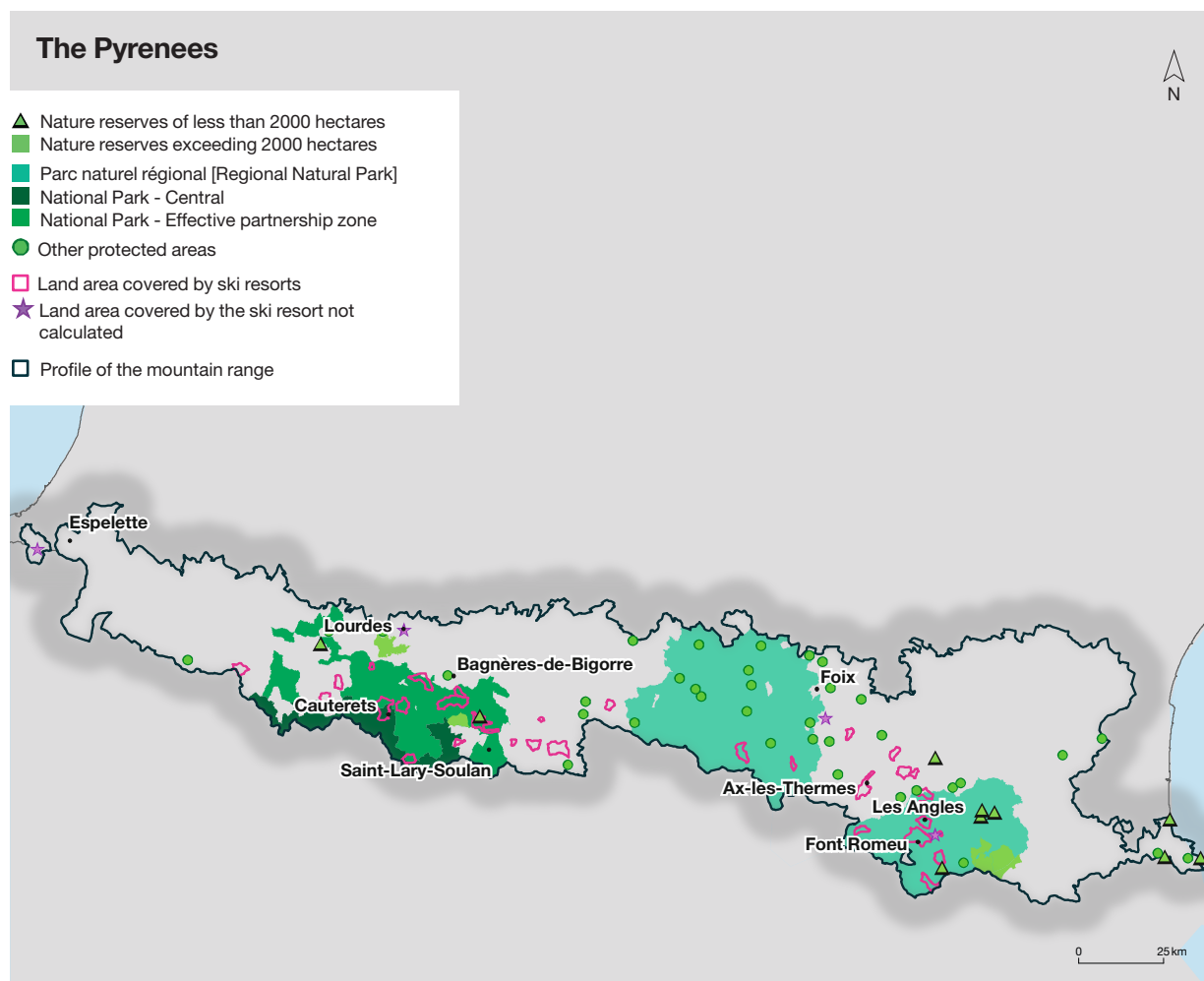
In ha



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (March 2017 update). Processing: SDES

part 2: the Pyrenees

Map 21: interaction between ski resorts and protected areas (excluding Natura 2000 sites) in the Pyrenees in 2017

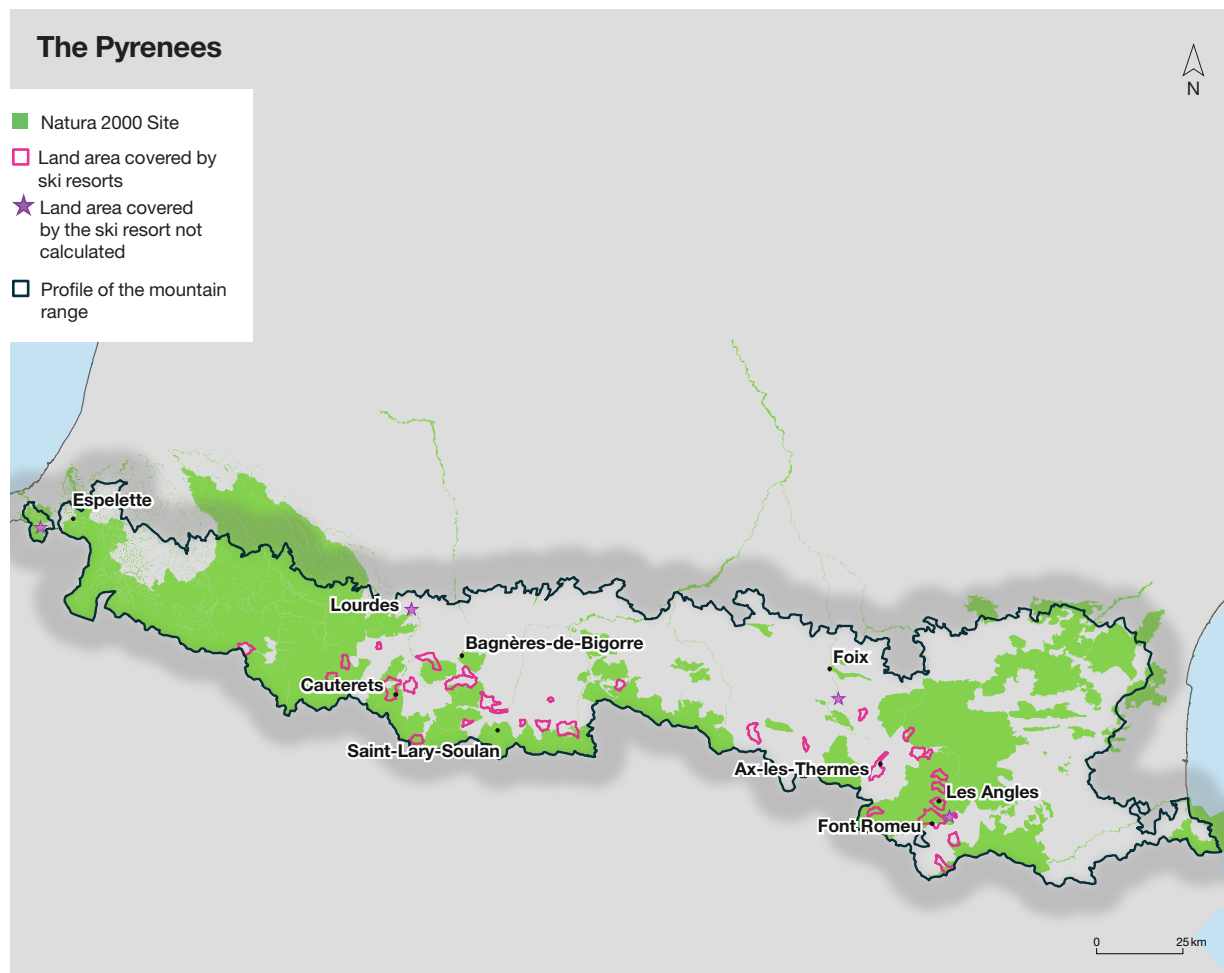


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "protected areas" (February 2017 update). Processing: SDES

Protected areas (excluding Natura 2000)

The protected areas taken into account (excluding Natura 2000 sites to improve readability) include regulatory provisions referred to as strict protection systems based on prohibiting or limiting certain human activities (central areas of national parks, national nature reserves, regional nature reserves, prefectural biotope decrees, biological reserves, national hunting and wildlife reserves). They also include contractual management arrangements (national park partnership zones, regional nature parks). The latter are less strict than regulatory provisions. They combine natural heritage conservation and local development and are based on voluntary partnership on the part of local communities.

Map 22: interaction between ski resorts and protected areas (Natura 2000 sites) in the Pyrenees in 2017

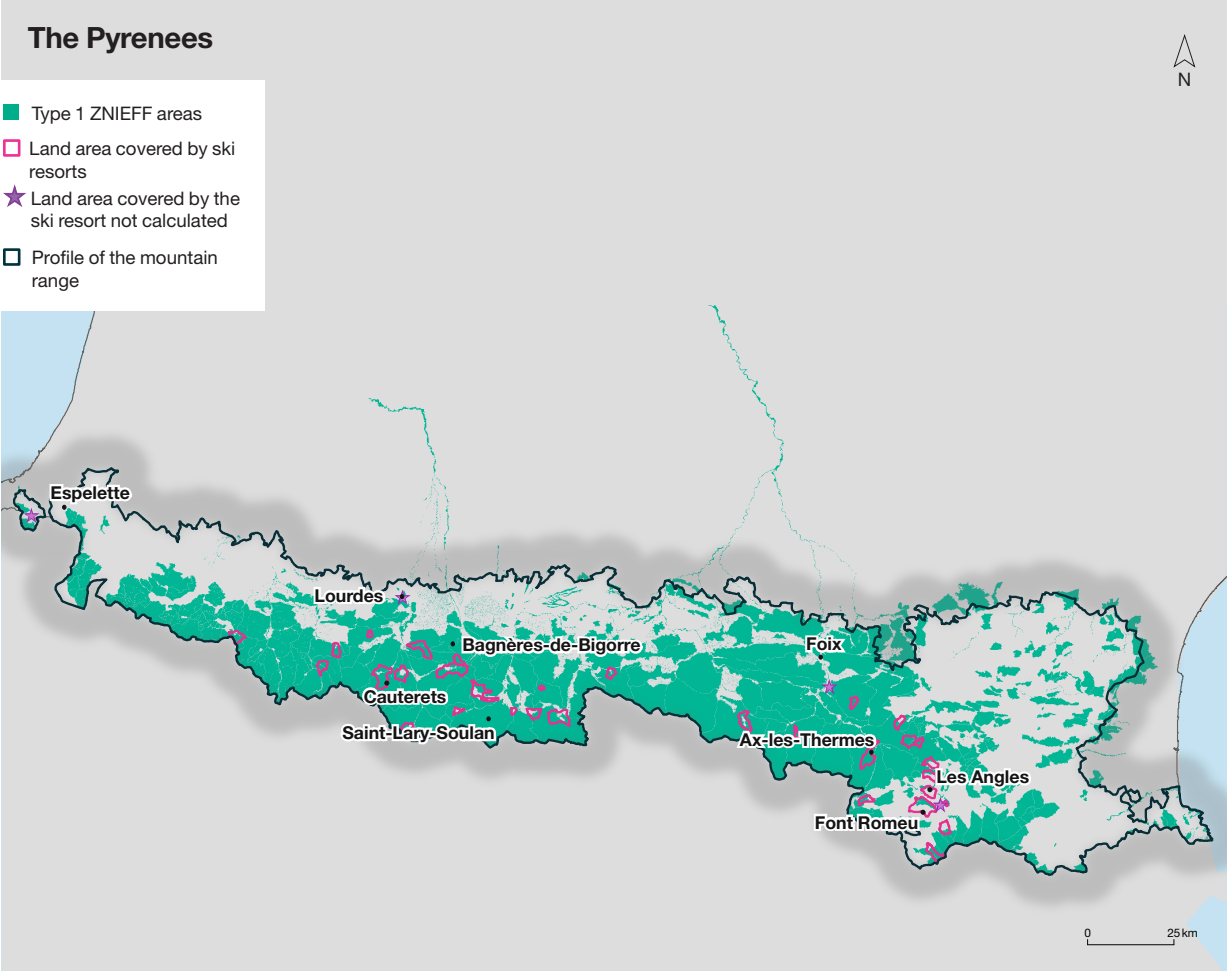


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Natura 2000" (December 2017 update). Processing: SDES

Protected areas: Natura 2000 sites

The Natura 2000 network is a European-level conservation system: it includes special protected areas (SPA) under the "Birds" directive and special areas of conservation (SAC). The purpose of the latter is to conserve habitats and animal species (excluding birds) and plant species of community interest under the "Habitats, Fauna and Flora" Directive.

Map 23: interaction between ski resorts and type 1 ZNIEFF areas in the Pyrenees in 2017



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (February 2017 update). Processing: SDES

Type 1 ZNIEFF areas

The purpose of the list of natural areas of ecological, fauna and flora interest (ZNIEFF) is to identify remarkable natural or semi-natural environments in France that have high biological capacity and are in a good state of conservation. This knowledge tool, which does not in itself provide protection for these areas, indicates a wealth of biodiversity in the area concerned.

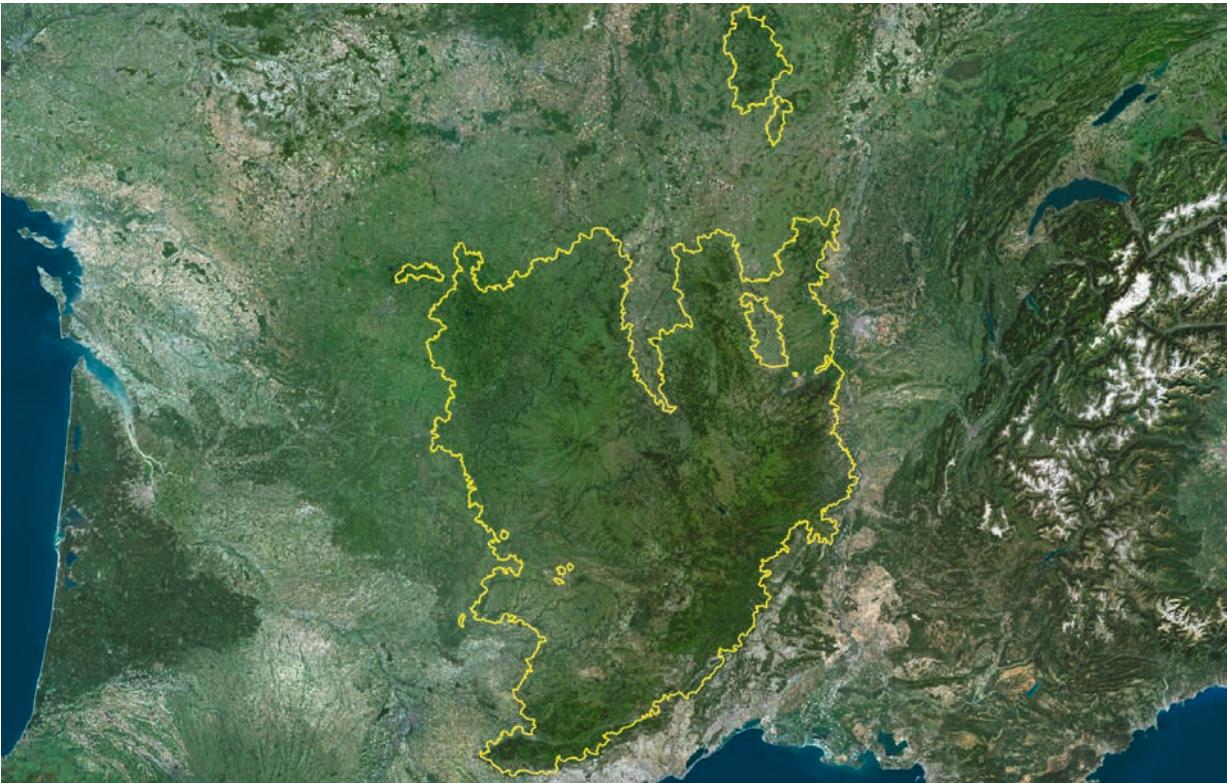
Type 1 ZNIEFF areas are sectors of major biological or ecological interest defined by the presence of species and environments that are rare, remarkable or characteristic of the national or regional natural heritage.

part 3

The Massif central



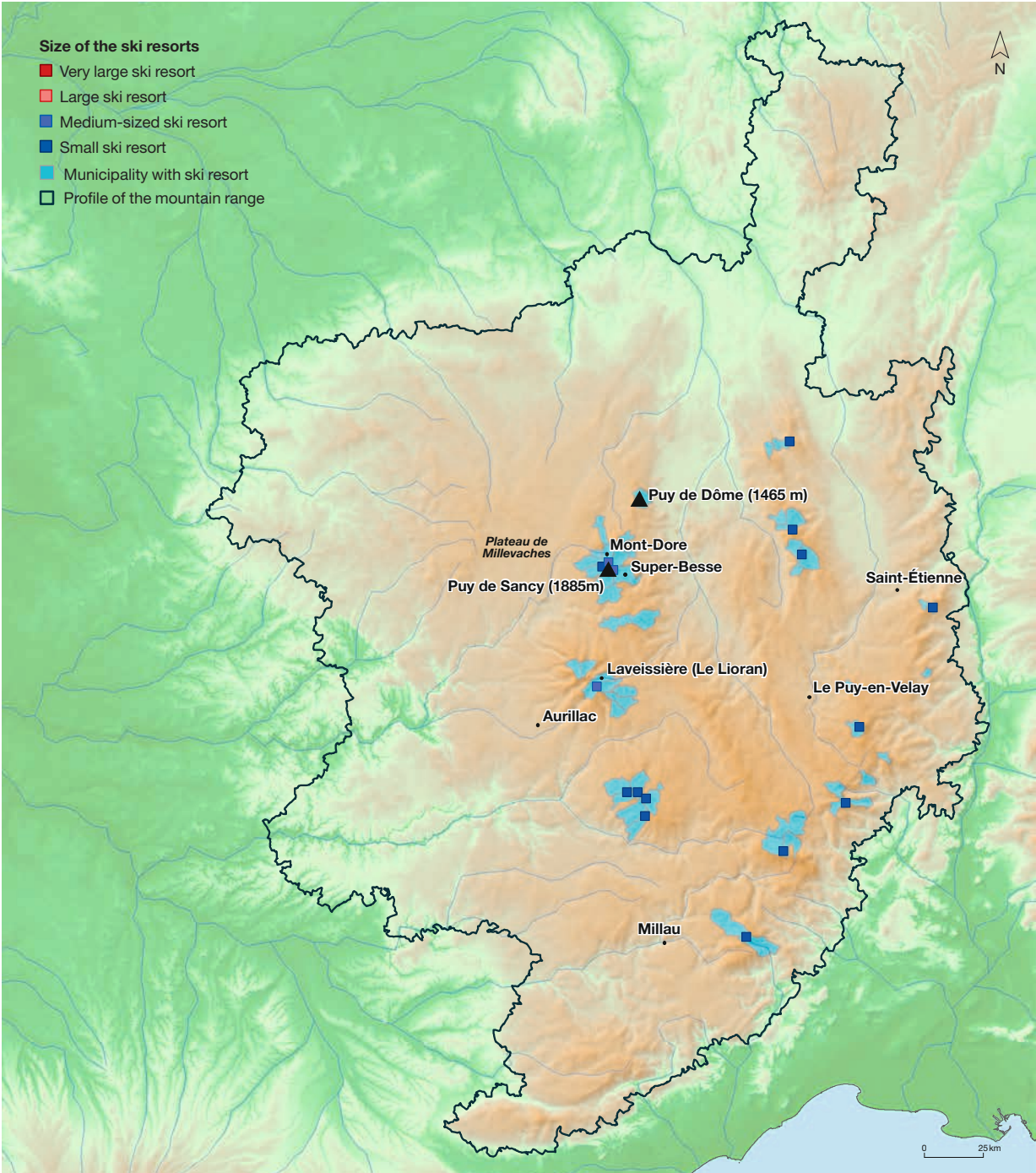
Characteristics of the mountain area



Aerial view of the Massif central

AREA	POPULATION	ALTITUDE
5,472,866 ha	1,986,607 inhabitants	Average altitude of the municipalities: 687 m
2446 municipalities (2237 ha/municipality on average)	812 inhabitants/ municipality on average	Average altitude of the highest municipality: 1399 m
	36 inhabitants/km ²	

Map 24: ski resorts and municipalities with ski resorts in the Massif central in 2017



Note: municipalities are classified according to the sum of the vertical transport feet per hour (VTF/H) ratings of their operational cable cars and ski lifts. They are divided into four groups: small resorts (VTF/H < 2500 km.skiers/h), medium-sized resorts (VTF/H between 2500 and 6000 km.skiers/h), large resorts (VTF/H between 6000 and 15,000 km.skiers/h) and very large resorts (VTF/H > 15,000 km.skiers/h).

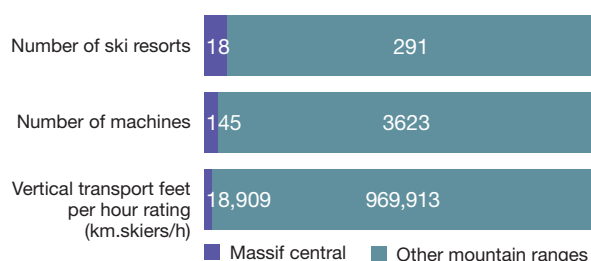
Sources: BDTOPO®; CGET; ©OpenStreetMap; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Ski resorts and municipalities with ski resorts

SKI RESORTS

The Massif central has 18 ski resorts in total, accounting for 6% of resorts located in France. These resorts include 145 cable cars/ski lifts and have a vertical transport feet per hour rating of almost 19,000 km.skiers/h.

Figure 44: characteristics of ski resorts in the Massif central in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

The area covered by ski resorts in the Massif central is estimated at almost 10,000 ha, i.e. 0.2% of the mountain area. The average surface area is less than 650 ha per resort.

Figure 45: land area covered by ski resorts in the Massif central in 2017

Land area covered by ski resorts	10,360 ha
Average area of ski resorts	647 ha
Proportion of the mountain area	0.2 %

Note: in the absence of data, the area covered by 2 resorts could not be estimated.
Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

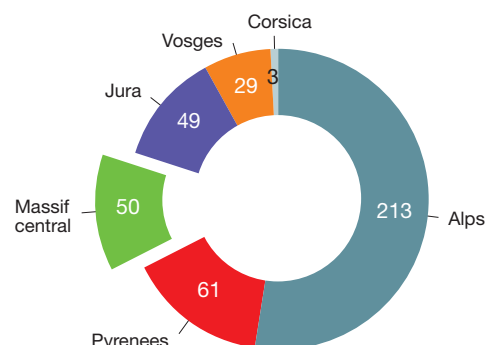
MUNICIPALITIES WITH SKI RESORTS

Municipalities with ski resorts have at least one cable car/ski lift line or one cross-country skiing facility.

The Massif central has 50 municipalities with ski resorts. Half of them are equipped with cross-country ski facilities and do not have cable cars/ski lifts.

Figure 46: distribution of municipalities with ski resorts in 2017 for each mountain range

By number of municipalities with ski resorts

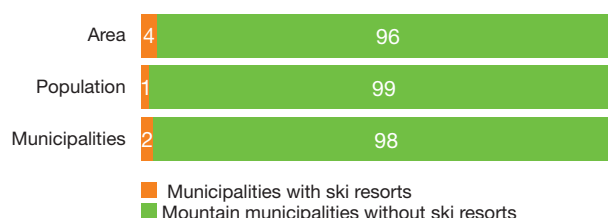


Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

The space occupied by municipalities with ski resorts in the Massif central is somewhat reduced. They extend over an area of less than 211,000 hectares, i.e. 4% of the mountain area. They account for 2% of mountain municipalities in the Massif central and only 1% of the population lives there all the year round.

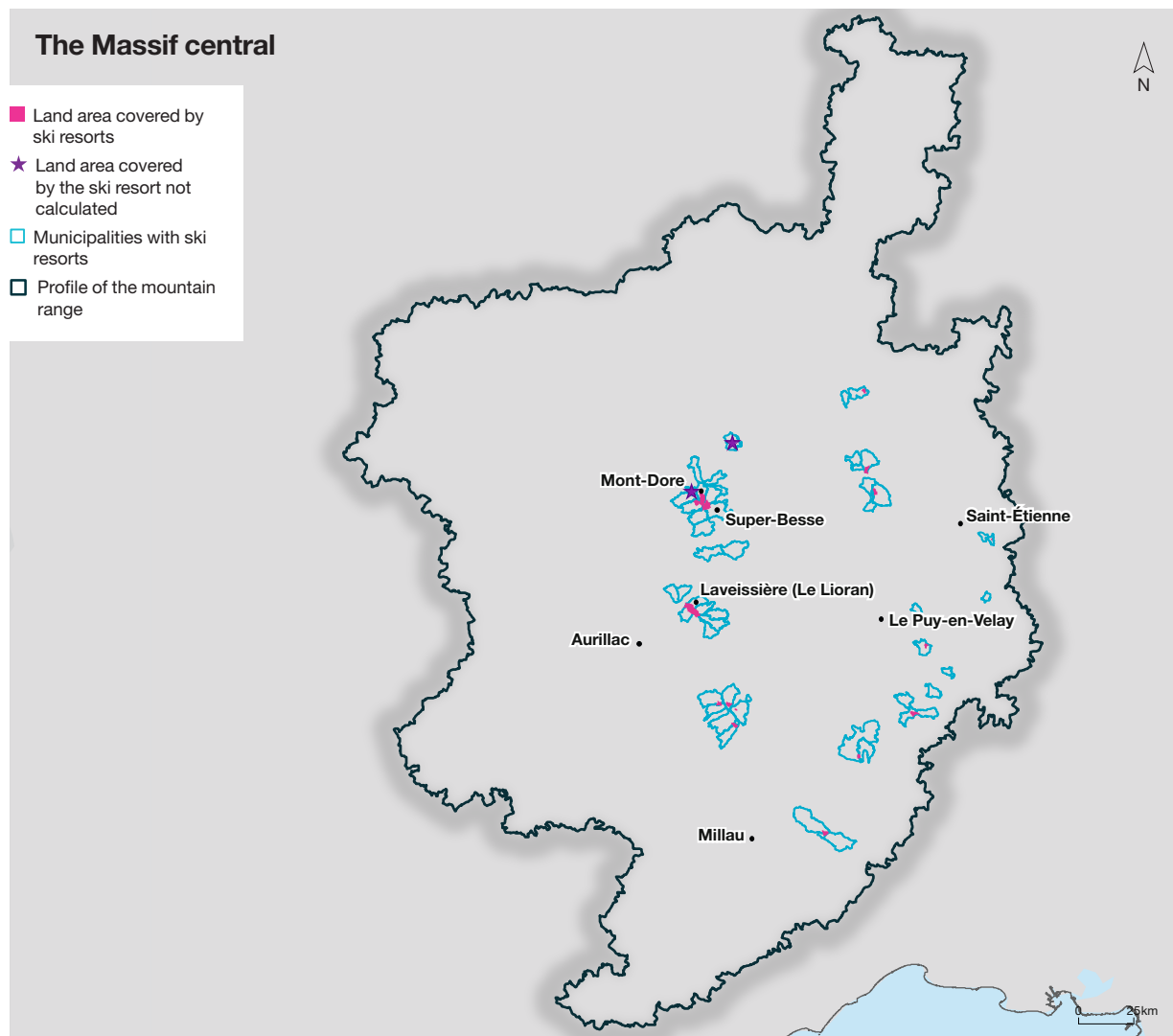
Figure 47: space occupied by municipalities with ski resorts in the Massif central mountain area in 2017

In %



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Map 25: municipalities with ski resorts and land area covered by ski resorts in the Massif central in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

Land area covered by ski resorts

The land area covered by resorts is the estimated surface area of the ski resorts. Their profile was calculated on the basis of the area covered by geo-localized cable cars and ski lifts and from the location of surrounding tourist accommodation facilities and buildings in the ski resort.

Tourism

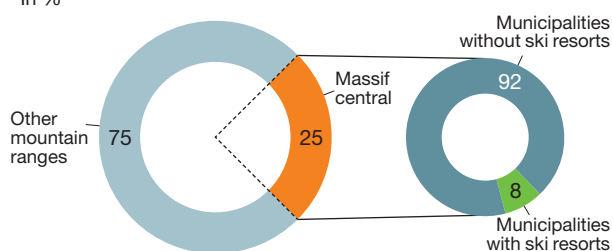
ACCOMMODATION CAPACITY AND TOURIST NUMBERS

With almost 1.4 million beds in 2017, the Massif central has the greatest tourist accommodation capacity after the Alps. This area has almost a quarter of all beds in the mountain tourism industry.

More than 90% of these tourist beds are located outside municipalities with ski resorts, showing the minor role occupied by this tourism activity.

Figure 48: tourist accommodation capacity of mountain municipalities in the Massif central in 2017

In %

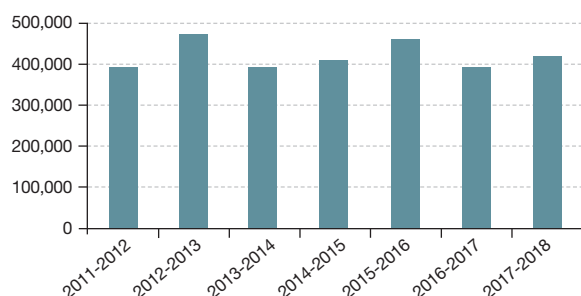


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Over the last seven winters, the tourist turnover in municipalities with winter sports resorts in the Massif central varied substantially. Over the observed period, the number of overnight stays remained largely unchanged as a whole, with numerous annual fluctuations.

Figure 49: trends in the number of overnight winter tourism stays in municipalities with winter sports resorts in the Massif central

Number of overnight stays



Note: municipalities with winter sports resorts defined by Insee as having ski equipment among their permanent facilities or classified as "tourist municipalities" by the Tourism Code.

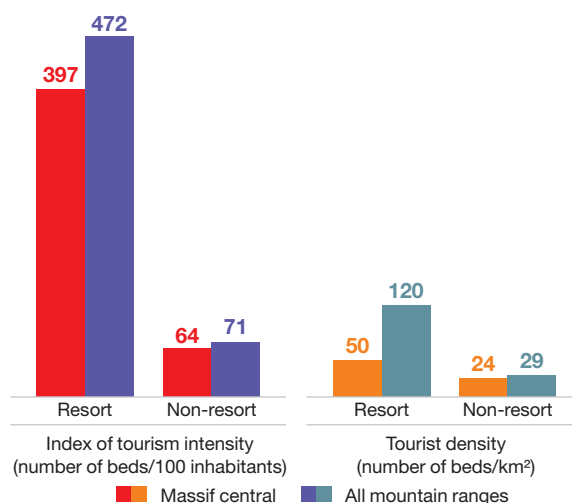
Source: Insee-CRT-DGE, surveys on the number of stays in tourist accommodation

PRESSURE FROM TOURISM

In the Massif central, variations in population associated with tourism, expressed by the index of tourism intensity, are six times greater in municipalities with ski resorts than in the rest of the mountain area.

The index of tourism intensity in municipalities with ski resorts in the Massif central is nevertheless lower than the average in municipalities with ski resorts throughout the whole of France.

Figure 50: index of tourism intensity and tourism density in mountain municipalities in the Massif central in 2017



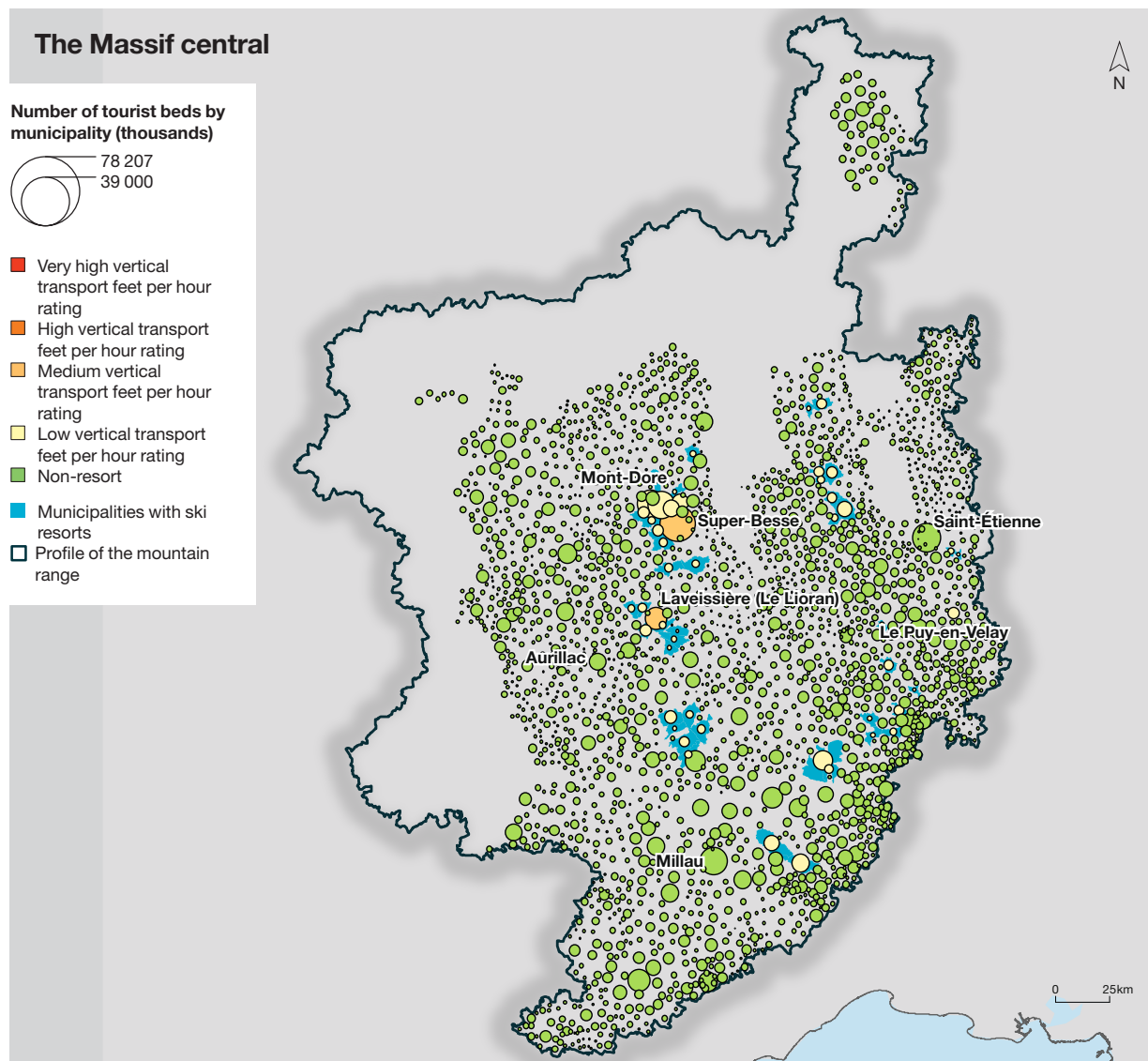
Highlights: on average, municipalities with ski resorts in the Massif central have an index of tourism intensity of 397 beds per 100 inhabitants and a tourism density of 50 beds per km².

Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

With 50 beds per km² on average, the tourist density of municipalities with ski resorts is two times higher than in the rest of the mountain area.

However, it is considerably less than the average in municipalities with ski resorts in France as a whole.

Map 26: tourist accommodation capacity of mountain municipalities in the Massif central in 2017

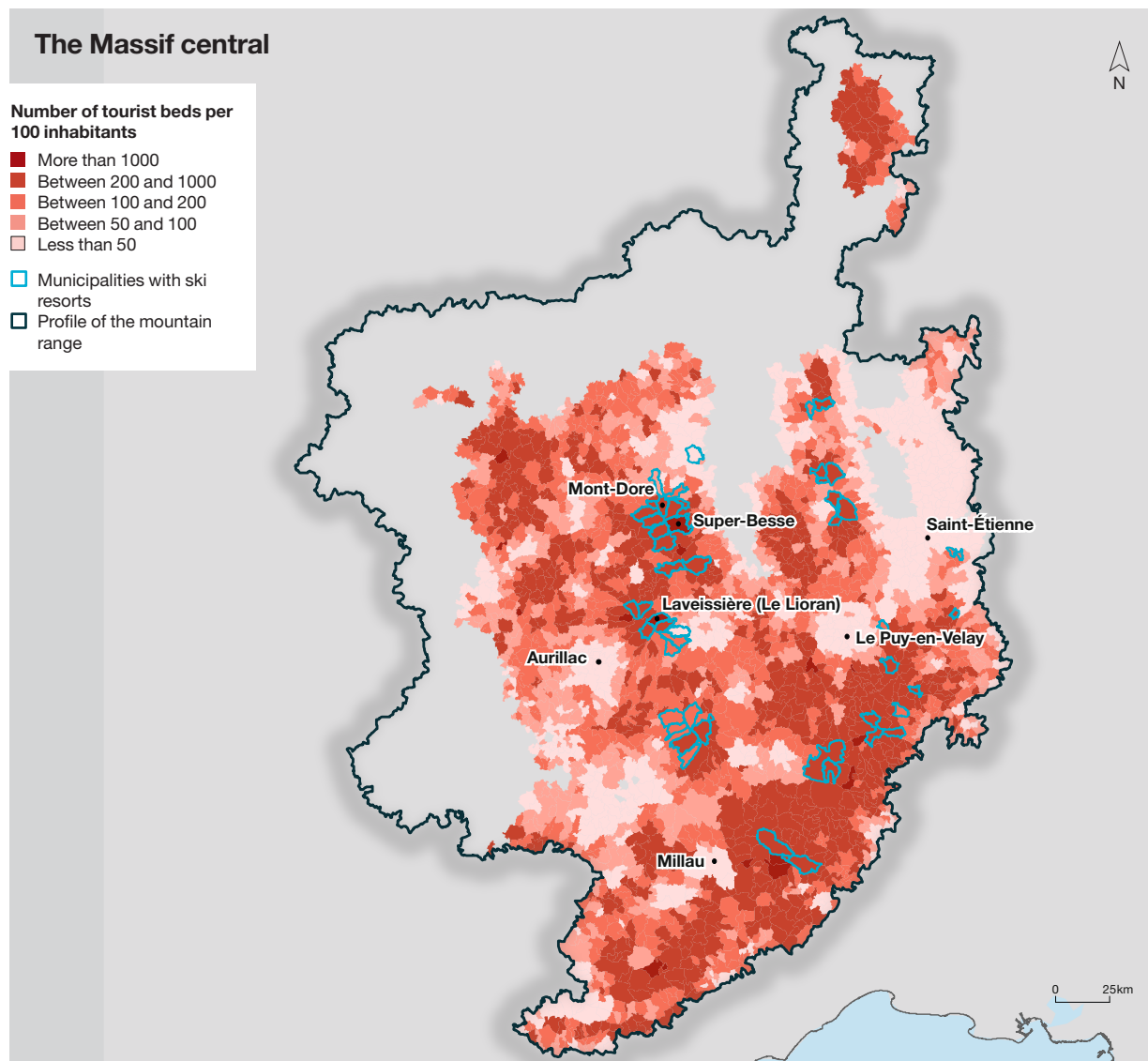


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Tourist accommodation capacity

Tourist accommodation capacity defines the number of tourist beds located in a municipality. This indicator includes tourist beds in paid accommodation facilities (hotels, camping sites, holiday residences, holiday villages, youth hostels, sports centers, etc.) and in non-paid accommodation facilities (second homes). Private tourist accommodation (Airbnb type) is not taken into consideration. The ratios defined by Insee have been used to estimate the number of tourist beds for hotels (two beds per room), camping sites (three beds per camping pitch) and second homes (five beds per second home).

Map 27: index of tourism intensity of mountain municipalities in the Massif central in 2017

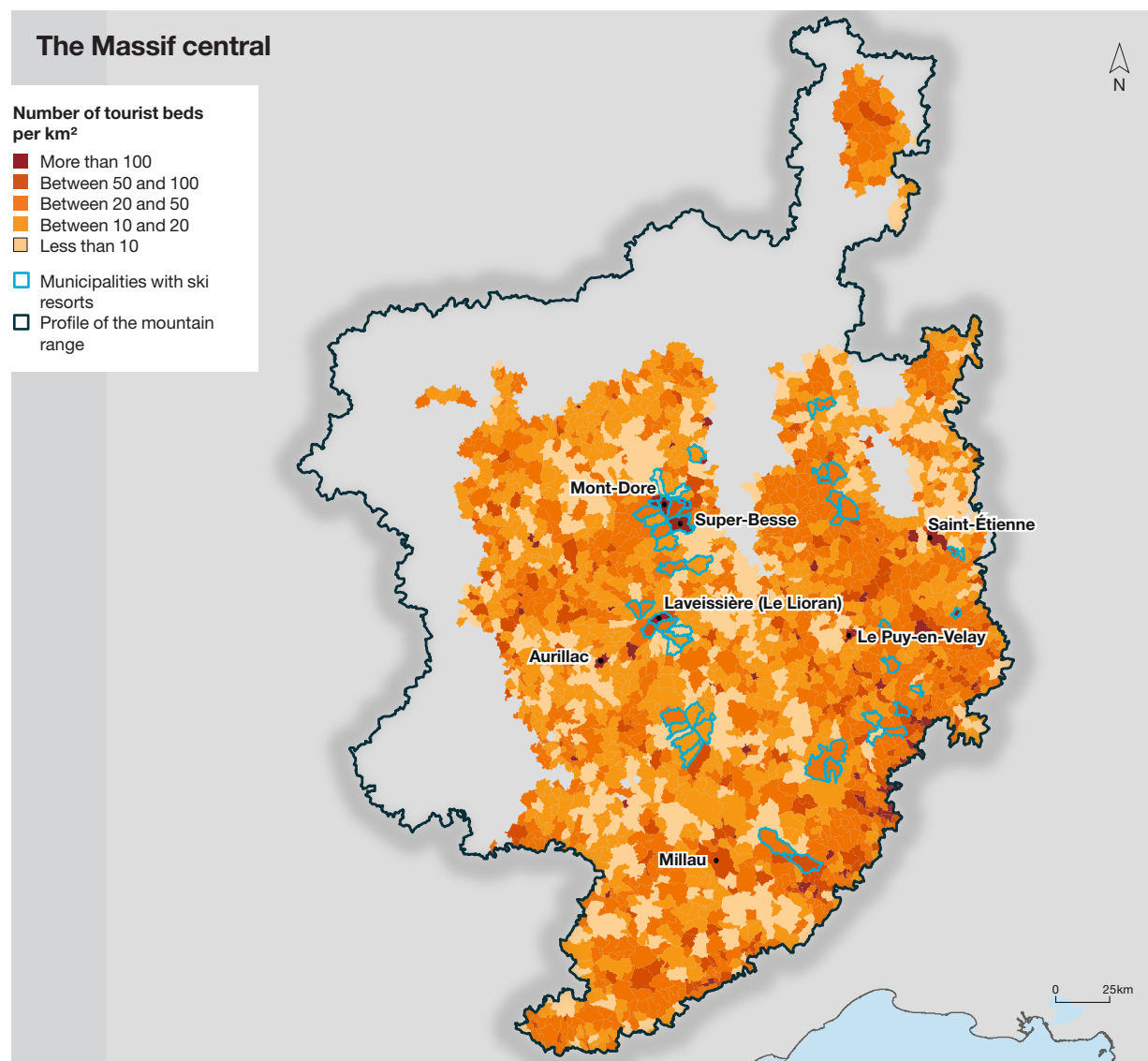


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Index of tourism intensity

The index of tourism intensity is an indicator of tourist pressure or tourist intensity. This is the ratio of the number of tourist beds in a given area to its resident population. This indicator expresses the theoretical capacity of an area to increase its population in terms of accommodating tourists. An index equal to 100 means that the area has a tourist accommodation capacity equivalent to its permanent population and could therefore double its population.

Map 28: tourist density in mountain municipalities in the Massif central in 2017



Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Tourist density

Tourist density is the ratio between the number of tourist beds in a given area and its surface area. This indicator is used to estimate the spatial concentration of tourist accommodation in a given area.

Land use

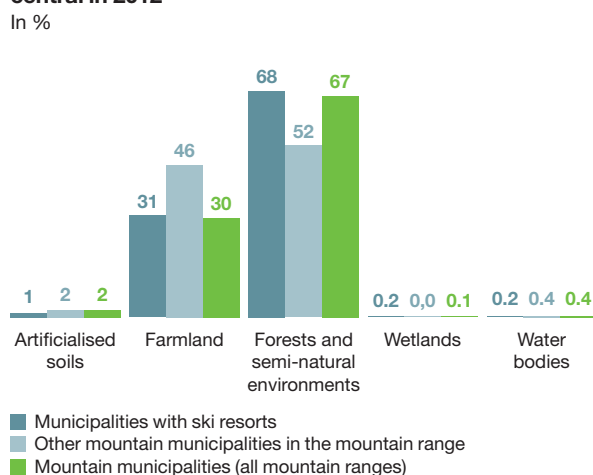
LAND USE

In the mountainous areas of the Massif central, land use in municipalities with ski resorts is close to the average for all mountain ranges.

Outside the resorts, forests and grassland are predominant, but in a lower proportion to the other mountain ranges. On the other hand, the proportion of agricultural land outside the resorts is substantially higher than on all the mountain ranges.

The proportion of developed areas is very similar to that of all mountain municipalities and is still four times less than the national average.

Figure 51: land use in mountain municipalities in the Massif central in 2012
In %

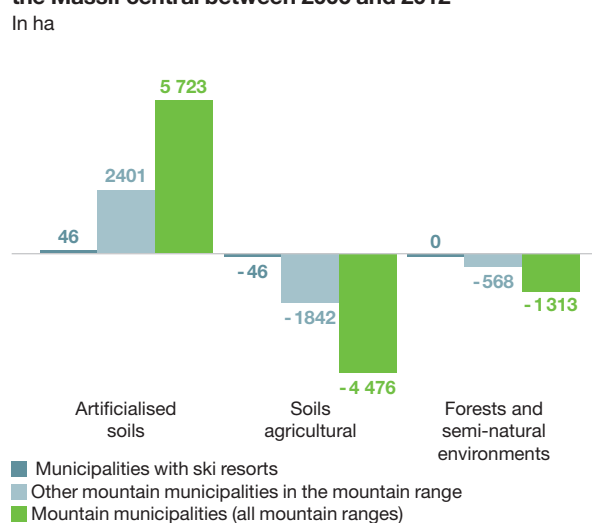


Highlights: on average, 31% of the surface area of municipalities with ski resorts in the Massif central consisted of agricultural land in 2012.

Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn; EU-SDES, CORINE Land Cover. Processing: SDES

Fluctuations in land use in municipalities with ski resorts in the Massif central follow the same trends as in the rest of the mountain area. Developed areas are increasing, while agricultural land is decreasing substantially. Forested areas and grassland are largely unchanged overall.

Figure 52: trends in land use in mountain municipalities in the Massif central between 2006 and 2012
In ha



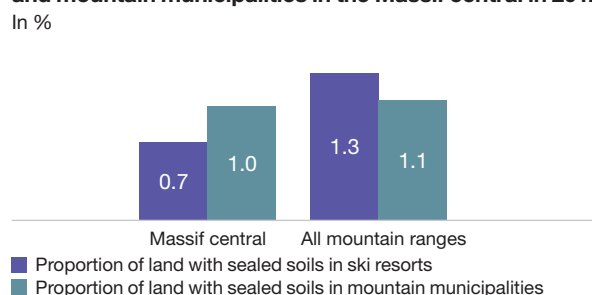
Highlights: between 2006 and 2012, the area of developed land increased by 46 ha in municipalities with ski resorts in the Massif central, while 46 ha of agricultural land disappeared.

Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn; EU-SDES, CORINE Land Cover. Processing: SDES

SOIL SEALING

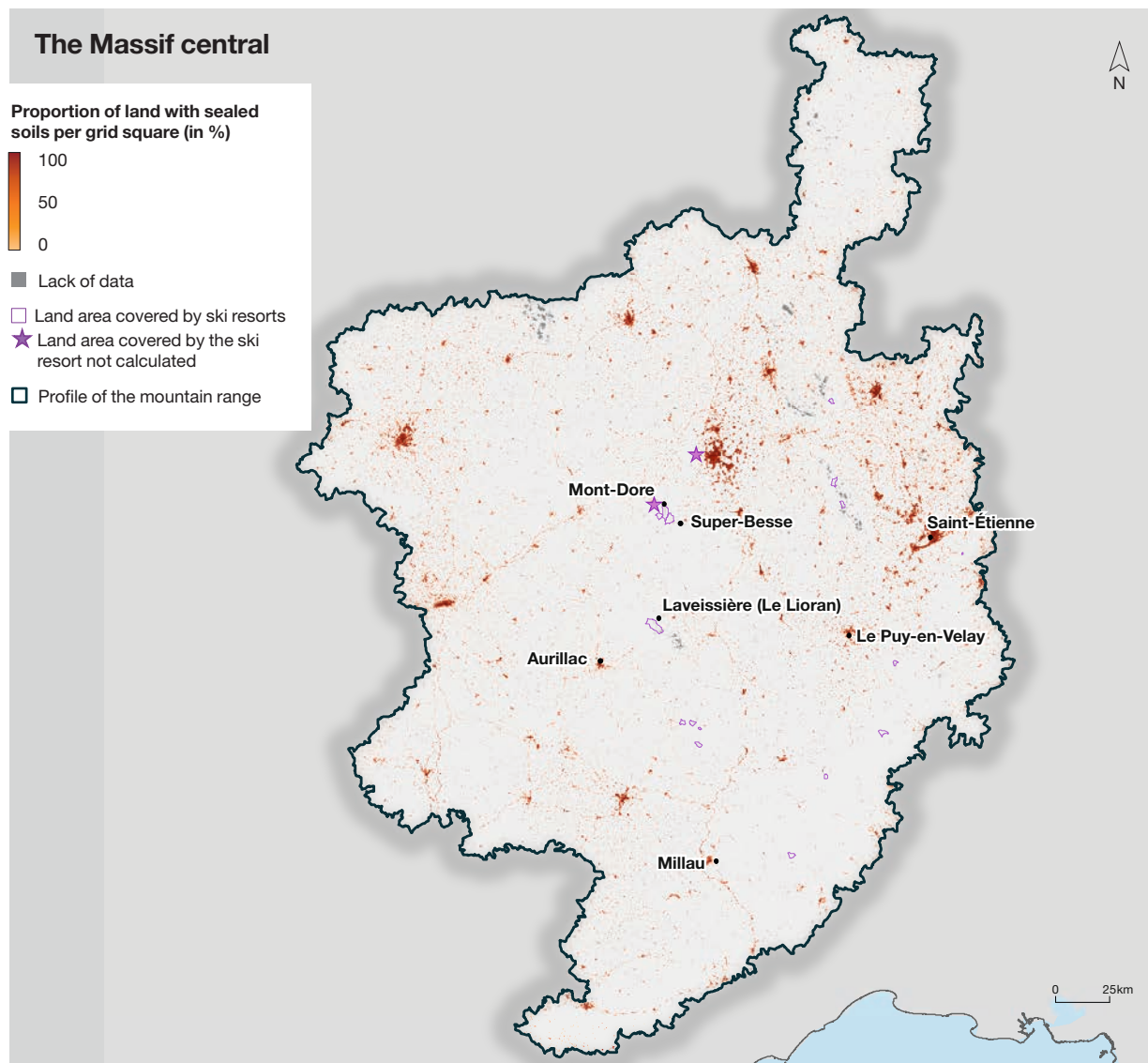
The proportion of land with sealed soils in mountain municipalities in the Massif central is very close to the proportion for all mountain ranges. On average, ski resorts have fewer areas with sealed soils than the latter. There are two times fewer areas with sealed soils in these resorts on average compared to all ski resorts in France as a whole.

Figure 53: proportion of land with sealed soils in ski resorts and mountain municipalities in the Massif central in 2012
In %



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Map 29: proportion of land with sealed soils in ski resorts and mountain municipalities in the Massif central in 2012



Note: the "high-resolution" layer that was used maps the percentage of sealed soils in pixels measuring 20 m x 20 m.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Soil sealing

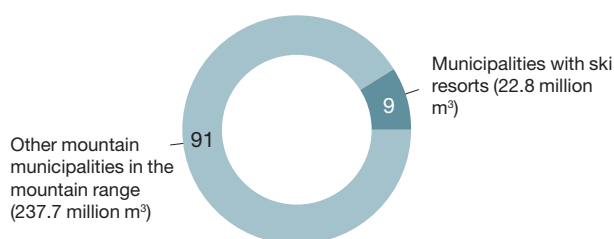
Soil sealing is defined as permanent coverage of the ground with a material that is impermeable to water and air. This can be the result of the construction of roads, buildings or car parks. Sealed soils irreversibly lose their ecological functions, particularly in terms of water storage, and thus notably create the risk of mudslides and water run-off that could lead to flooding.

Drinking water

VOLUMES OF FRESH WATER ABSTRACTED FOR DRINKING WATER SUPPLIES IN THE REGION

A total of 10% of water volumes in the Massif central abstracted for drinking water supplies comes from municipalities with ski resorts. This accounts for more than 23 million m³.

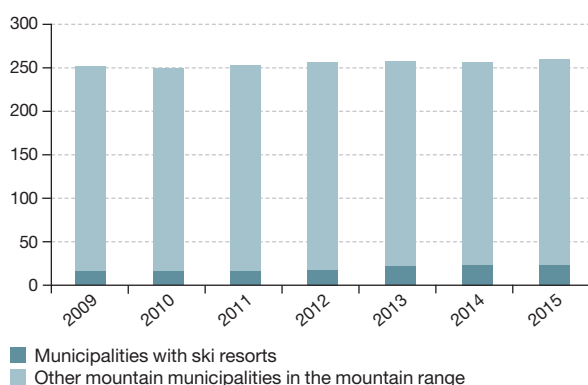
Figure 54: fresh water abstracted for the drinking water supply in mountain municipalities in the Massif central in 2015
In %



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Between 2009 and 2015, water abstraction for drinking water supplies in the Massif central mountain area increased slightly (+3%). Although the abstracted water volume has remained largely unchanged outside ski resorts, it is increasing particularly steadily in municipalities with ski resorts (+52%).

Figure 55: trends in fresh water abstraction for the drinking water supply in mountain municipalities in the Massif central
In millions of m³

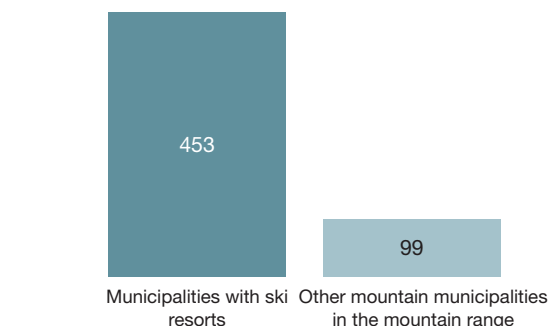


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

WATER ABSTRACTED FOR DRINKING WATER IN RELATION TO THE MUNICIPALITIES AND THE POPULATION

In relation to the number of municipalities involved, abstracted water volumes are 4.5 times higher in municipalities with ski resorts than in municipalities without ski resorts.

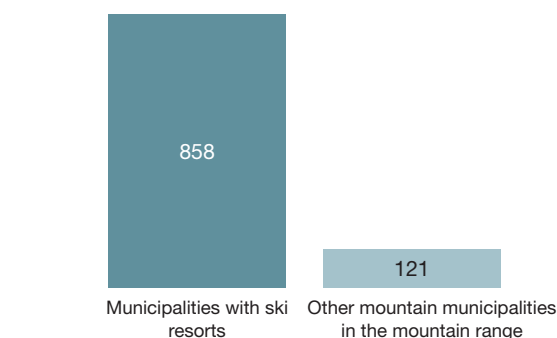
Figure 56: fresh water abstracted for drinking water supplies in the Massif central in 2015 by mountain municipality
In thousands of m³ per municipality



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

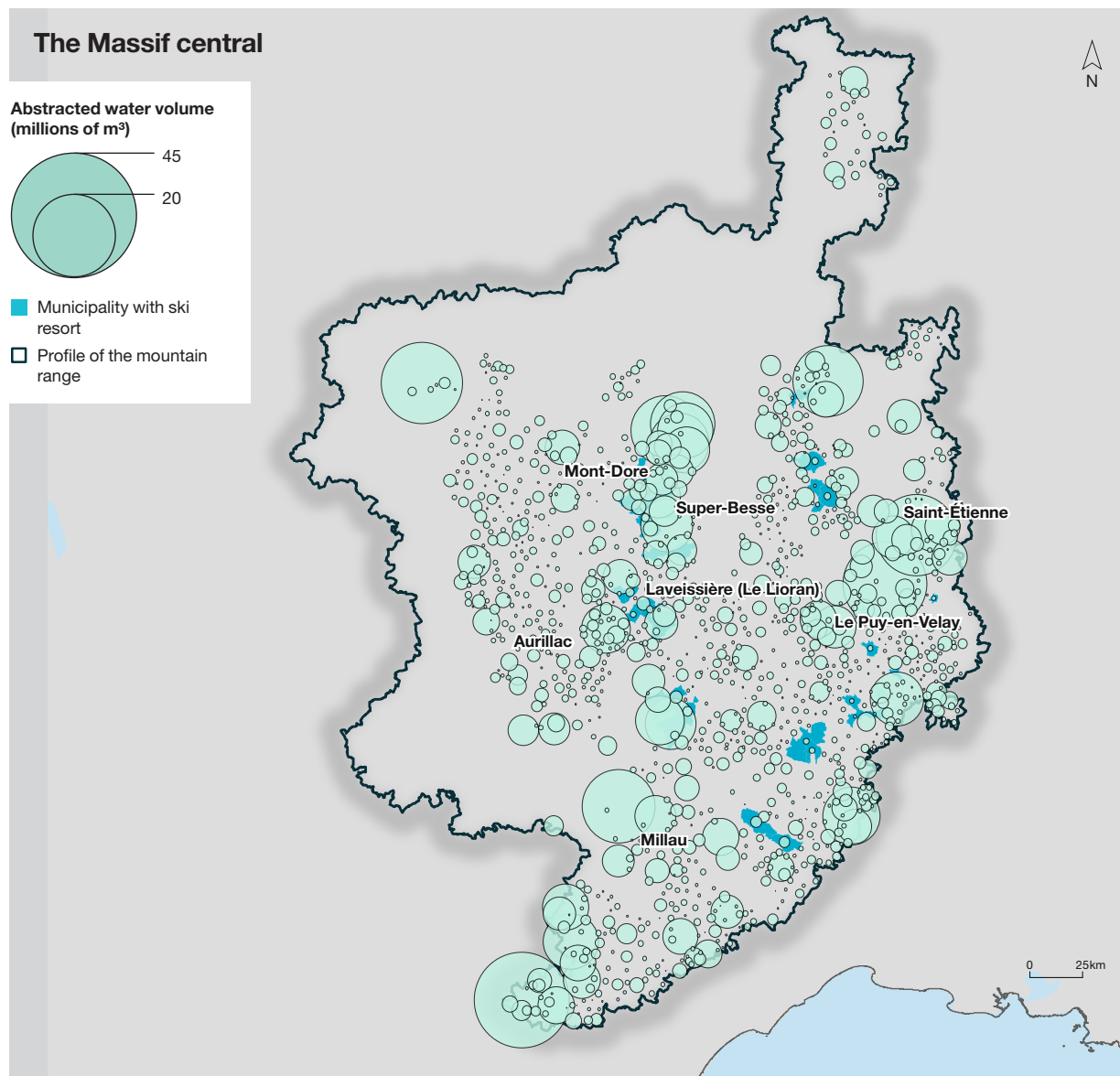
In relation to the number of inhabitants, there are also significant divergences between water volumes abstracted for drinking water supplies in municipalities with ski resorts and those in other mountain municipalities in the Massif central. On average, the volume of abstracted water amounts to 858 m³ in municipalities with ski resorts, versus 121 m³ in other municipalities in this mountain range.

Figure 57: fresh water abstracted for drinking water supplies in the Massif central in 2015 by inhabitant
In m³ per inhabitant



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Map 30: fresh water abstraction for the drinking water supply in mountain municipalities in the Massif central in 2015



Sources: CGET; STRMTG, Cairn, Ministry of Sport, RES; SDES, Corine Land Cover. Processing: SDES

Fresh water abstracted for the drinking water supply

Fresh water abstracted for the drinking water supply is equal to the quantities of water taken for the production of drinking water. The withdrawal location is not necessarily the consumption location. Some water abstracted in a municipality may be intended for supplying adjacent areas.

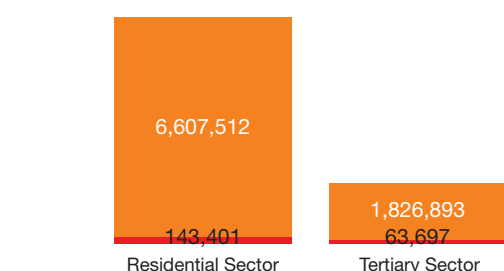
Electricity

ELECTRICITY CONSUMPTION IN MUNICIPALITIES WITH SKI RESORTS

Municipalities with ski resorts in the Massif central account for 2% of electricity consumption by the residential sector in the mountain area and 3% of electricity consumption by the service sector. In total this accounts for consumption exceeding 207,000 kWh.

Figure 58: electricity consumption in the residential and service sectors in mountain municipalities in the Massif central in 2016

In kWh

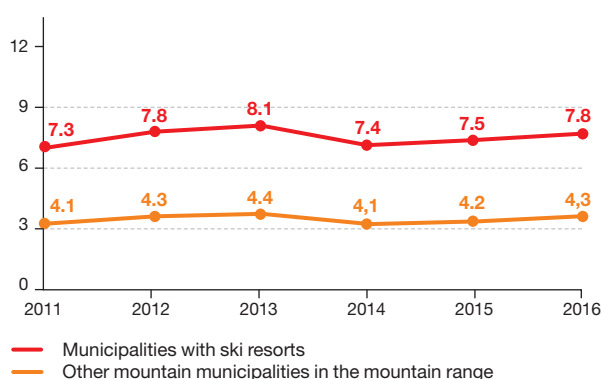


■ Other mountain municipalities in the mountain range
■ Municipalities with ski resorts

Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Figure 59: trends in electricity consumption in the residential and service sectors in the Massif central per inhabitant

In kWh per inhabitant



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

In relation to the number of inhabitants, the accumulated electricity consumed by the residential and service sectors is almost twice as high on average in municipalities with ski resorts in the Massif central than in other municipalities in France.

Between 2011 and 2016, consumption also increased at a slightly faster rate in municipalities with ski resorts (+7% as opposed to +6%).

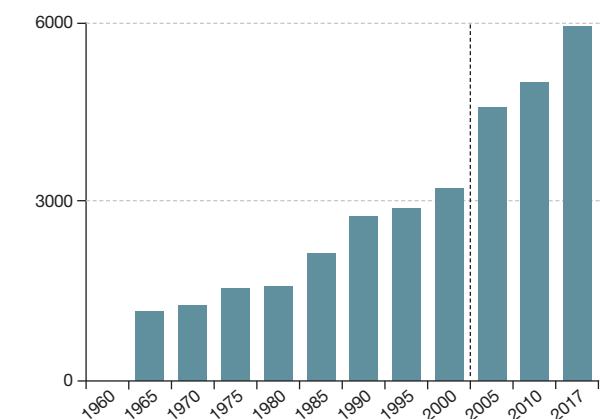
ELECTRICAL POWER OF CABLE CARS AND SKI LIFTS

In fifty years, the electrical power of cable cars and ski lifts in the Massif central has increased substantially. The greatest increases occurred between 1980 and 2000.

Between 2005 and 2017, usable electrical power continued to increase at a rate which remains constant (+30%).

Figure 60: development of the installed electrical power rating of cable cars and ski lifts in municipalities with ski resorts in the Massif central

In kWh

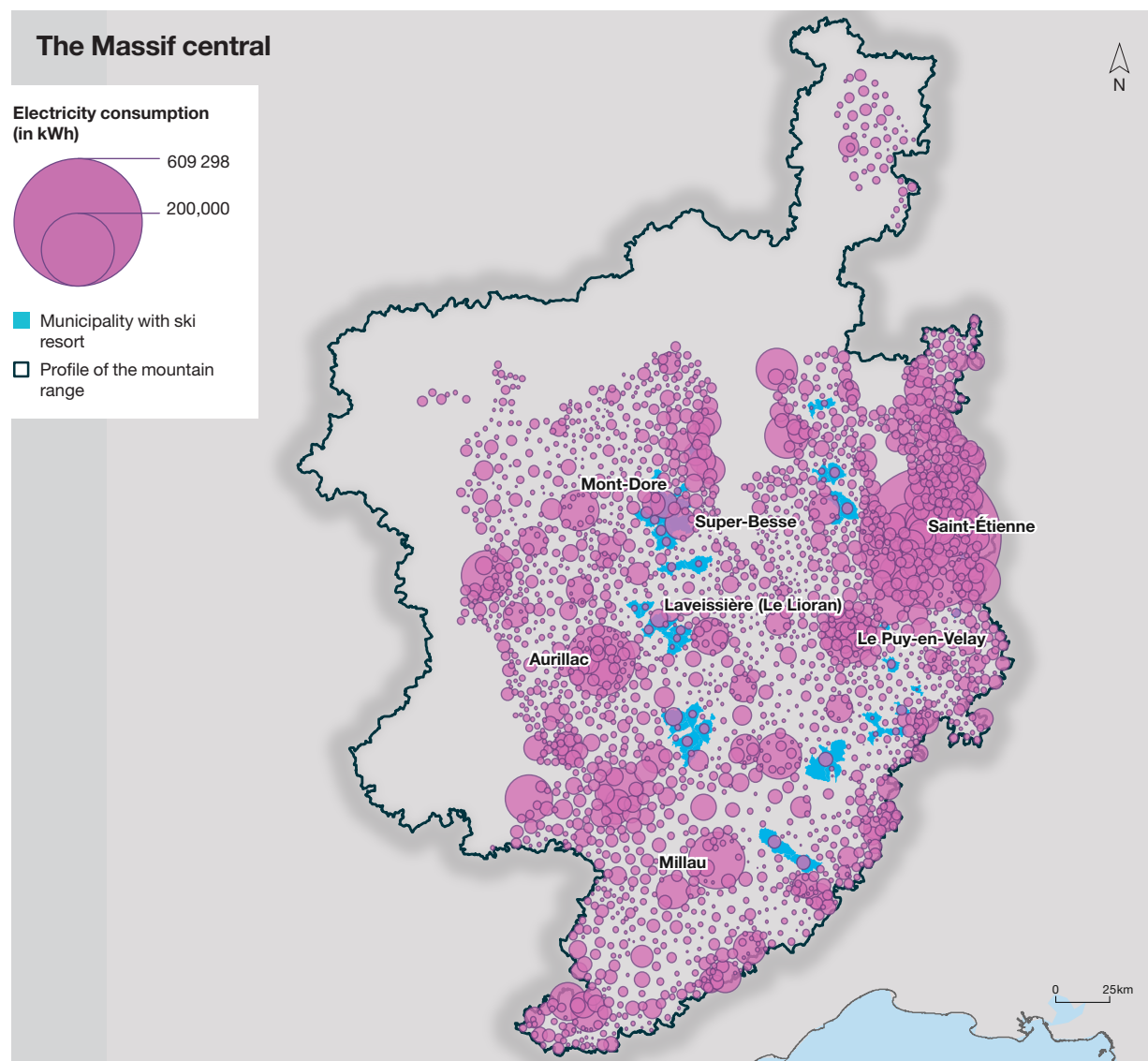


Note: break in the series in 2005.

Sources: CGET; STRMTG, Cairn. Processing: SDES

part 3: the Massif central

Map 31: electricity consumption in the residential and service sectors in mountain municipalities in the Massif central in 2016



Sources: Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Electricity consumption in the residential and service sectors

The residential sector corresponds to household electricity consumption The service sector corresponds to electricity consumption for service activities (shops, tourist accommodation, catering, offices, leisure infrastructures, etc.).

Biodiversity

INTERACTION BETWEEN SKI RESORTS AND PROTECTED AREAS

All ski resorts in the Massif central are located in protected areas. The overlap covers an area of 16,000 ha.

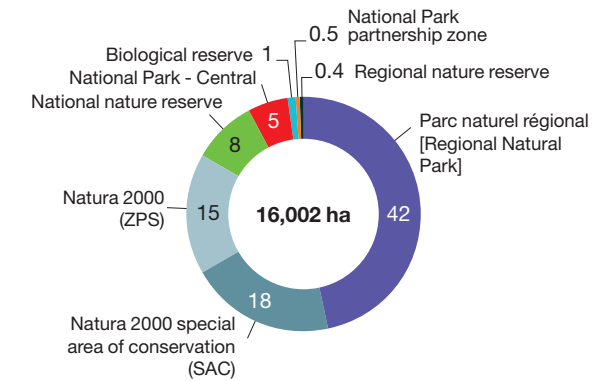
Figure 61: proportion of ski resorts overlapping protected areas in the Massif central in 2017
In %



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

In terms of surface area, regional nature parks and Natura 2000 sites are the main protected areas affected by overlap with ski resorts.

Figure 62: protected areas overlapping ski resorts in the Massif central in 2017 by type of protection
In % of ha

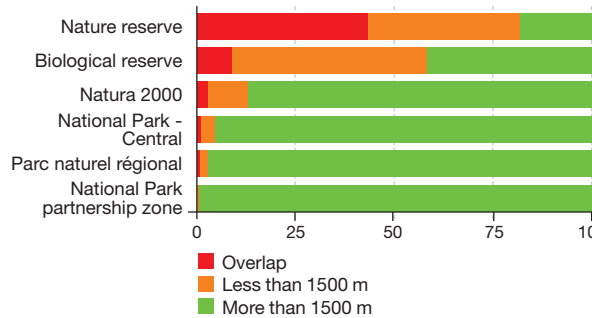


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

However, in proportion to their area, small-sized protected areas that are strictly protected are the most affected by this interaction.

Indeed, the nature reserves and biological reserves affected by close proximity to ski resorts in the Massif central have more than half their area intersected by a ski resort or are less than 1500 m from a resort.

Figure 63: distribution of the surface area of protected areas located less than 1500 m from a ski resort in the Massif central in 2017 in relation to their distance from the resort
In % of ha



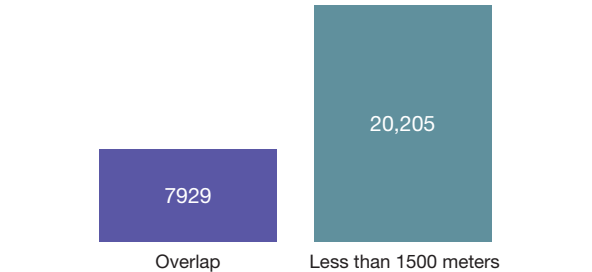
Highlights: 44% of the area of nature reserves located less than 1500 meters from a ski resort overlap with a resort.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap ; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

INTERACTION BETWEEN SKI RESORTS AND REMARKABLE NATURAL SITES: CASE OF TYPE 1 ZNIEFF (NATURAL AREAS OF ECOLOGICAL, FLORA AND FAUNA INTEREST)

In 2017, more than 28,000 ha of type 1 ZNIEFF areas were located less than 1500 m from a Massif central ski resort, with an overlap of 28% of their area.

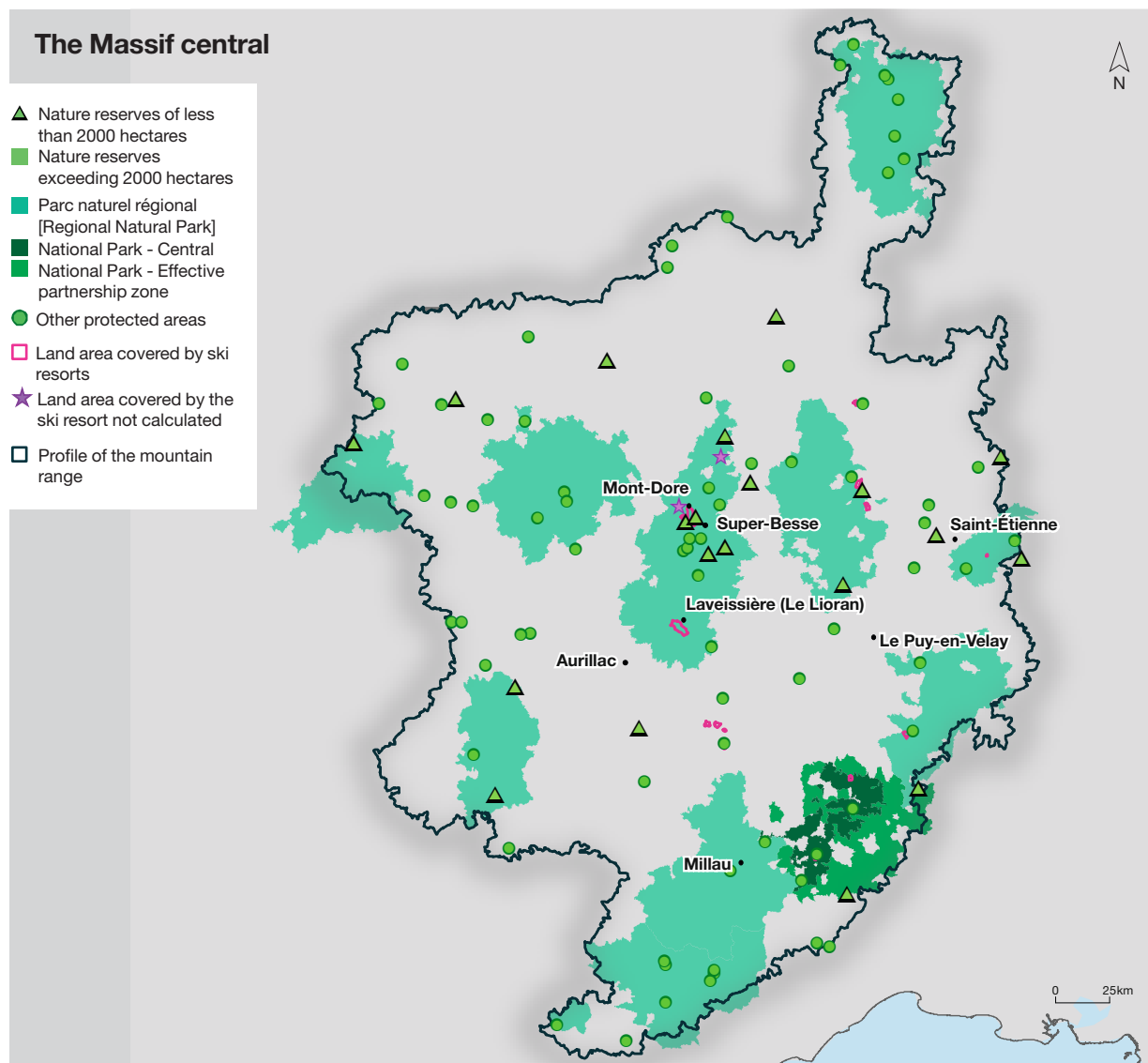
Figure 64: area covered by type 1 ZNIEFF areas in the Massif central in the vicinity of a ski resort in 2017
In ha



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (March 2017 update). Processing: SDES

part 3: the Massif central

Map 32: interaction between ski resorts and protected areas (excluding Natura 2000 sites) in the Massif central in 2017

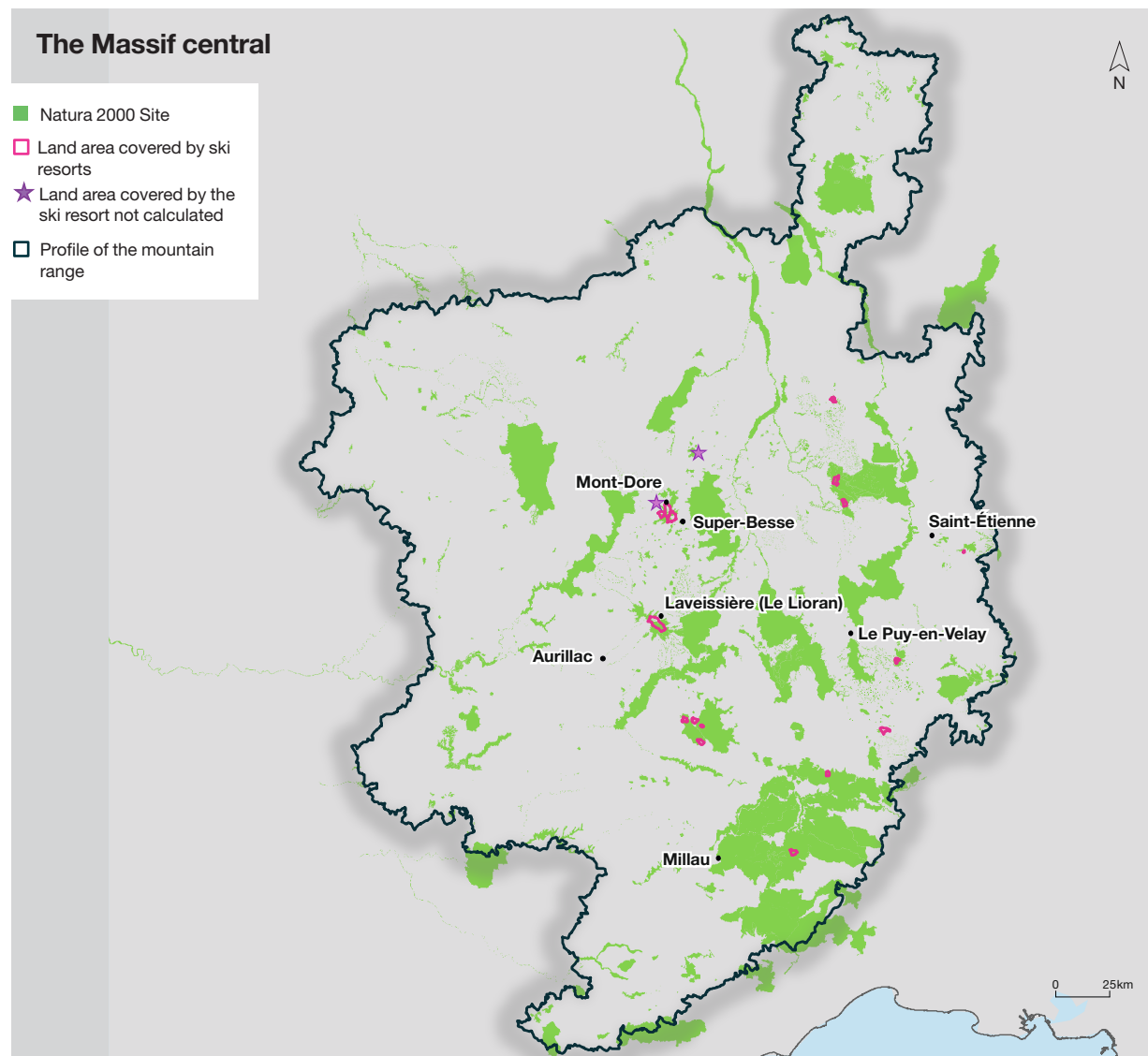


Sources: BDTOP©, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "protected areas" (February 2017 update). Processing: SDES

Protected areas (excluding Natura 2000)

The protected areas taken into account (excluding Natura 2000 sites to improve readability) include regulatory provisions referred to as strict protection systems based on prohibiting or limiting certain human activities (central areas of national parks, national nature reserves, regional nature reserves, prefectural biotope decrees, biological reserves, national hunting and wildlife reserves). They also include contractual management arrangements (national park partnership zones, regional nature parks). The latter are less strict than regulatory provisions. They combine natural heritage conservation and local development and are based on voluntary partnership on the part of local communities.

Map 33: interaction between ski resorts and protected areas (Natura 2000 sites) in the Massif central in 2017

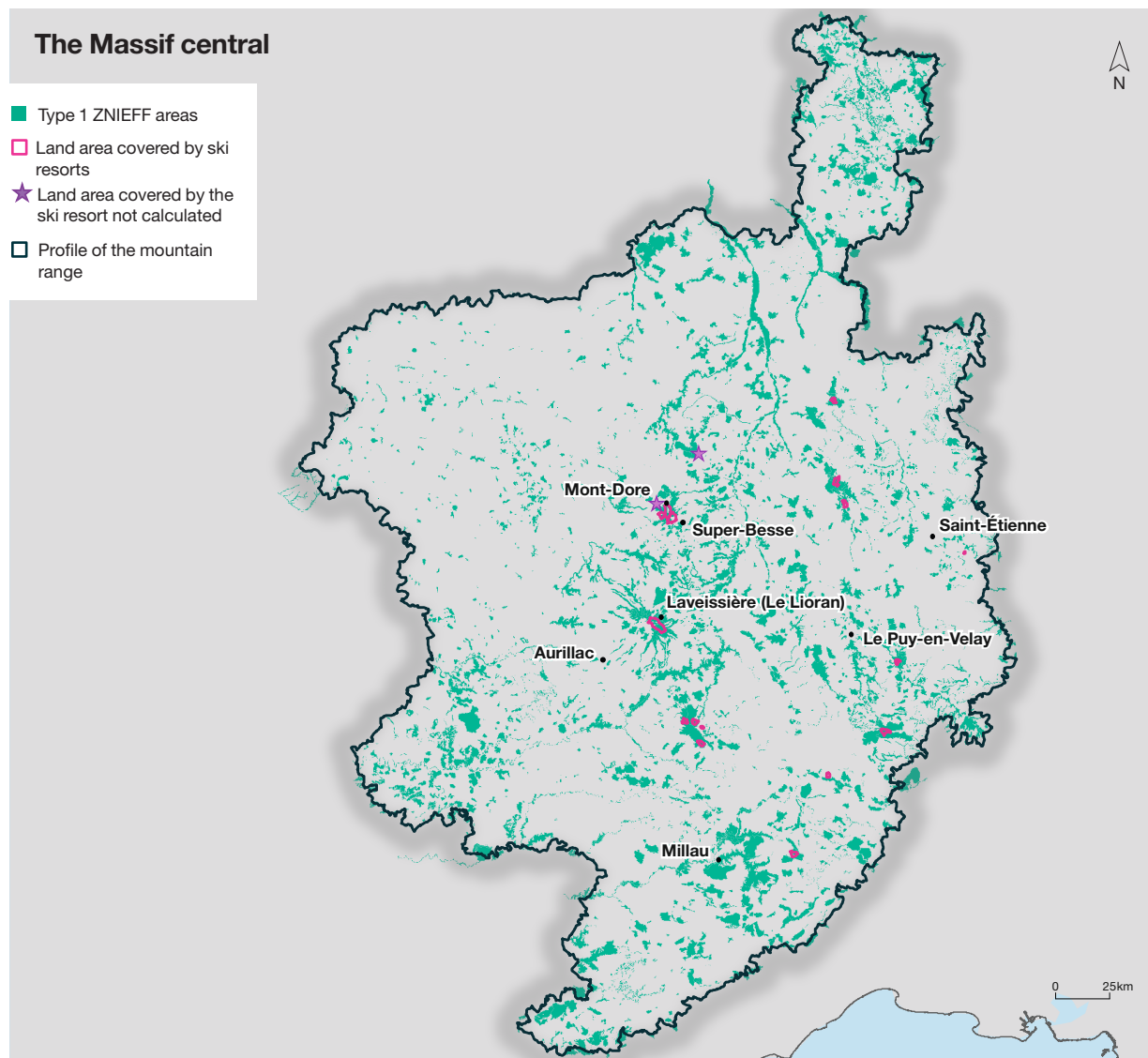


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Natura 2000" (December 2017 update). Processing: SDES

Protected areas: Natura 2000 sites

The Natura 2000 network is a European-level conservation system: it includes special protected areas (SPA) under the "Birds" directive and special areas of conservation (SAC). The purpose of the latter is to conserve habitats and animal species (excluding birds) and plant species of community interest under the "Habitats, Fauna and Flora" Directive.

Map 34: interaction between ski resorts and type 1 ZNIEFF areas in the Massif central in 2017



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (February 2017 update). Processing: SDES

Type 1 ZNIEFF areas

The purpose of the list of natural areas of ecological, fauna and flora interest (ZNIEFF) is to identify remarkable natural or semi-natural environments in France that have high biological capacity and are in a good state of conservation. This knowledge tool, which does not in itself provide protection for these areas, indicates a wealth of biodiversity in the area concerned.

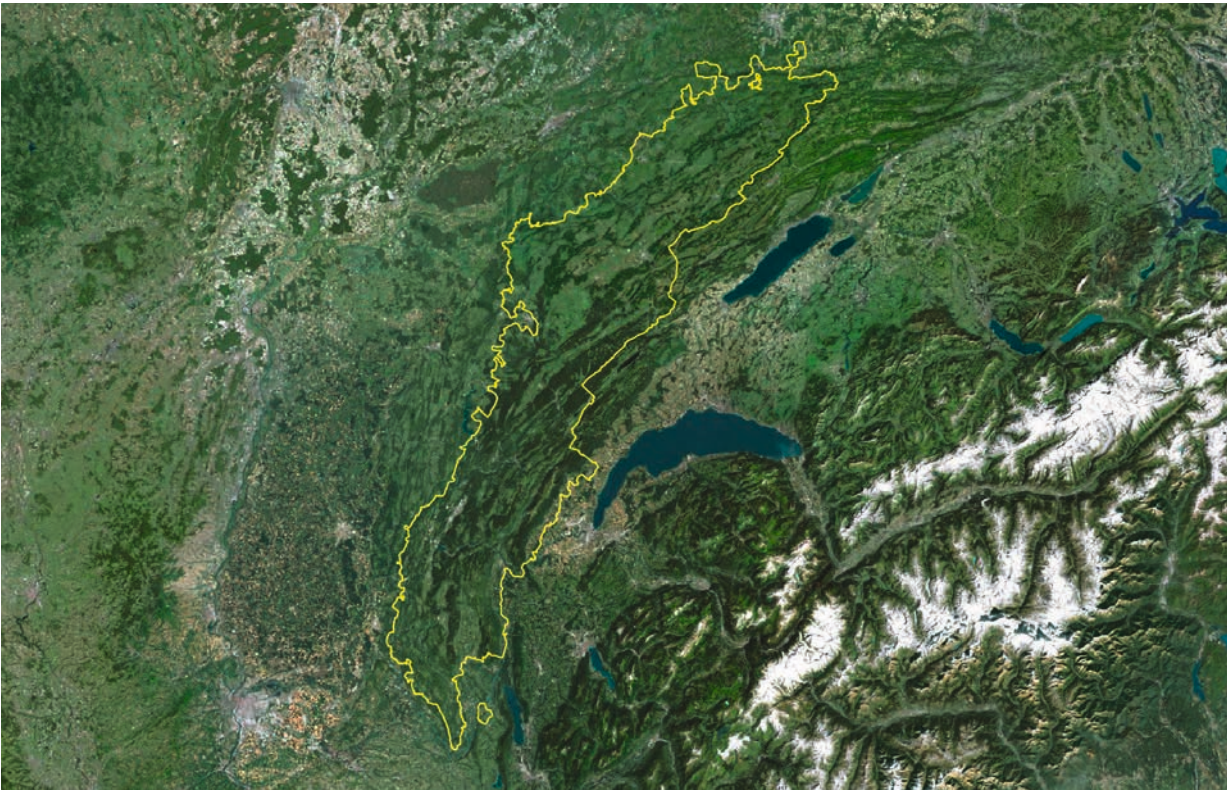
Type 1 ZNIEFF areas are sectors of major biological or ecological interest defined by the presence of species and environments that are rare, remarkable or characteristic of the national or regional natural heritage.

part 4

The Jura



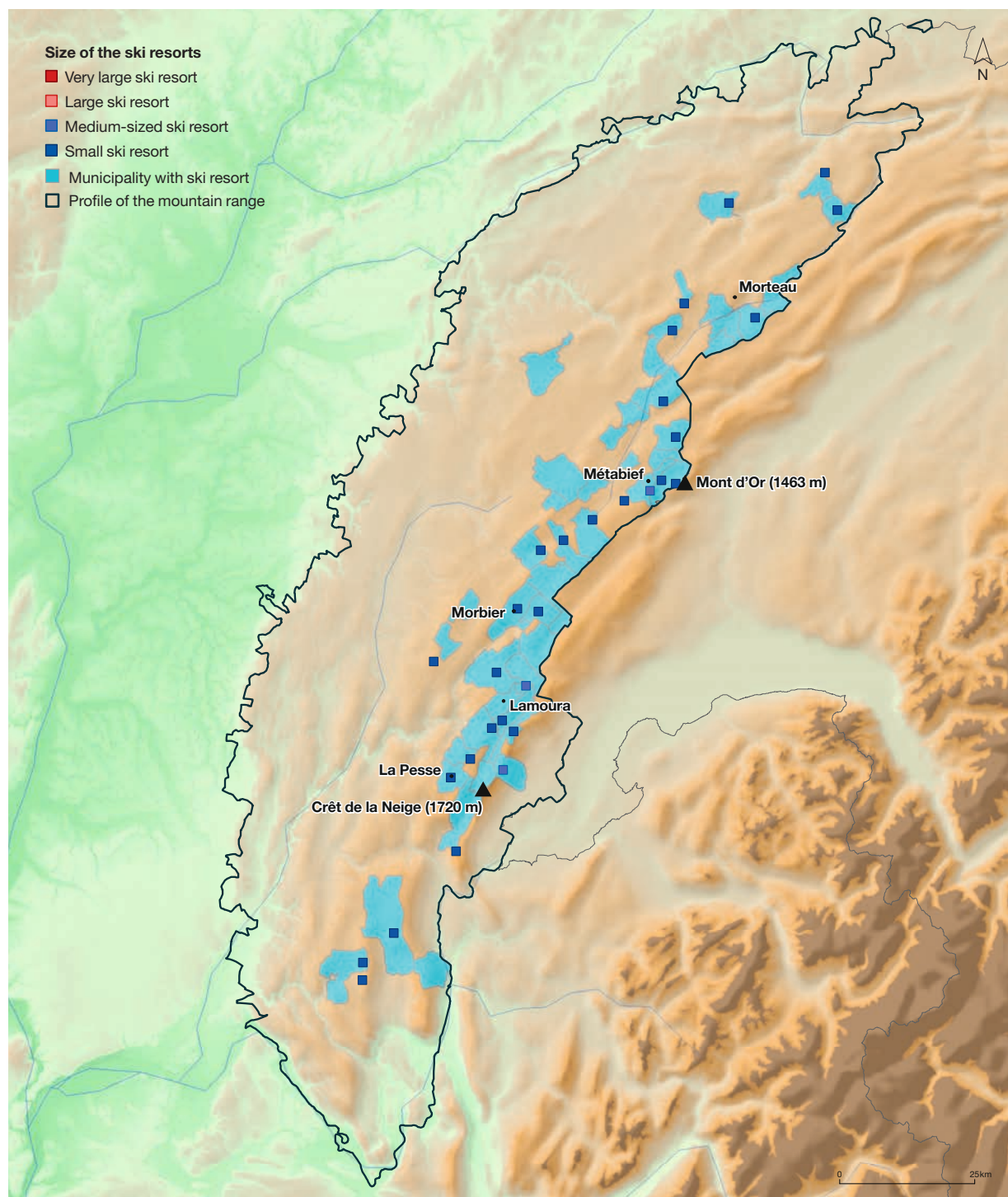
Characteristics of the mountain area



Aerial view of the Jura

AREA	POPULATION	ALTITUDE
643,687 ha	355,369 inhabitants	Average altitude of the municipalities: 765 m
496 municipalities (1298 ha/municipality on average)	716 inhabitants/ municipality on average	Average altitude of the highest municipality: 1243 m
	55 inhabitants/km ²	

Map 35: ski resorts and municipalities with ski resorts in the Jura in 2017



Note: municipalities are classified according to the sum of the vertical transport feet per hour (VTF/H) ratings of their operational cable cars and ski lifts. They are divided into four groups: small resorts (VTF/H < 2500 km.skiers/h), medium-sized resorts (VTF/H between 2500 and 6000 km.skiers/h), large resorts (VTF/H between 6000 and 15,000 km.skiers/h) and very large resorts (VTF/H > 15,000 km.skiers/h).

Sources: BDTOP®; CGET; ©OpenStreetMap; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

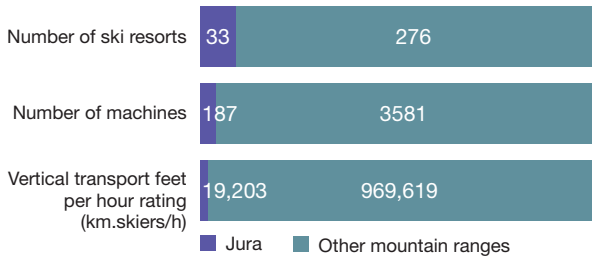
Ski resorts and municipalities with ski resorts

SKI RESORTS

The Jura have 33 ski resorts in total, accounting for 11% of resorts located in France.

These resorts include 187 cable cars/ski lifts (i.e. 5% of the total for ski resorts) and have a vertical transport feet per hour rating of more than 19,000 km.skiers/h.

Figure 65: characteristics of ski resorts in the Jura in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

The area covered by Jura ski resorts is estimated at almost 10,000 ha, i.e. 1.5% of the Jura area.

These ski resorts are mainly small with a low vertical transport feet per hour rating. Their average area is 331 ha.

Figure 66: area covered by ski resorts in the Jura in 2017

Land area covered by ski resorts	9931 ha
Average area of ski resorts	331 ha
Proportion of the mountain area	1.5 %

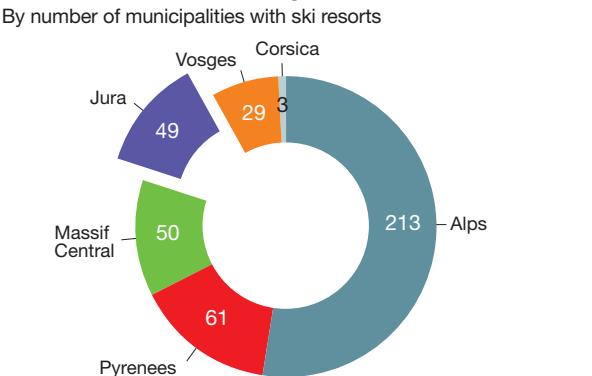
Note: owing to a lack of data, the area covered by 3 resorts could not be estimated.
Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

MUNICIPALITIES WITH SKI RESORTS

Municipalities with ski resorts have at least one cable car/ski lift line or one cross-country skiing facility.

In France, more than one in ten municipalities with ski resorts are located in the Jura. This accounts for 49 municipalities, of which 15 are only equipped with cross-country ski facilities.

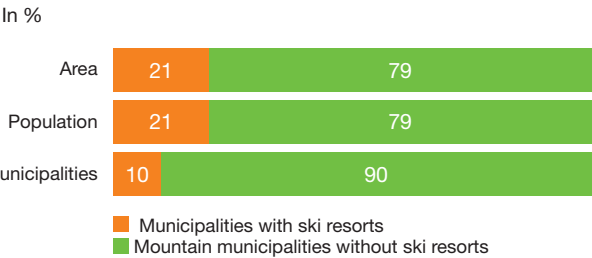
Figure 67: distribution of municipalities with ski resorts in 2017 for each mountain range



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

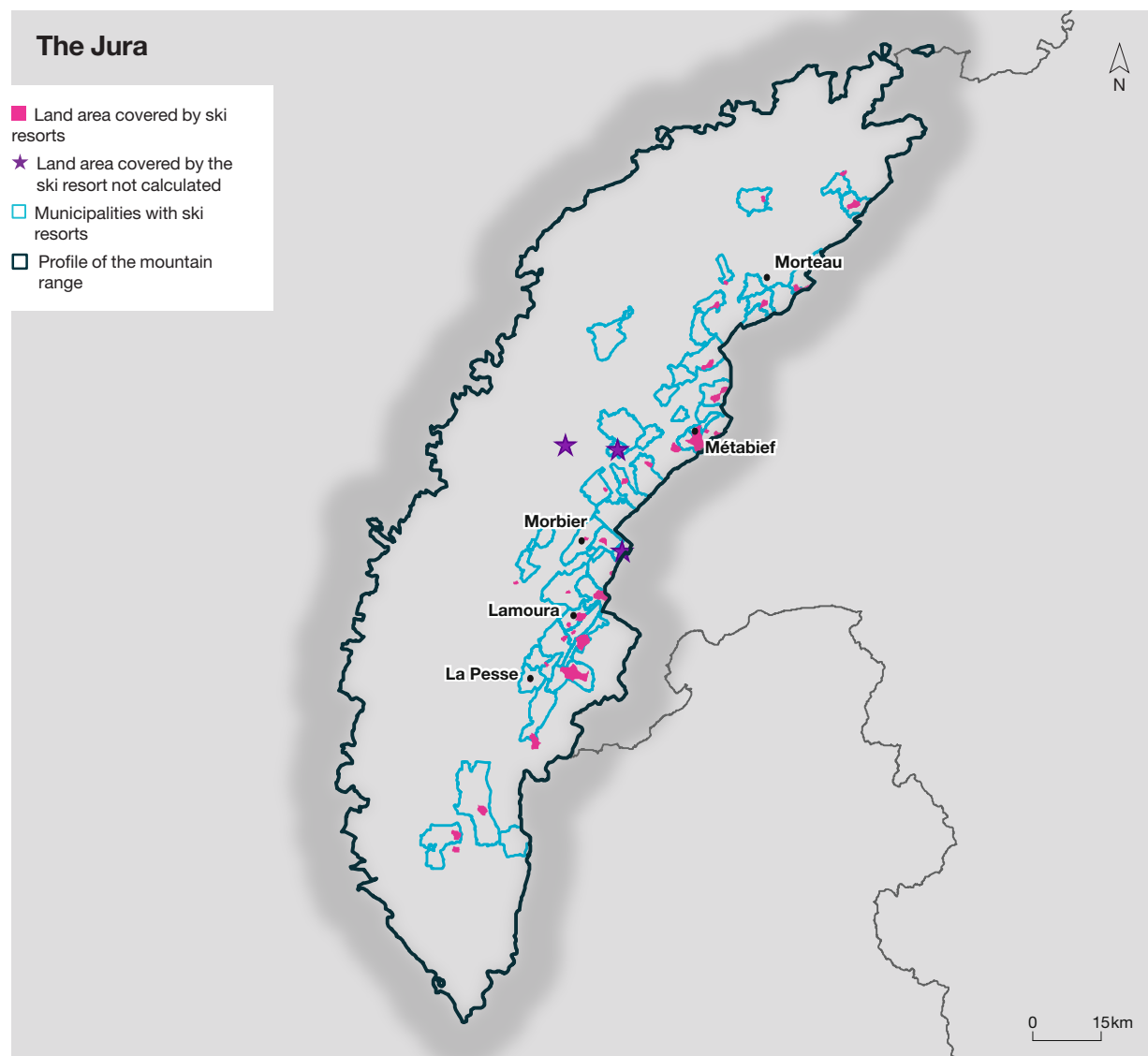
Municipalities with ski resorts occupy a substantial area of the Jura. They extend over an area of 133,000 hectares, i.e. 21% of the mountain area. They represent 10% of Jura municipalities and two inhabitants out of ten live there all year round.

Figure 68: space occupied by municipalities with ski resorts in the Jura area in 2017



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Map 36: municipalities with ski resorts and land area covered by ski resorts in the Jura in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

Land area covered by ski resorts

The land area covered by resorts is the estimated surface area of the ski resorts. Their profile was calculated on the basis of the area covered by geo-localized cable cars and ski lifts and from the location of surrounding tourist accommodation facilities and buildings in the ski resort.

Tourism

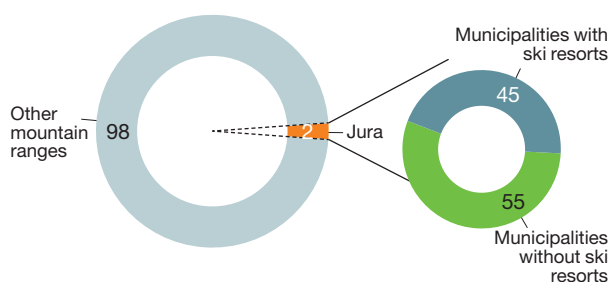
ACCOMMODATION CAPACITY AND TOURIST NUMBERS

With more than 135,000 beds in 2017, the Jura have the smallest tourist mountain accommodation capacity, at 2% of the total.

In this region, most tourist beds are located in municipalities without ski resorts (55%). Outside the ski resorts, tourist beds are distributed fairly evenly around the mountain area.

Figure 69: tourist accommodation capacity of mountain municipalities in the Jura in 2017

In %

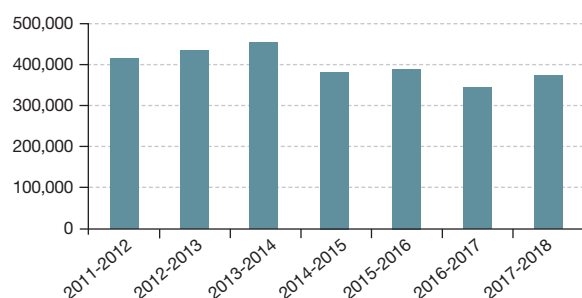


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

During the 2017-18 season, Jura municipalities with winter sports resorts registered almost 375,000 overnight stays, i.e. 2% of the total number of overnight stays in the mountains in winter. Over the last seven seasons, this number of overnight stays has diminished (by 10%) overall, but with annual fluctuations. After a 9% increase between the 2011-12 and 2013-14 seasons, followed by a reduction during the subsequent year, the number of overnight stays in ski resorts in winter has not changed since the 2014-15 season.

Figure 70: trends in the number of overnight winter tourism stays in municipalities with winter sports resorts in the Jura

Number of overnight stays



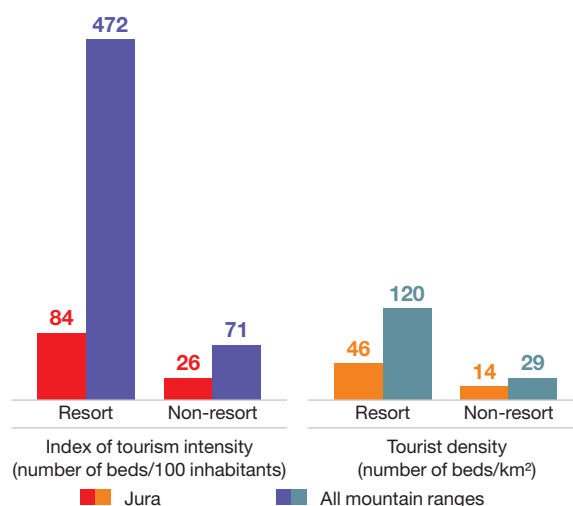
Note: municipalities with winter sports resorts identified by Insee (National Institute of Statistics and Economic Studies) as having ski facilities listed in the permanent equipment database or originating from the classification of tourist municipalities as "supporting winter sports resorts".

Source: Insee-CRT-DGE, surveys on the number of stays in tourist accommodation

PRESSURE FROM TOURISM

In the Jura, variations in population associated with tourism, expressed by the index of tourism intensity, are substantially lower than in all mountain ranges as a whole, both in municipalities with ski resorts and in the rest of the mountain area. On average, the potential number of tourist arrivals is less than the resident population.

Figure 71: index of tourism intensity and tourist density in mountain municipalities in the Jura in 2017



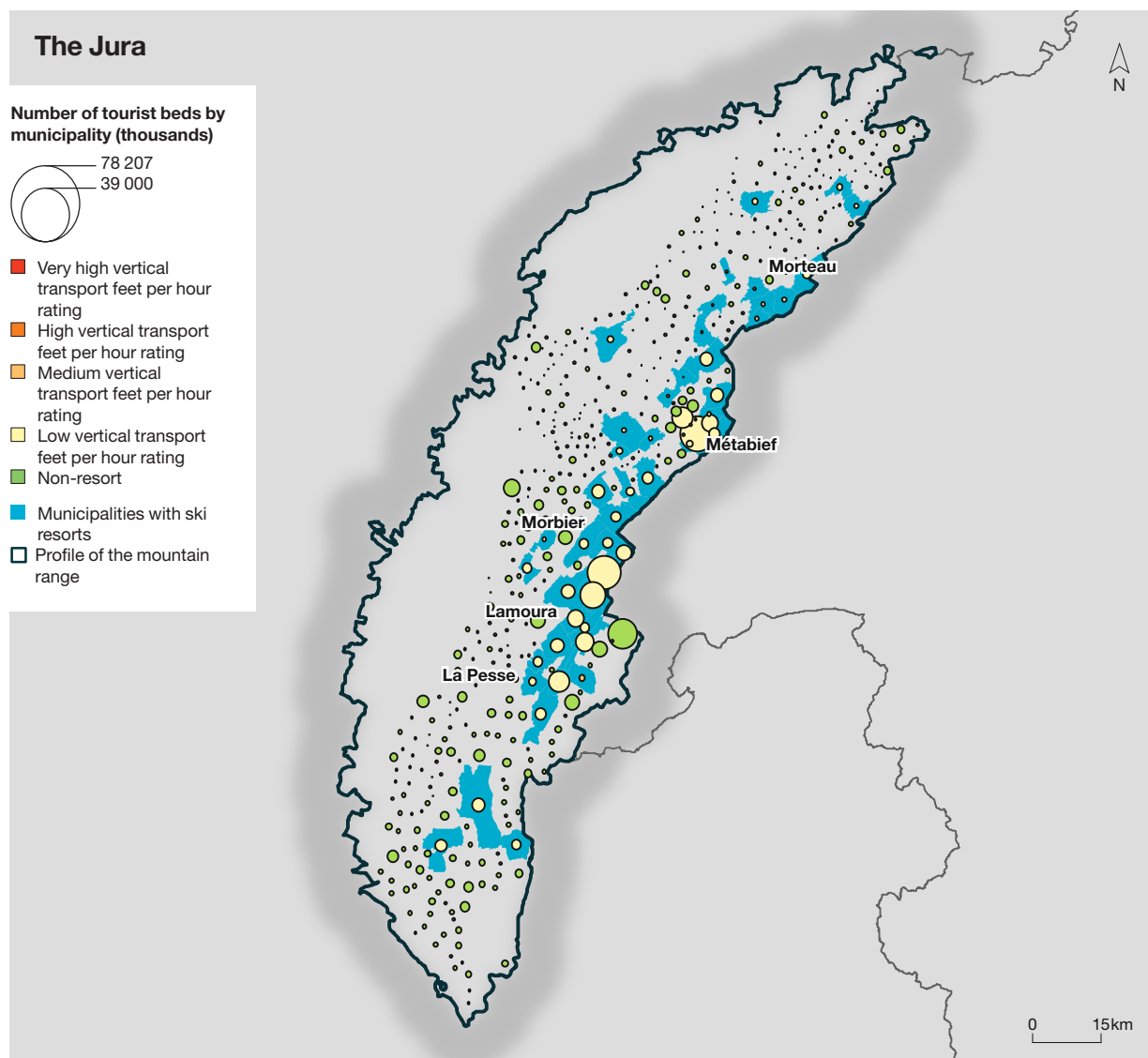
Highlights: on average, municipalities with ski resorts in the Jura have an index of tourism intensity of 84 beds per 100 inhabitants and a tourist density of 46 beds per km².

Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

With 46 beds per km² on average, tourist density in municipalities with ski resorts in the Jura is higher than the average for mountain municipalities without ski resorts in this mountain range.

The tourist density in these municipalities with ski resorts is nevertheless considerably lower than average for mountain municipalities with ski resorts.

Map 37: tourist accommodation capacity of mountain municipalities in the Jura in 2017

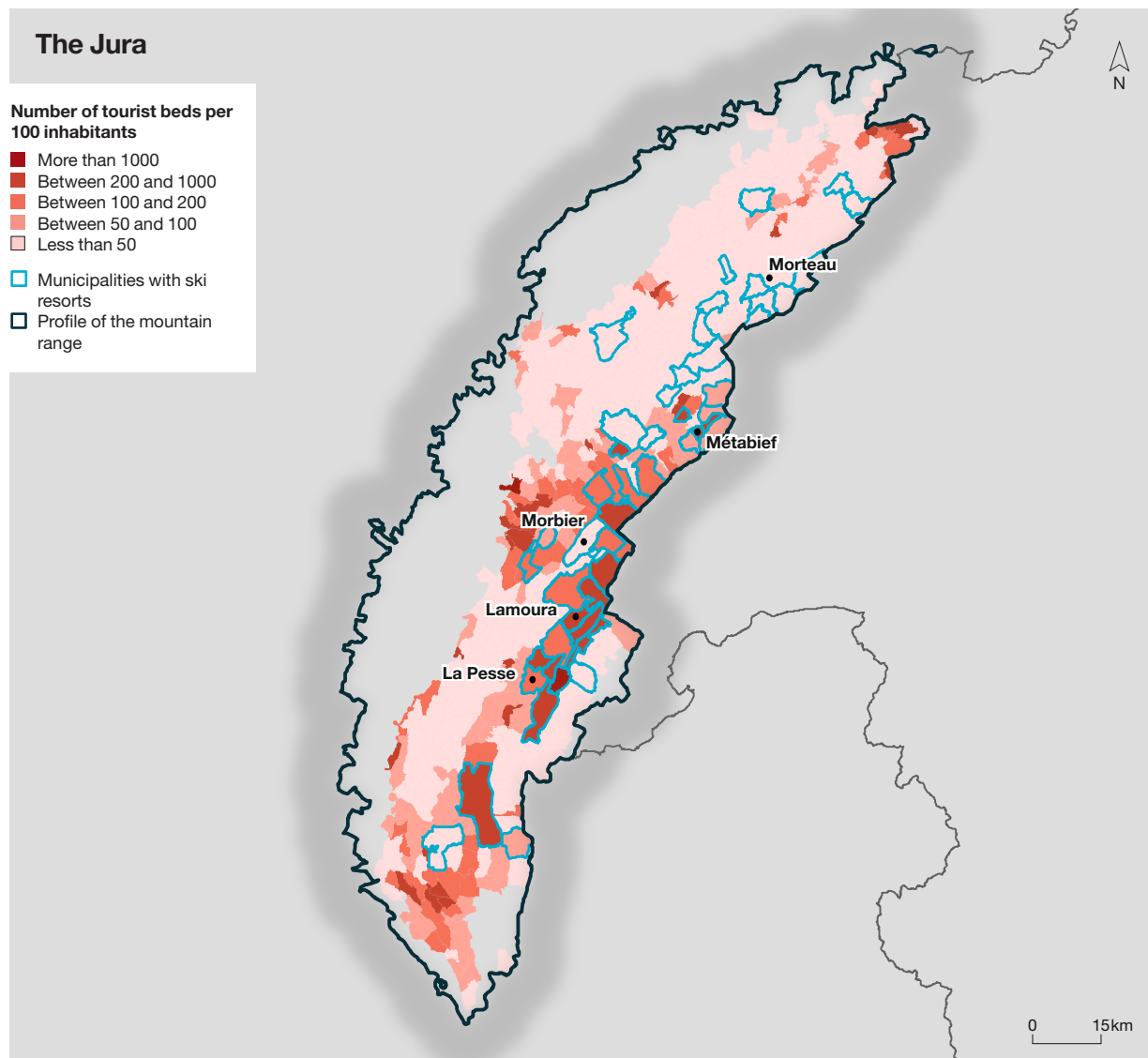


Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Tourist accommodation capacity

Tourist accommodation capacity defines the number of tourist beds located in a municipality. This indicator includes tourist beds in paid accommodation facilities (hotels, camping sites, holiday residences, holiday villages, youth hostels, sports centers, etc.) and in non-paid accommodation facilities (second homes). Private tourist accommodation (Airbnb type) is not taken into consideration. The ratios defined by Insee have been used to estimate the number of tourist beds for hotels (two beds per room), camping sites (three beds per camping pitch) and second homes (five beds per second home).

Map 38: index of tourism intensity of mountain municipalities in the Jura in 2017

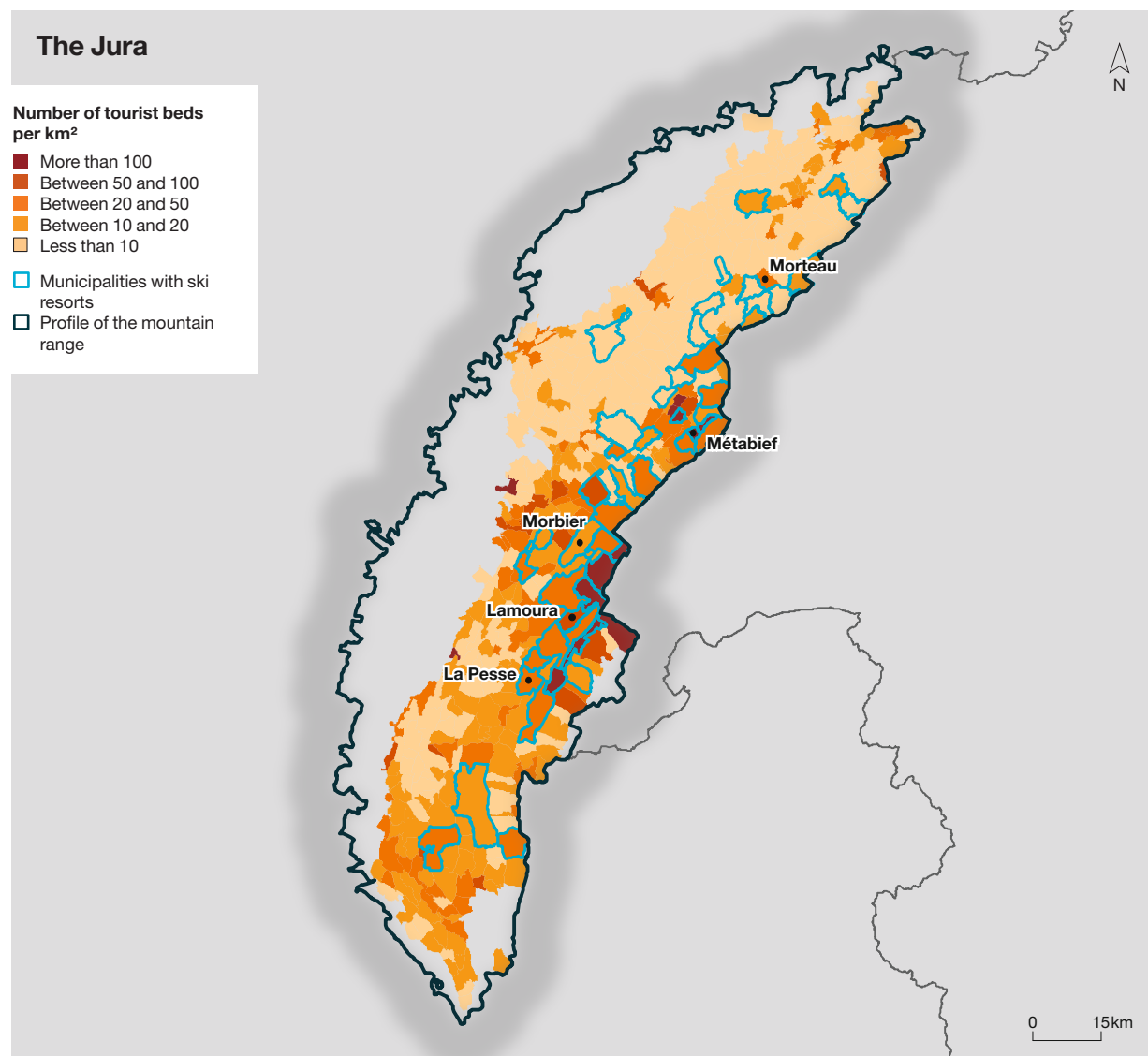


Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Index of tourism intensity

The index of tourism intensity is an indicator of tourist pressure or tourist intensity. This is the ratio of the number of tourist beds in a given area to its resident population. This indicator expresses the theoretical capacity of an area to increase its population in terms of accommodating tourists. An index equal to 100 means that the area has a tourist accommodation capacity equivalent to its permanent population and could therefore double its population.

Map 39: tourist density of mountain municipalities in the Jura in 2017



Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Tourist density

Tourist density is the ratio between the number of tourist beds in a given area and its surface area. This indicator is used to estimate the spatial concentration of tourist accommodation in a given area.

Land use

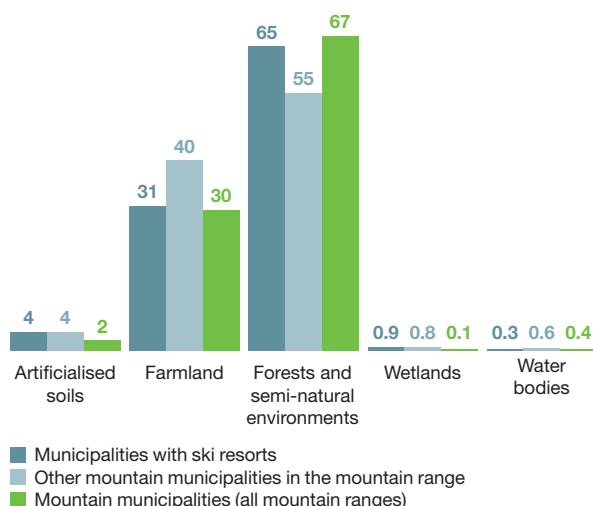
LAND USE

Jura areas are mainly composed of forests and grassland, particularly in municipalities with ski resorts. Outside the ski resorts, the space occupied by forested areas is less than average for all mountain ranges as a whole. However, the proportion of agricultural land is higher.

The proportion of developed land areas is twice that of all mountain municipalities as a whole, both in municipalities with ski resorts and in other municipalities in the Jura area.

Figure 72: land use in municipalities in the Jura in 2012

In %



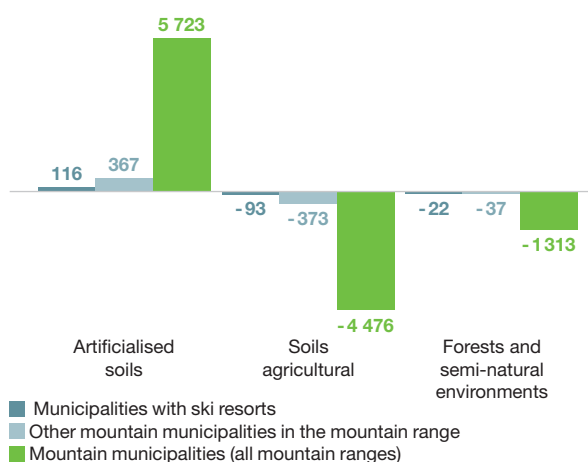
Highlights: on average, 31% of the area of municipalities with ski resorts in the Jura consisted of agricultural land in 2012.

Sources: CGET; Ministry of Sport, RES; EU-SDES, CORINE Land Cover; STRMTG, Cairn. Processing: SDES

Land use in municipalities with ski resorts in the Jura follows the same trends as in the rest of the mountain area. Developed areas are increasing, while agricultural land, forested areas and grassland are decreasing.

Figure 73: trends in land use in municipalities in the Jura between 2006 and 2012

In ha



Highlights: between 2006 and 2012, the area of developed land increased by 116 ha in municipalities with ski resorts in the Jura, while 93 ha of agricultural land disappeared.

Sources: CGET; Ministry of Sport, RES; EU-SDES, CORINE Land Cover; STRMTG, Cairn. Processing: SDES

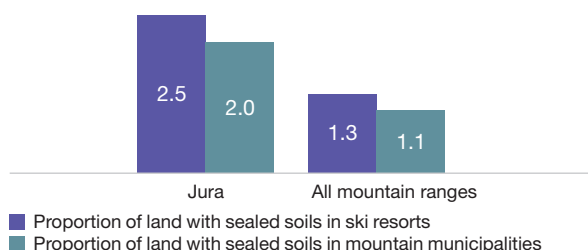
SOIL SEALING

The proportion of areas with sealed soils in the Jura area is almost twice the average for mountain municipalities in France. The proportion of land with sealed soils also exceeds the national average (1.3%).

Ski resorts are particularly affected by this phenomenon. The proportion of areas with sealed soil areas in the Jura ski resorts is almost twice as high as that of all the ski resorts in France.

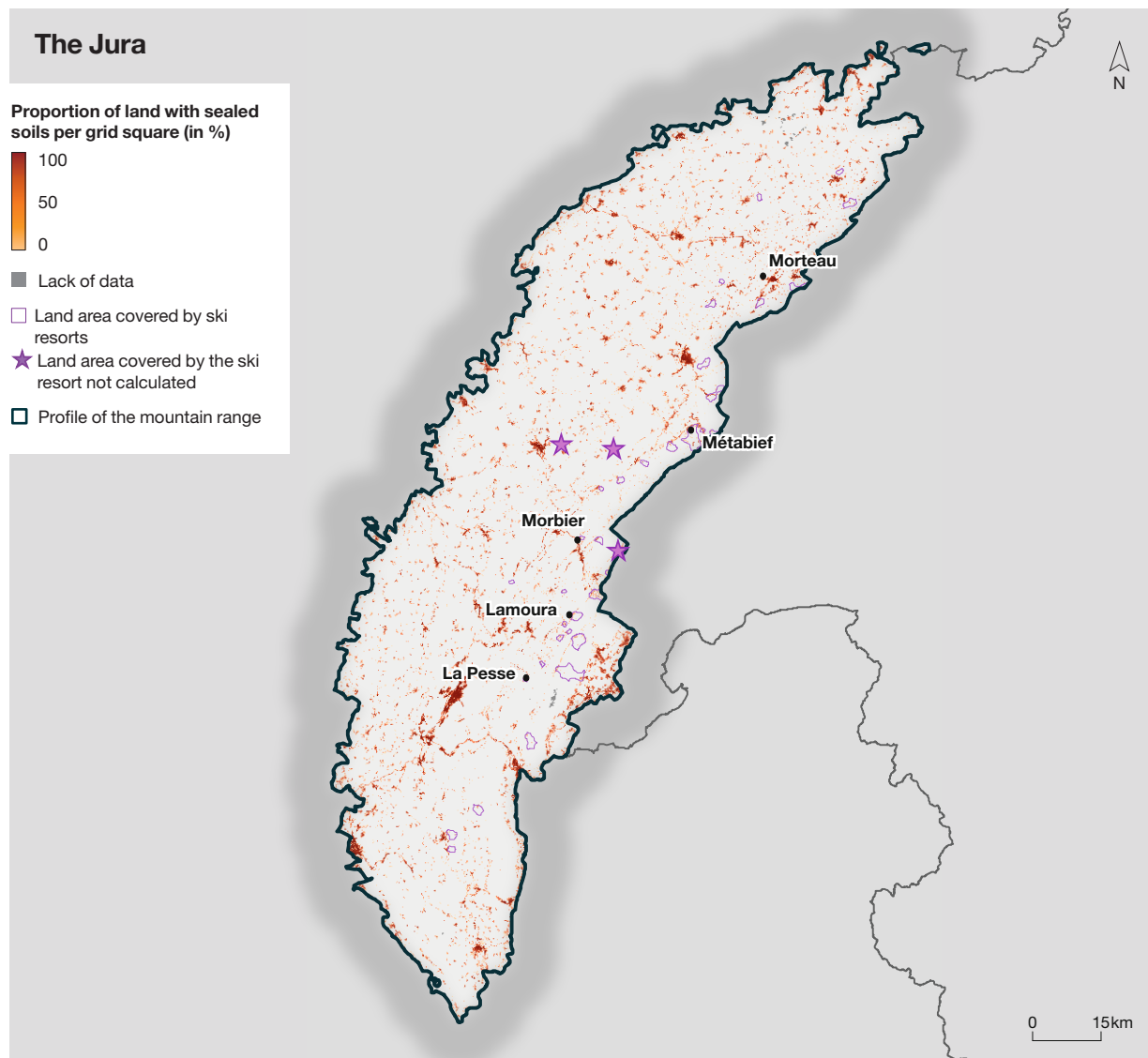
Figure 74: proportion of areas with sealed soil areas in ski resorts and municipalities in the Jura in 2012

In %



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Map 40: proportion of areas with sealed soils in ski resorts and mountain municipalities in the Jura in 2012



Note: the "high-resolution" layer that was used maps the percentage of sealed soils in pixels measuring 20 m x 20 m.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Soil sealing

Soil sealing is defined as permanent coverage of the ground with a material that is impermeable to water and air. This can be the result of the construction of roads, buildings or car parks. Sealed soils irreversibly lose their ecological functions, particularly in terms of water storage, and thus notably create the risk of mudslides and water run-off that could lead to flooding.

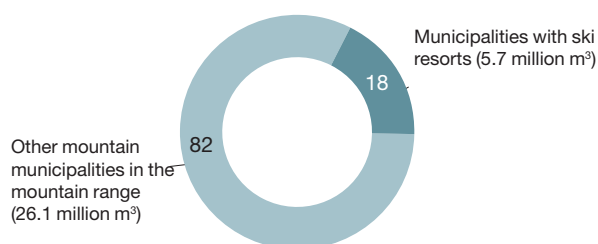
Drinking water

VOLUMES OF FRESH WATER ABSTRACTED FOR DRINKING WATER SUPPLIES IN THE REGION

A total of 18% of the water volumes in the Jura abstracted for drinking water supplies comes from municipalities with ski resorts. This accounts for more than 5 million m³.

Figure 75: volumes of fresh water abstracted for the drinking water supply in mountain municipalities in the Jura in 2015

In %

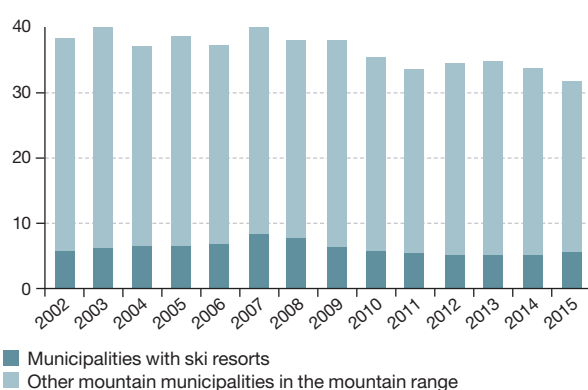


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Between 2002 and 2015, despite annual fluctuations, water abstraction for drinking water supplies diminished by 17% throughout the entire mountain area.

Figure 76: fluctuations in the volume of fresh water abstracted for the drinking water supply in municipalities in the Jura

In millions of m³



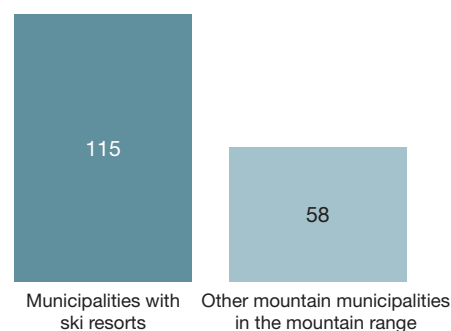
Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

WATER ABSTRACTED FOR DRINKING WATER IN RELATION TO THE MUNICIPALITIES AND THE POPULATION

In the Jura, abstracted volumes per municipality are almost twice as high in ski resorts than in municipalities without ski resorts.

Figure 77: fresh water abstracted for drinking water supplies in the Jura in 2015 by mountain municipality

In thousands of m³ per municipality

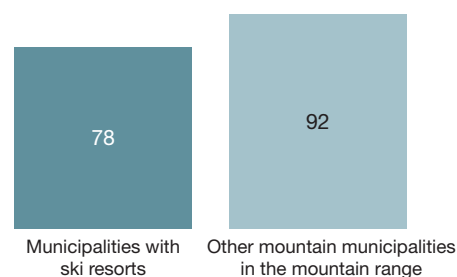


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

In relation to the number of inhabitants, the divergences between municipalities with ski resorts and other municipalities in the Jura are fairly substantial. On average, volumes abstracted per inhabitant are lower in municipalities with ski resorts.

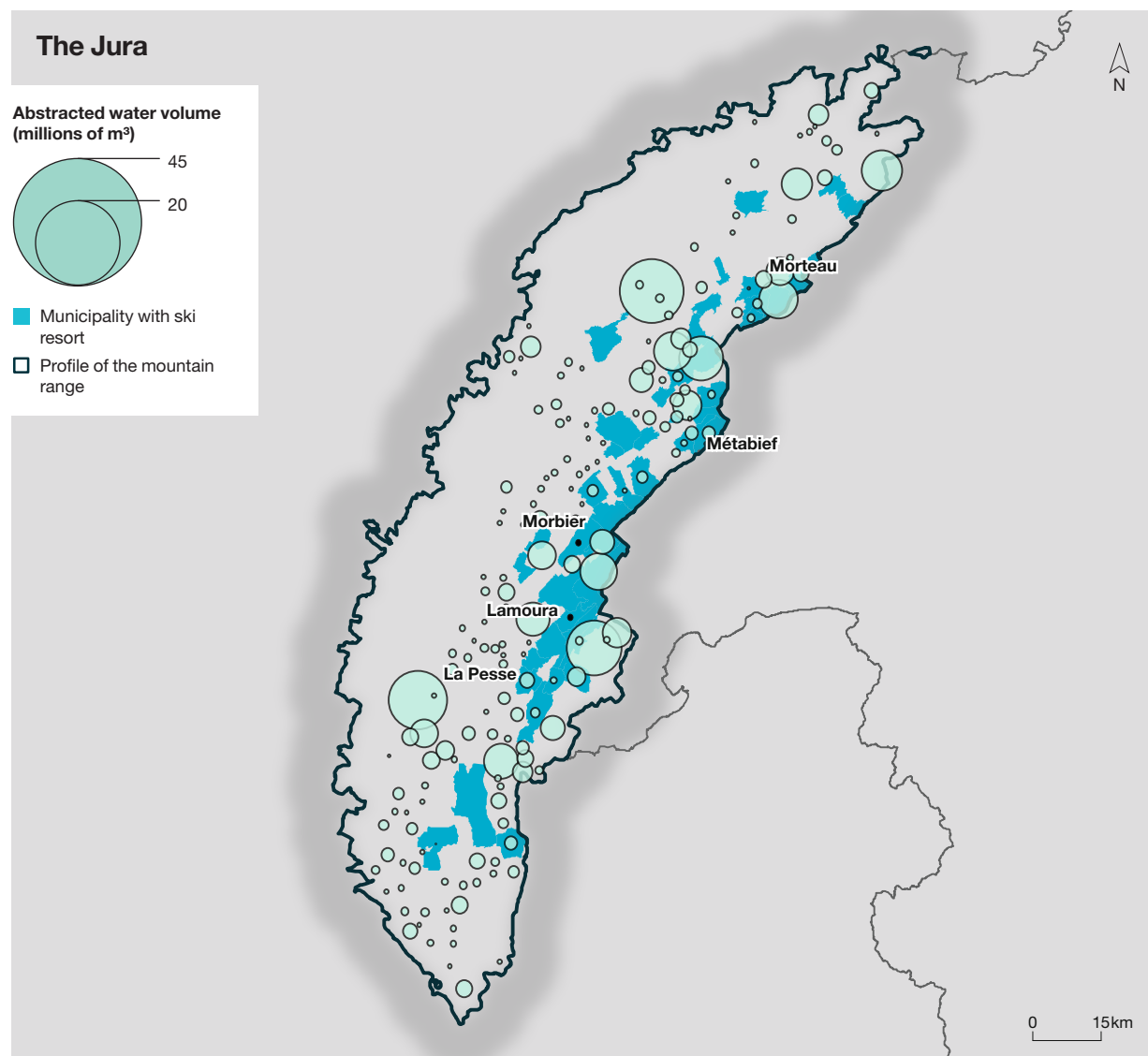
Figure 78: fresh water abstracted for drinking water supplies in the Jura in 2015 per inhabitant

In m³ per inhabitant



Sources: Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Map 41: fresh water abstraction for the drinking water supply in Jura municipalities in 2015



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Fresh water abstracted for the drinking water supply

Fresh water abstracted for the drinking water supply is equal to the quantities of water taken for the production of drinking water. The withdrawal location is not necessarily the consumption location. Some water abstracted in a municipality may be intended for supplying adjacent areas.

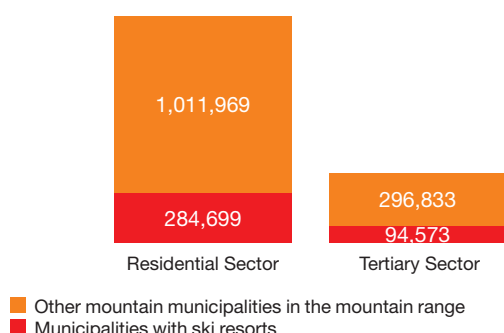
Electricity

ELECTRICITY CONSUMPTION IN MUNICIPALITIES WITH SKI RESORTS

In the Jura, 22% of the electricity consumed by the residential sector and almost one quarter of the electricity consumed by the service sector originates from municipalities with ski resorts. In total, this accounts for consumption of almost 380,000 kWh.

Figure 79: electricity consumption in the residential and service sectors in municipalities in the Jura in 2016

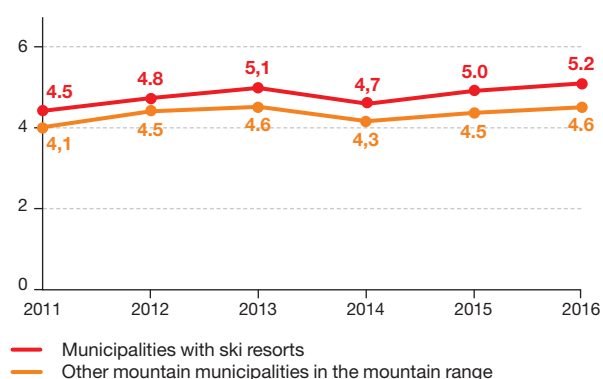
In kWh



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Figure 80: trends in electricity consumption in the residential and service sectors in the Jura per inhabitant

In kWh per inhabitant



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

In relation to the number of inhabitants, the accumulated electricity consumed by the residential and service sectors is slightly higher in municipalities with ski resorts in the Jura than in other municipalities in the region.

Electricity consumption also increased between 2011 and 2016 at a comparable rate in municipalities with ski resorts and in other municipalities in the Jura area (by 15% and 12%, respectively).

ELECTRICAL POWER OF CABLE CARS AND SKI LIFTS

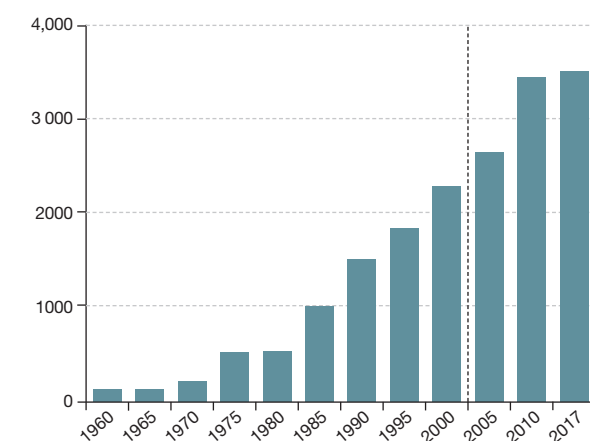
In 2017, the accumulated installed electrical power rating of cable cars and ski lifts in Jura ski resorts was almost 3500 kW. This accounts for 0.5% of the total electrical power of all such machinery located in ski resorts in France.

In fifty years, the electrical power of cable cars and ski lifts in the Jura has increased substantially. The greatest increases occurred between 1980 and 2000.

Between 2010 and 2017 usable electrical power continued to increase, but at a more moderate rate (+2%).

Figure 81: development of the installed electrical power rating of cable cars and ski lifts in municipalities with ski resorts in the Jura

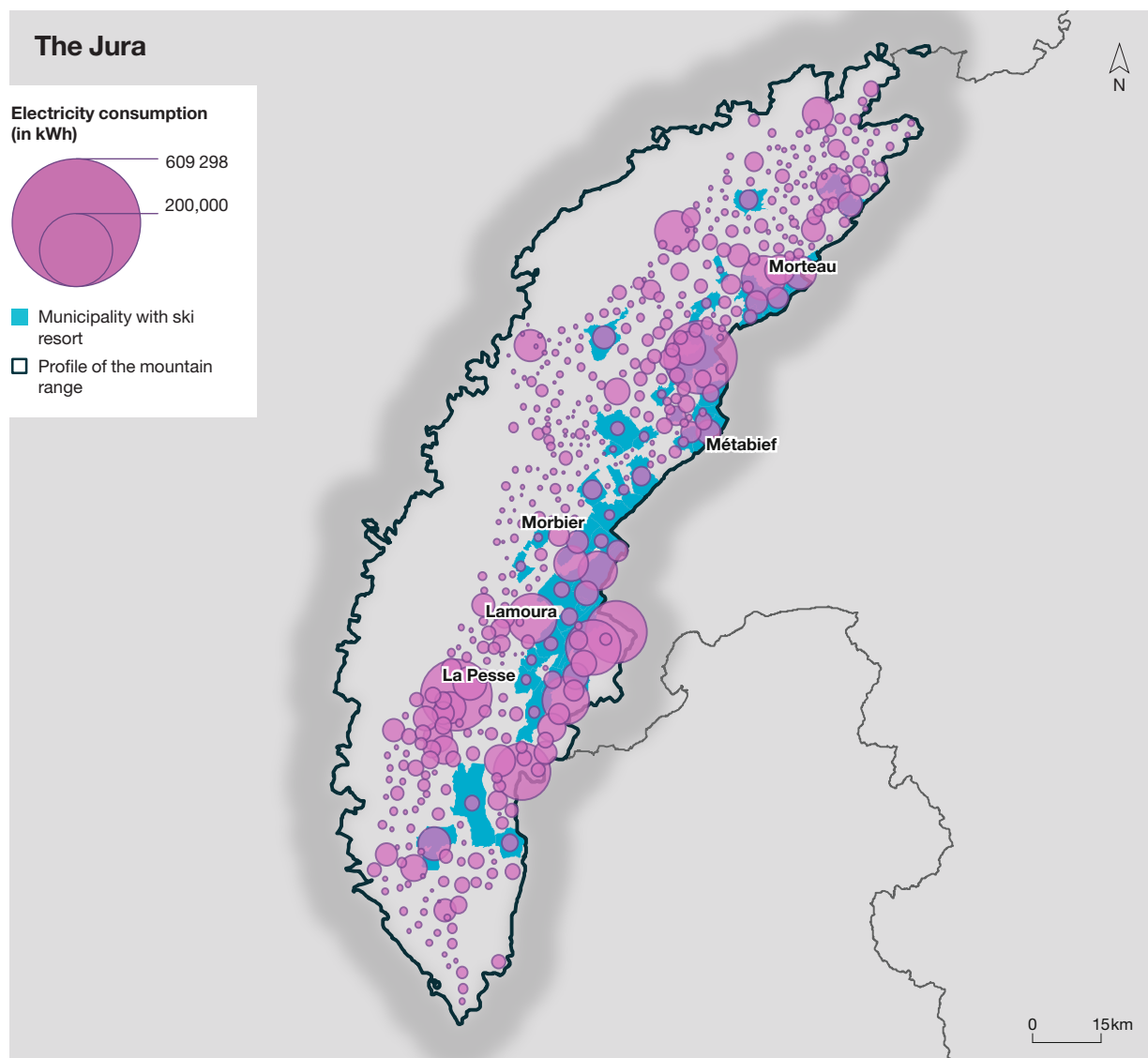
In kWh



Note: break in the series in 2005.

Sources: CGET; STRMTG, Cairn. Processing: SDES

Map 42: electricity consumption in the residential and service sectors in municipalities in the Jura in 2016



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Electricity consumption in the residential and service sectors

The residential sector corresponds to household electricity consumption The service sector corresponds to electricity consumption for service activities (shops, tourist accommodation, catering, offices, leisure infrastructures, etc.).

Biodiversity

INTERACTION BETWEEN SKI RESORTS AND PROTECTED AREAS

70% of Jura ski resorts are located in protected areas. The overlap covers an area of more than 10,000 ha.

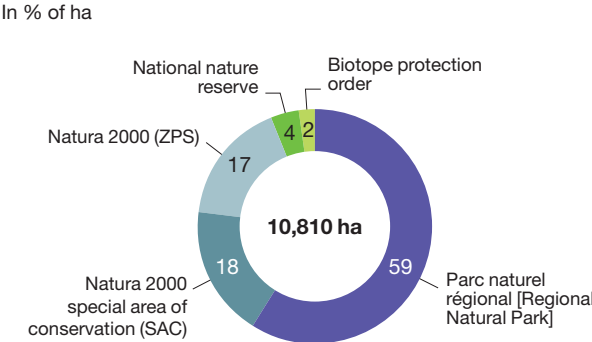
Figure 82: proportion of ski resorts overlapping protected areas in the Jura in 2017



Note: resorts of which the land area covered could not be calculated are not included.
Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/bases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

In terms of surface area, the Haut Jura regional nature park and Natura 2000 sites are the main protected areas affected by overlap with ski resorts.

Figure 83: protected areas overlapping ski resorts in the Jura in 2017 by type of protection

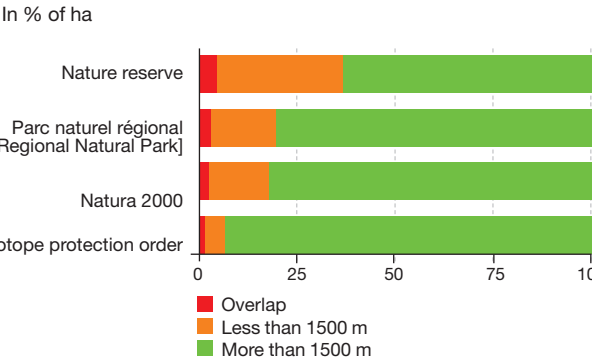


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/bases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

However, in relation to the total area of overlap or close proximity with ski resorts, small-sized protected areas that are strictly protected are the first to be affected by interaction with ski resorts.

With more than one third of their area intersecting or less than 1500 m from a ski resort, nature reserves are particularly affected.

Figure 84: distribution of the surface area of protected areas located less than 1500 m from a ski resort in the Jura in 2017 in relation to their distance from the resort

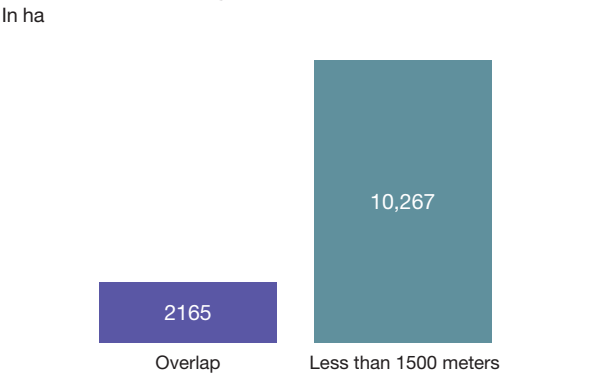


Highlights: 4% of the area of nature reserves located less than 1500 meters from a ski resort overlaps with a resort.
Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/bases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

INTERACTION BETWEEN SKI RESORTS AND REMARKABLE NATURAL SITES: CASE OF TYPE 1 ZNIEFF (NATURAL AREAS OF ECOLOGICAL, FLORA AND FAUNA INTEREST)

In 2017, more than 12,000 ha of ZNIEFF areas were located less than 1500 m from a Jura ski resort, with an overlap of 17% of their area.

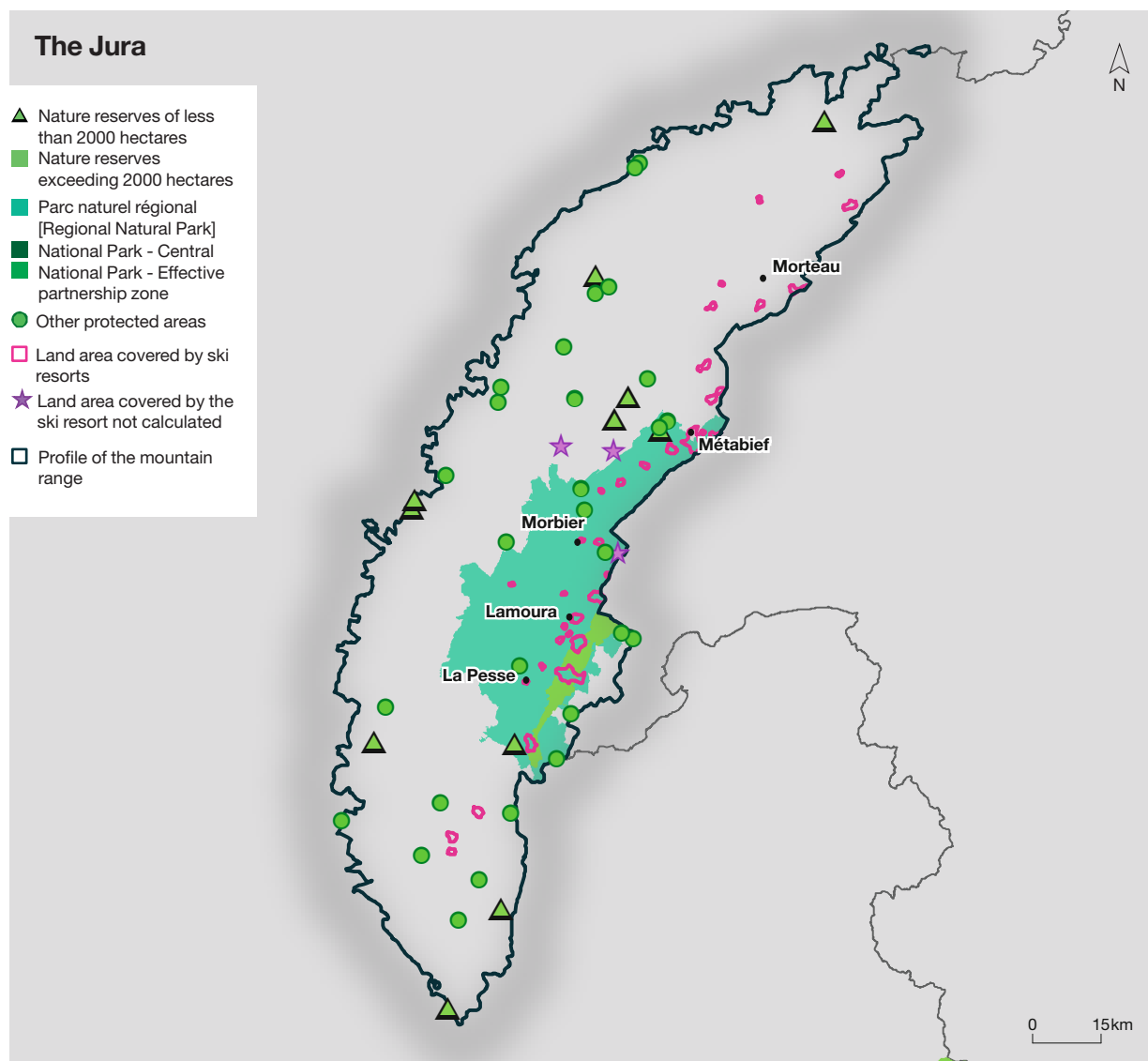
Figure 85: surface area covered by type 1 ZNIEFF areas in the Jura in the vicinity of a ski resort in 2017



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (March 2017 update). Processing: SDES

part 4: The Jura

Map 43: interaction between ski resorts and protected areas (excluding Natura 2000 sites) in the Jura in 2017

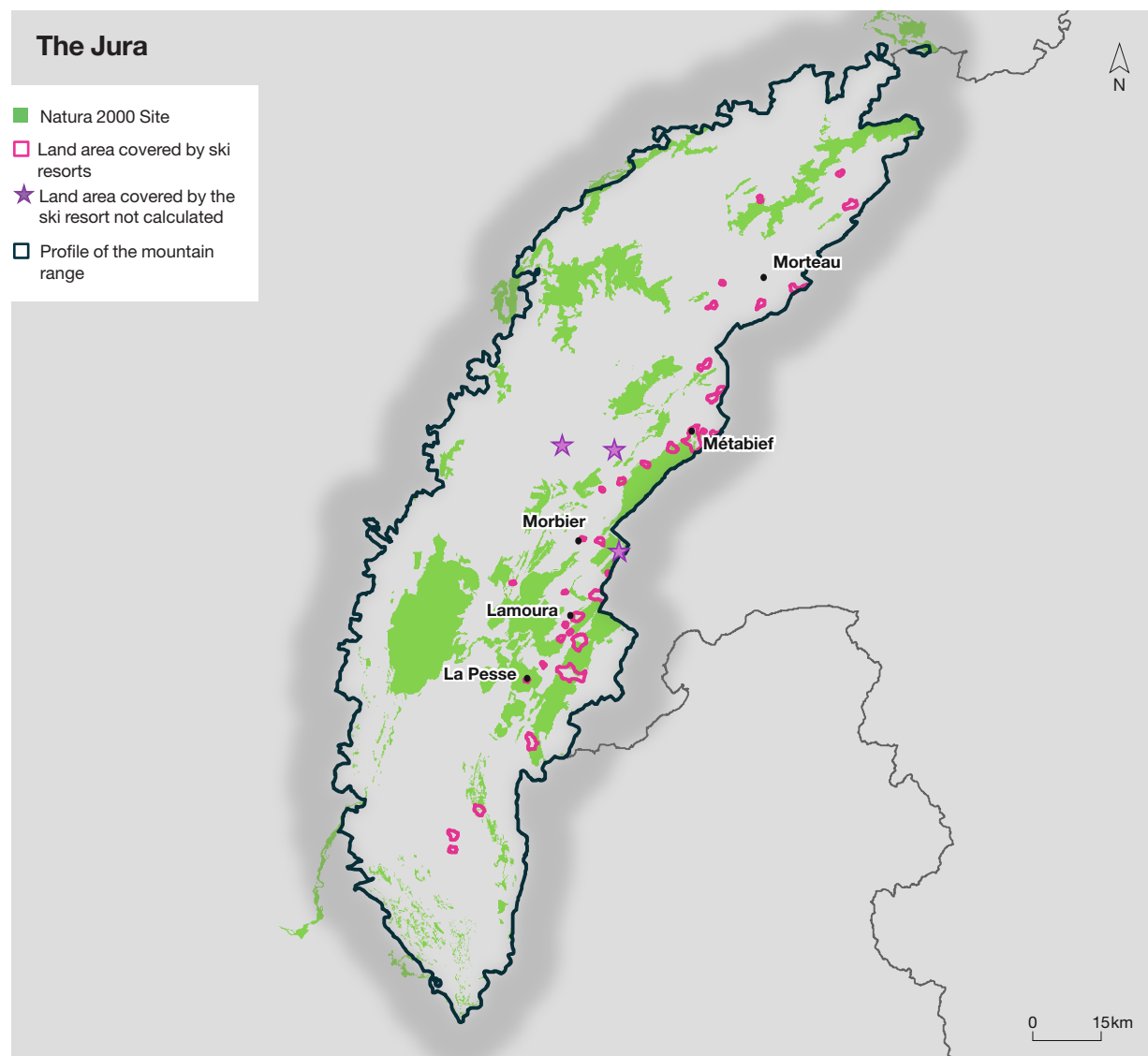


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "protected areas" (February 2017 update). Processing: SDES

Protected areas (excluding Natura 2000)

The protected areas taken into account (excluding Natura 2000 sites to improve readability) include regulatory provisions referred to as strict protection systems based on prohibiting or limiting certain human activities (central areas of national parks, national nature reserves, regional nature reserves, prefectural biotope protection orders, biological reserves, national hunting and wildlife reserves). They also include contractual management arrangements (national park partnership zones, regional nature parks). The latter are less strict than regulatory provisions. They combine natural heritage conservation and local development and are based on voluntary partnership on the part of local communities.

Map 44: interaction between ski resorts and protected areas (Natura 2000 sites) in the Jura in 2017

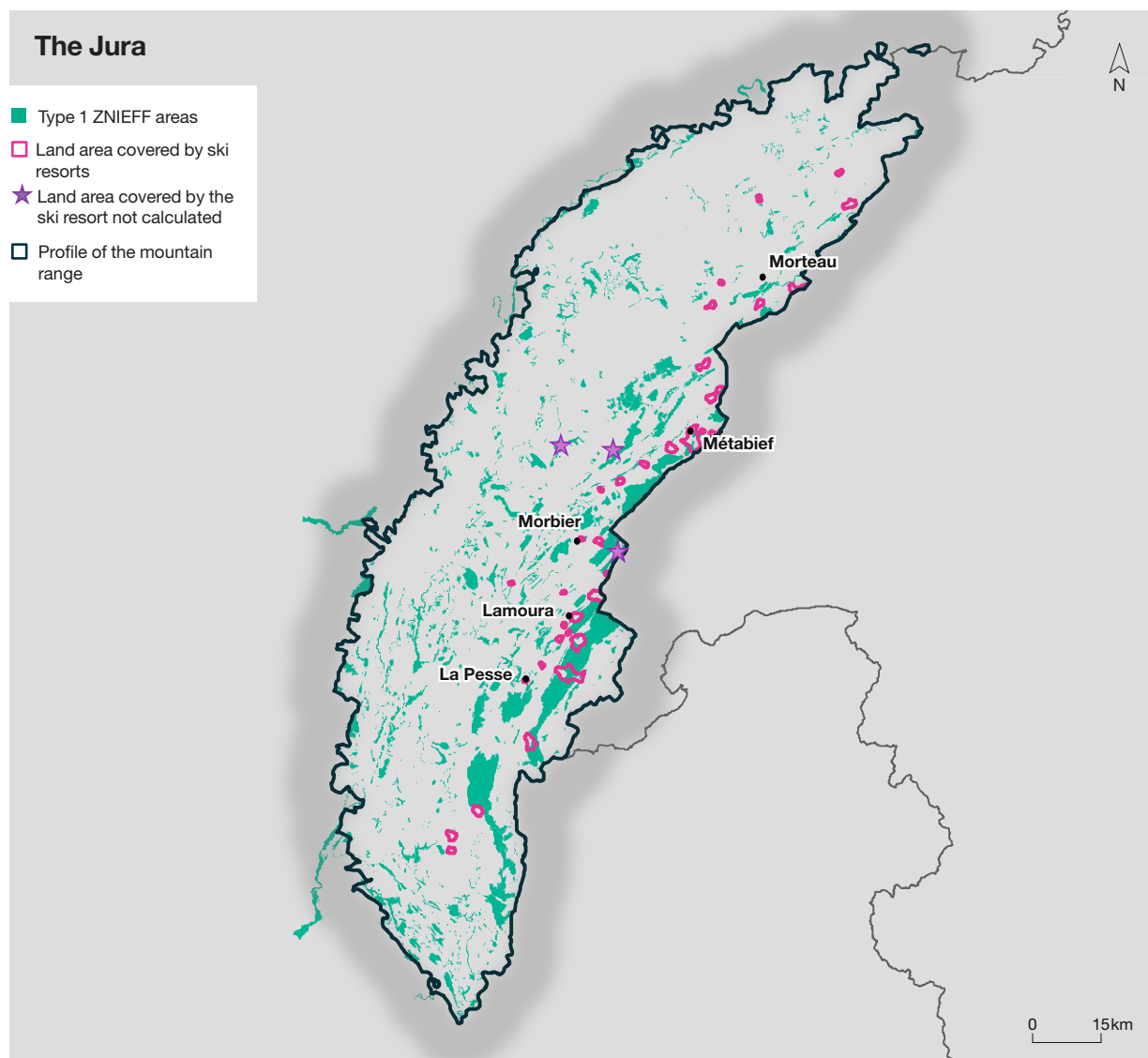


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Natura 2000" (December 2017 update). Processing: SDES

Protected areas: Natura 2000 sites

The Natura 2000 network is a European-level conservation system: it includes special protected areas (SPA) under the "Birds" directive and special areas of conservation (SAC). The purpose of the latter is to conserve habitats and animal species (excluding birds) and plant species of community interest under the "Habitats, Fauna and Flora" Directive.

Map 45: interaction between ski resorts and type 1 ZNIEFF areas in the Jura in 2017



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (March 2017 update). Processing: SDES

Type 1 ZNIEFF areas

The purpose of the list of natural areas of ecological, fauna and flora interest (ZNIEFF) is to identify remarkable natural or semi-natural environments in France that have high biological capacity and are in a good state of conservation. This knowledge tool, which does not in itself provide protection for these areas, indicates a wealth of biodiversity in the area concerned.

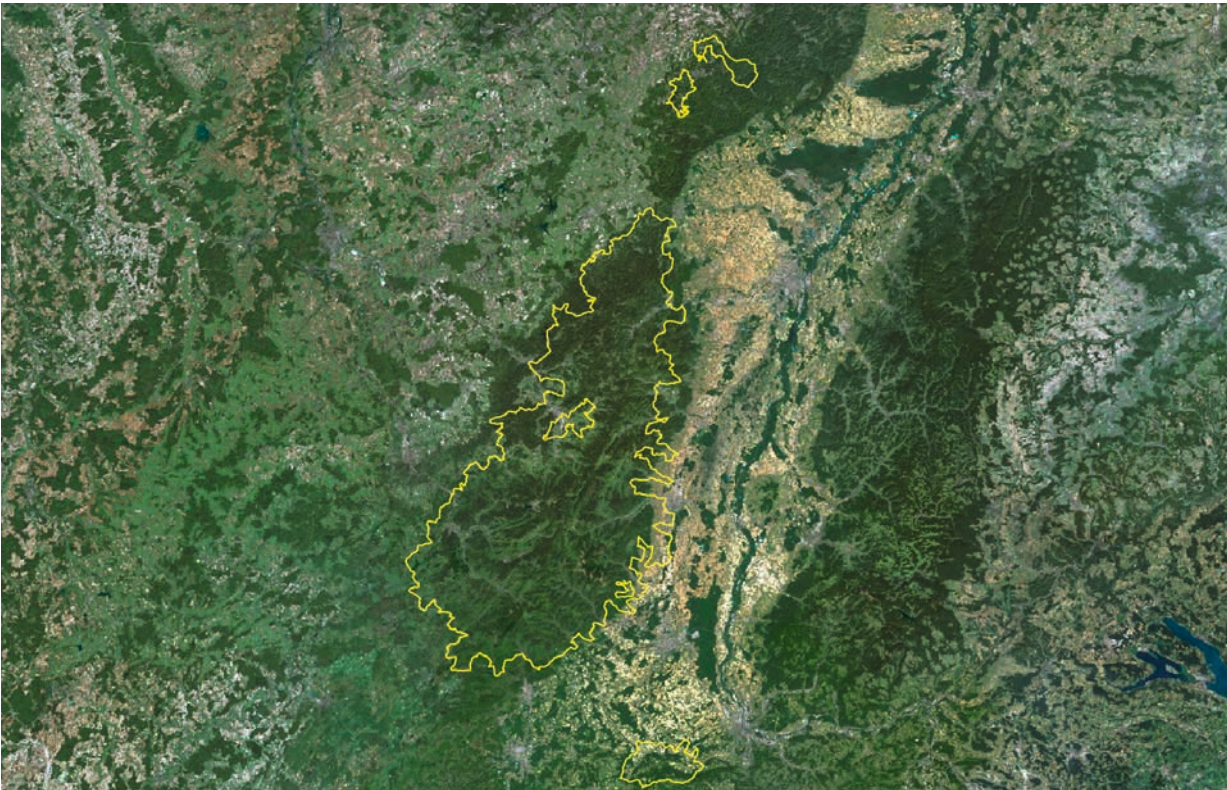
Type 1 ZNIEFF areas are sectors of major biological or ecological interest defined by the presence of species and environments that are rare, remarkable or characteristic of the national or regional natural heritage.

part 5

The Vosges



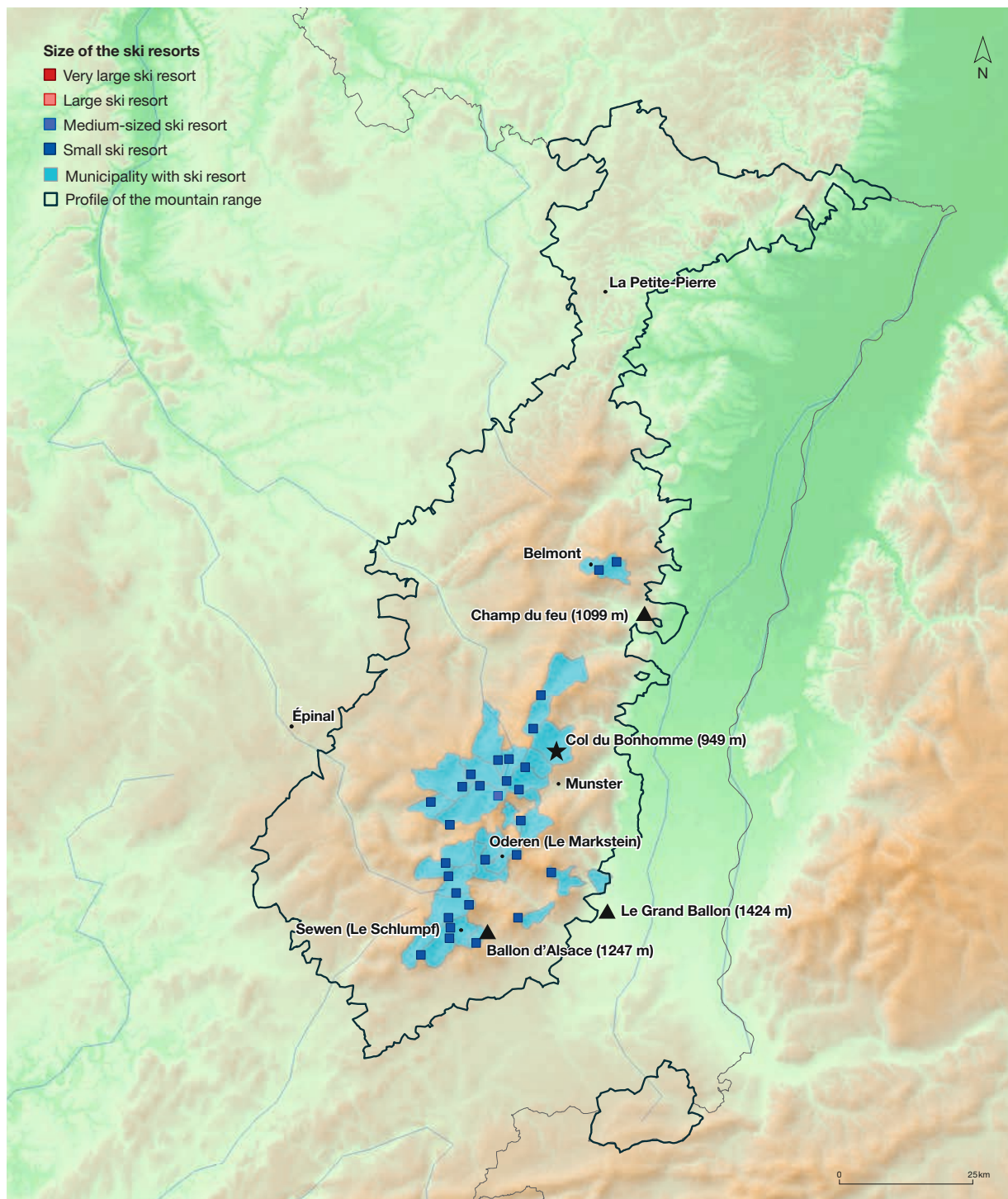
Characteristics of the mountain area



Aerial view of the Vosges

AREA	POPULATION	ALTITUDE
445,451 ha	351,190 inhabitants	Average altitude of the municipalities: 584 m
305 municipalities (1460 ha/municipality on average)	1151 inhabitants/ municipality on average	Average altitude of the highest municipality: 1007 m
	79 inhabitants/km ²	

Map 46: ski resorts and municipalities with ski resorts in the Vosges in 2017



Note: municipalities are classified according to the sum of the vertical transport feet per hour (VTF/H) ratings of their operational cable cars and ski lifts. They are divided into four groups: small resorts (VTF/H < 2500 km.skiers/h), medium-sized resorts (VTF/H between 2500 and 6000 km.skiers/h), large resorts (VTF/H between 6000 and 15,000 km.skiers/h) and very large resorts (VTF/H > 15,000 km.skiers/h).

Sources: BDTOP®; CGET; ©OpenStreetMap; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

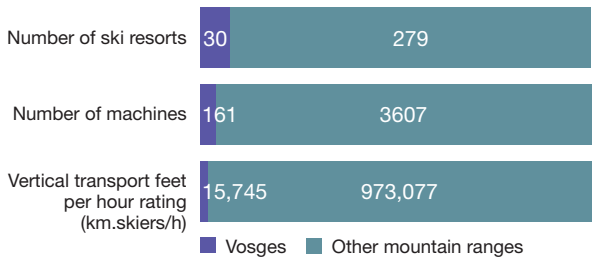
Ski resorts and municipalities with ski resorts

SKI RESORTS

The Vosges have 30 ski resorts in total, accounting for 10% of resorts located in France.

These resorts include 161 cable cars/ski lifts and have a vertical transport feet per hour rating of almost 16,000 km.skiers/h.

Figure 86: characteristics of ski resorts in the Vosges in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

The land area covered by ski resorts in the Vosges is estimated at about 14,000 ha, i.e. 3.2% of the mountain area.

Ski resorts in the Vosges are mainly small with a low vertical transport feet per hour rating. Their average area is 484 ha per ski resort.

Figure 87: land area covered by ski resorts in the Vosges in 2017

Land area covered by ski resorts	14,037 ha
Average area of ski resorts	484 ha
Proportion of the mountain area	3.2 %

Note: owing to a lack of data, the area covered by one resort could not be estimated.
Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

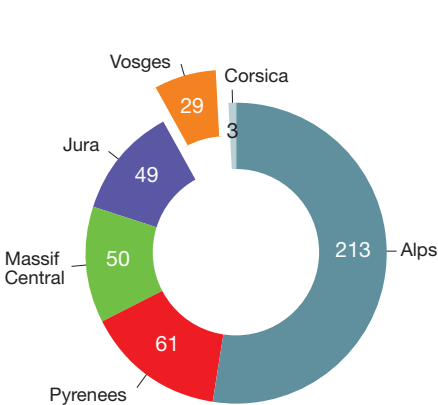
MUNICIPALITIES WITH SKI RESORTS

Municipalities with ski resorts have at least one cable car/ski lift line or one cross-country skiing facility.

A total of 29 municipalities have ski resorts in the Vosges. This accounts for 7% of all municipalities with ski resorts.

Figure 88: distribution of municipalities with ski resorts in 2017 for each mountain range

By number of municipalities with ski resorts

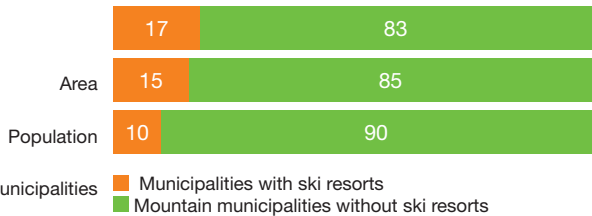


Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Municipalities with ski resorts occupy a substantial area of the Vosges. They extend over an area of almost 76,000 hectares, i.e. 17% of the mountain area. They account for 10% of mountain municipalities in the Vosges and 15% of the population lives there all the year round.

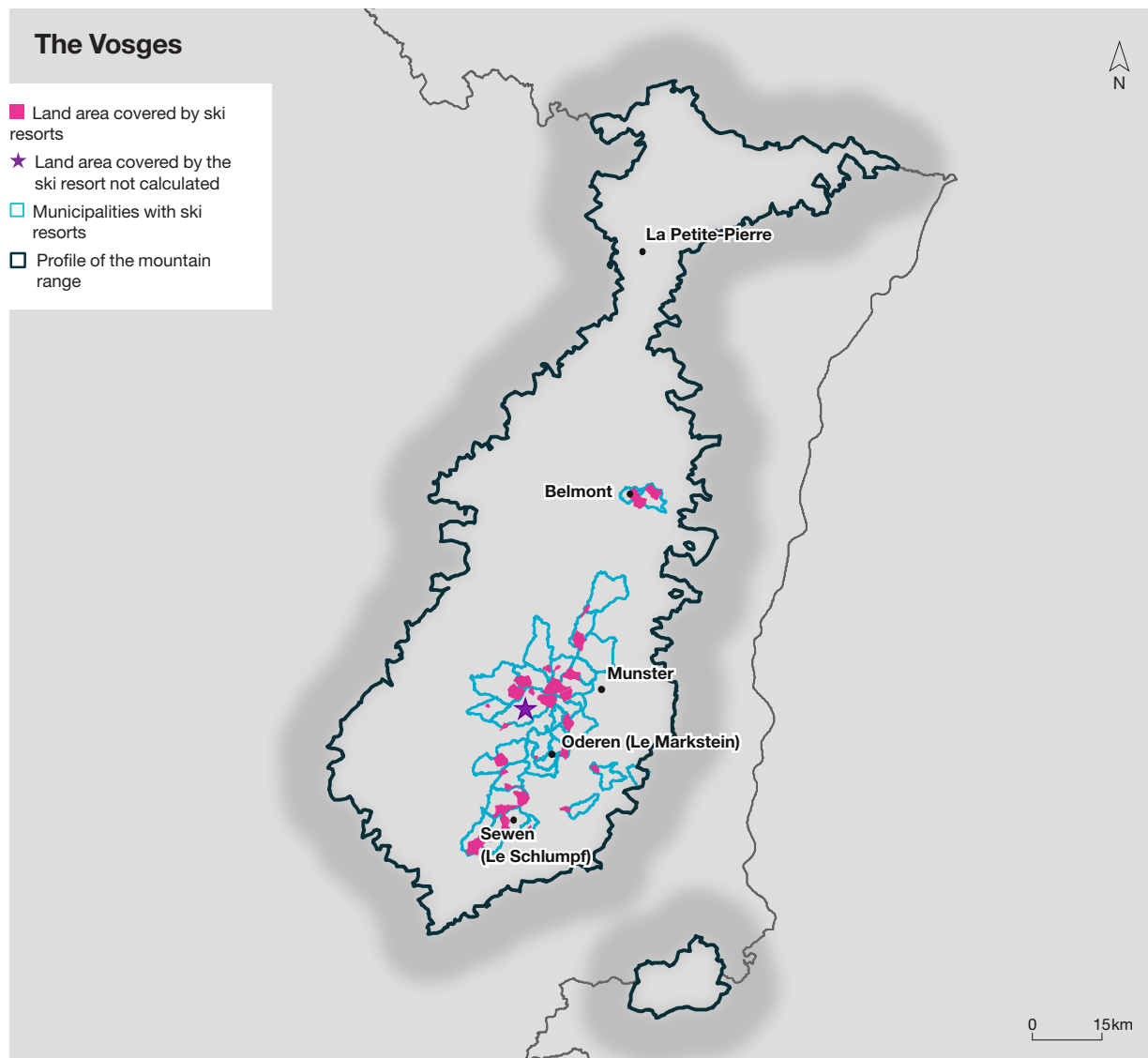
Figure 89: space occupied by municipalities with ski resorts in the Vosges mountain area in 2017

In %



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Map 47: municipalities with ski resorts and land area covered by ski resorts in the Vosges in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

Land area covered by ski resorts

The land area covered by resorts is the estimated surface area of the ski resorts. Their profile was calculated on the basis of the area covered by geo-localized cable cars and ski lifts and from the location of surrounding tourist accommodation facilities and buildings in the ski resort.

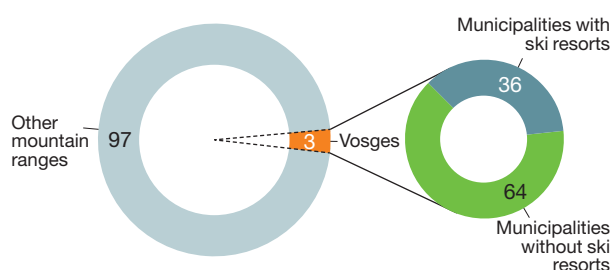
Tourism

ACCOMMODATION CAPACITY AND TOURIST NUMBERS

With almost 164,000 beds in 2017, the Vosges mountain area accounts for 3% of overall mountain tourist accommodation capacity.

A little more than one third of these tourist beds are located in municipalities with ski resorts. Most tourist beds in the Vosges are located outside municipalities with ski resorts and they are more evenly distributed throughout the region.

Figure 90: tourist accommodation capacity of mountain municipalities in the Vosges in 2017
In %

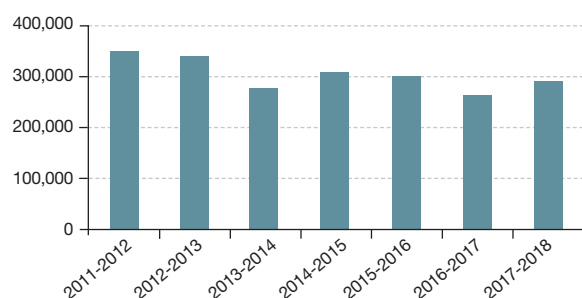


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

During the 2017-18 season, municipalities with winter sports resorts in the Vosges registered almost 290,000 overnight stays, i.e. 2% of the total number of overnight stays in the mountains in winter. Over the last seven seasons, the number of overnight stays has diminished substantially (by 17%) overall, but with annual fluctuations.

Figure 91: trends in the number of overnight winter tourism stays in municipalities with winter sports resorts in the Vosges

Number of overnight stays



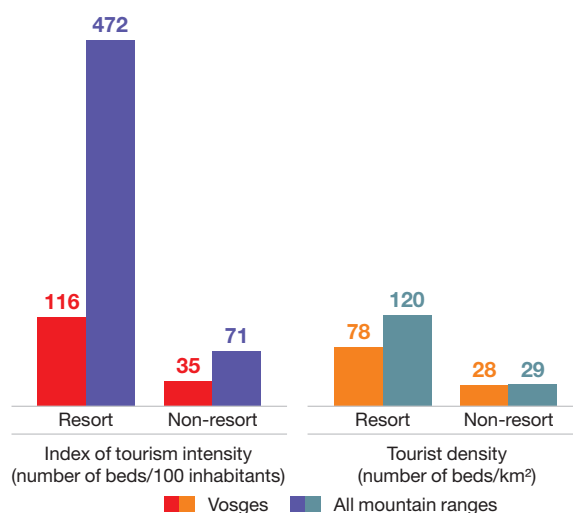
Note: municipalities with winter sports resorts defined by Insee as having ski equipment among their permanent facilities or classified as "tourist municipalities" by the Tourism Code.
Source: Insee-CRT-DGE, surveys on the number of stays in tourist accommodation

PRESSURE FROM TOURISM

In the Vosges, variations in population associated with tourism, expressed by the index of tourism intensity, are substantially lower than average for mountain municipalities in all of the mountain ranges as a whole.

However, these variations are significantly greater in municipalities with ski resorts than in the rest of the mountain area, as the population can at least double in the tourist season.

Figure 92: index of tourism intensity and tourist density in mountain municipalities in the Vosges in 2017



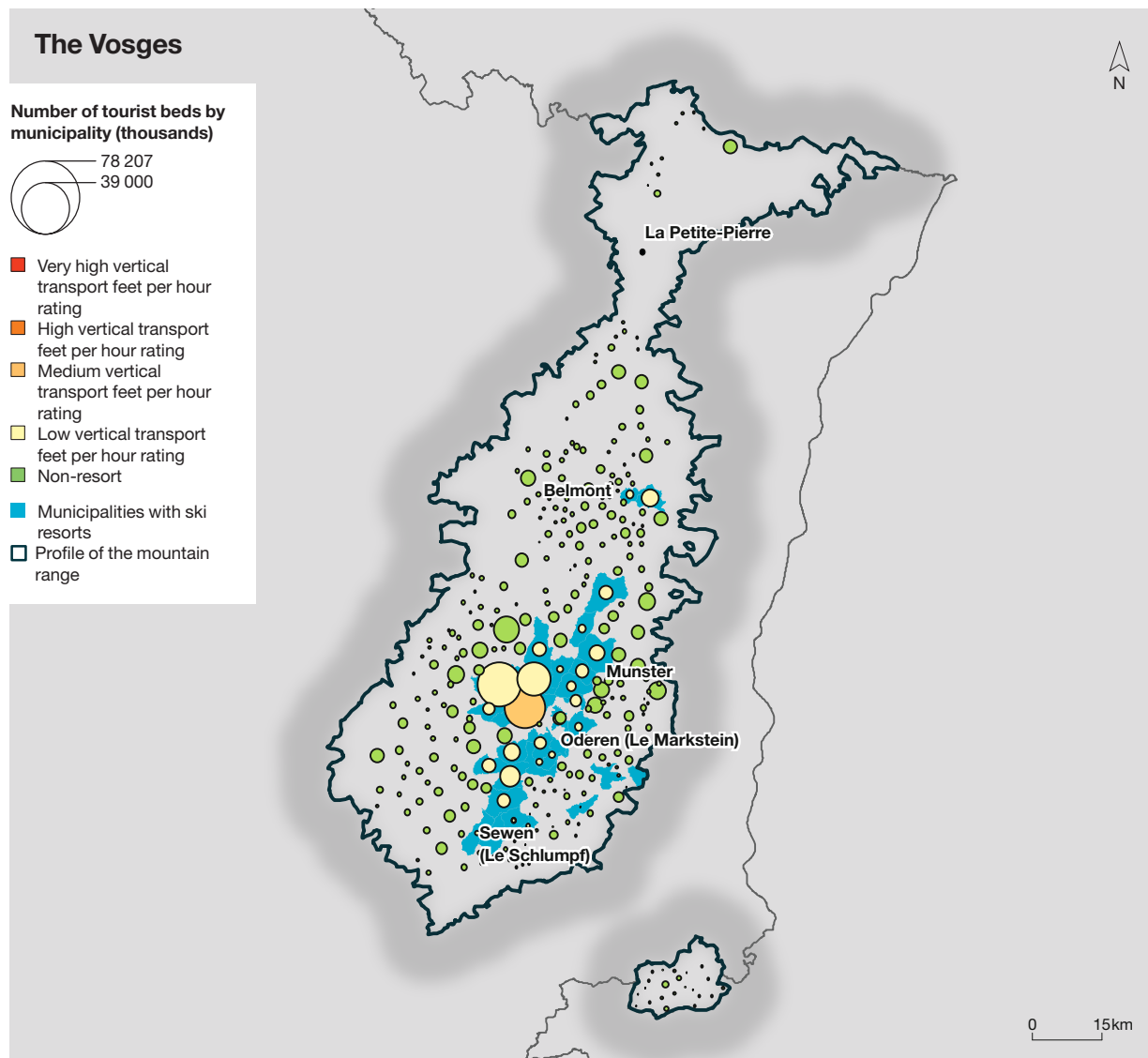
Highlights: on average, municipalities with ski resorts in the Vosges have an index of tourism intensity of 116 beds per 100 inhabitants and a tourist density of 78 beds per km².

Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP ; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

With 78 beds per km² on average, tourist density is almost three times higher in municipalities with ski resorts in the Vosges than in other mountain municipalities in the mountain range.

Tourist density, however, is still lower than the average for municipalities with ski resorts.

Map 48: tourist accommodation capacity of mountain municipalities in the Vosges in 2017

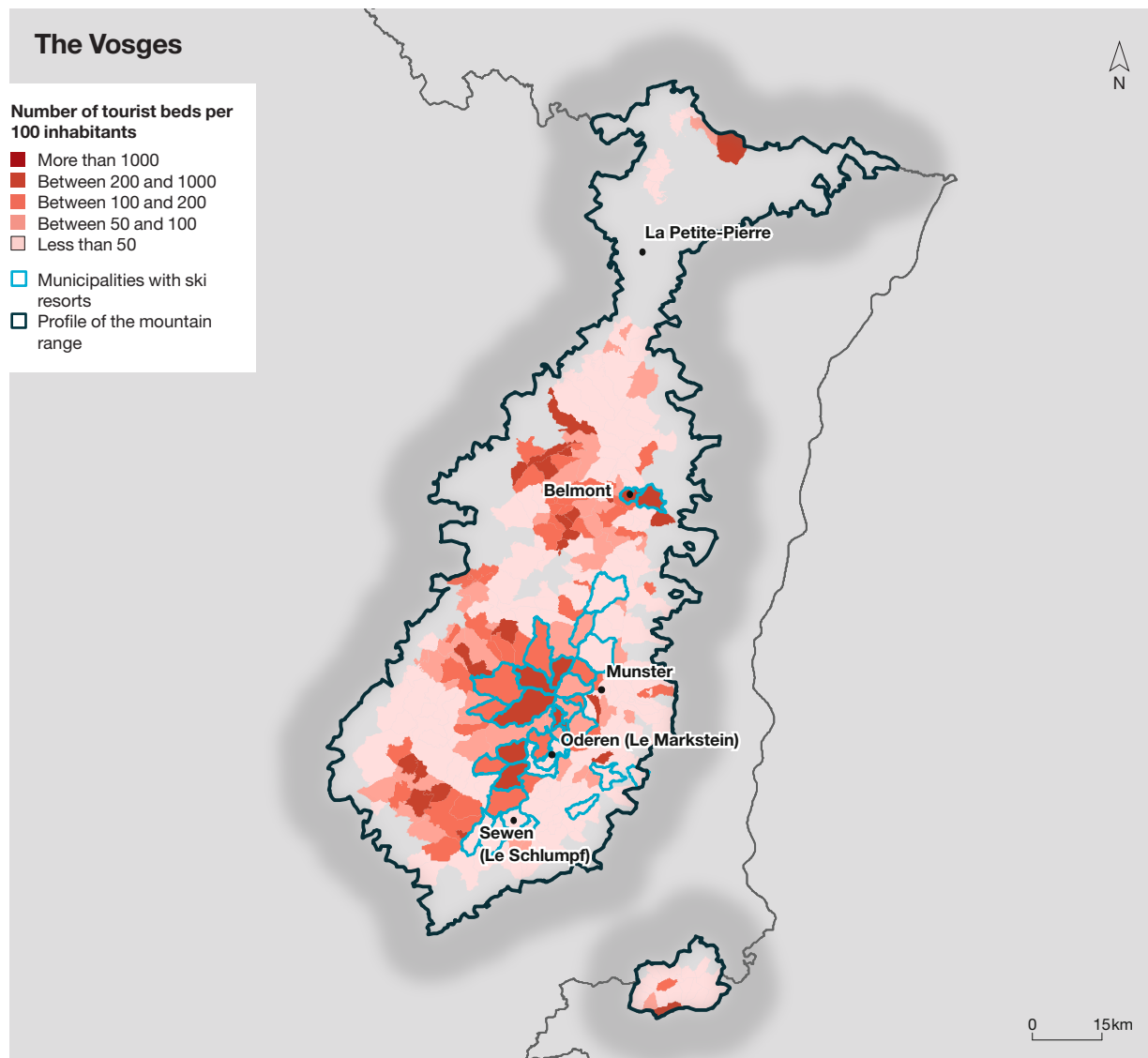


Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Tourist accommodation capacity

Tourist accommodation capacity defines the number of tourist beds located in a municipality. This indicator includes tourist beds in paid accommodation facilities (hotels, camping sites, holiday residences, holiday villages, youth hostels, sports centers, etc.) and in non-paid accommodation facilities (second homes). Private tourist accommodation (Airbnb type) is not taken into consideration. The ratios defined by Insee have been used to estimate the number of tourist beds for hotels (two beds per room), camping sites (three beds per camping pitch) and second homes (five beds per second home).

Map 49: index of tourism intensity in mountain municipalities in the Vosges in 2017

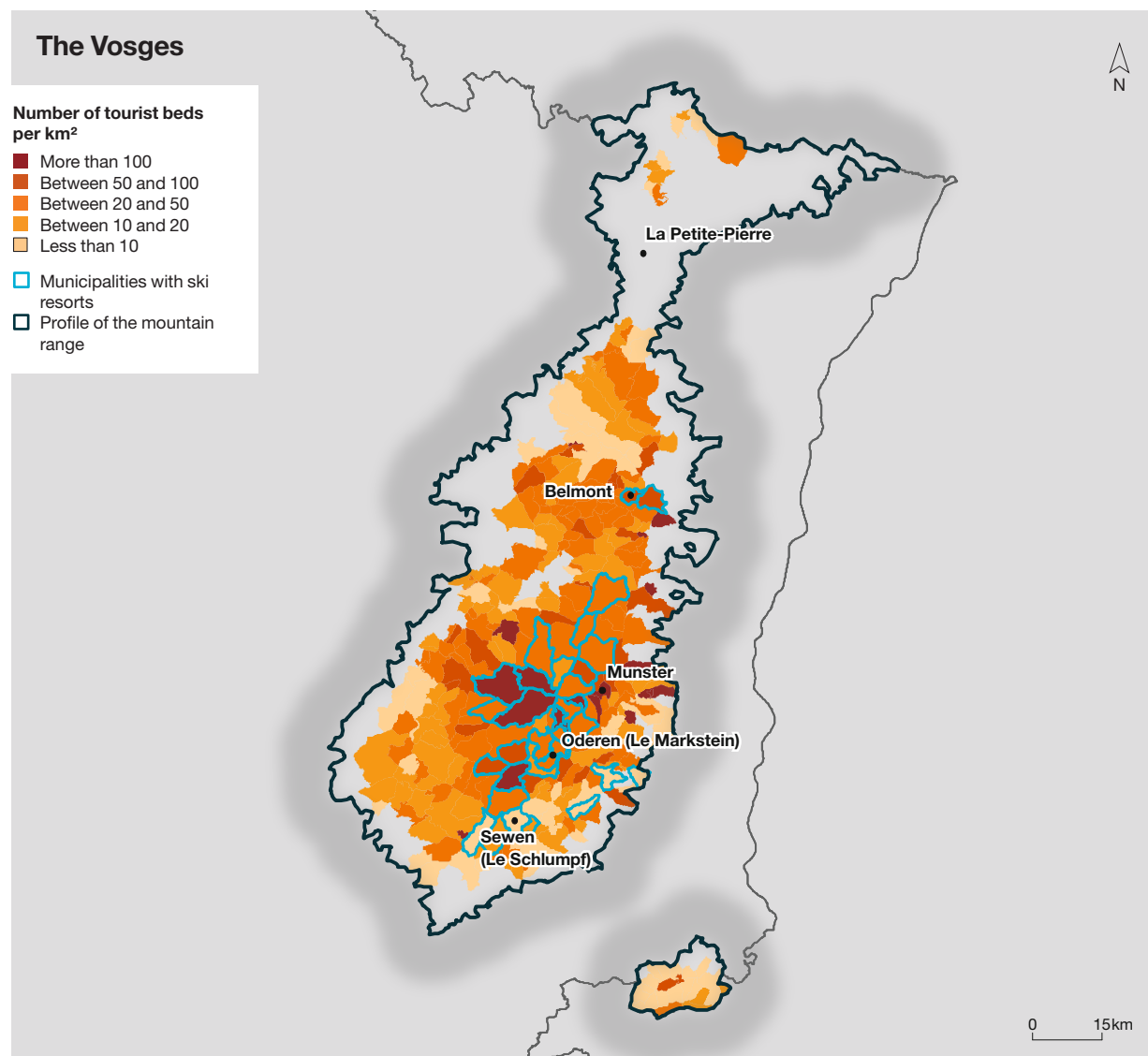


Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Index of tourism intensity

The index of tourism intensity is an indicator of tourist pressure or tourist intensity. This is the ratio of the number of tourist beds in a given area to its resident population. This indicator expresses the theoretical capacity of an area to increase its population in terms of accommodating tourists. An index equal to 100 means that the area has a tourist accommodation capacity equivalent to its permanent population and could therefore double its population.

Map 50: tourist density in mountain municipalities in the Vosges in 2017



Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Tourist density

Tourist density is the ratio between the number of tourist beds in a given area and its surface area. This indicator is used to estimate the spatial concentration of tourist accommodation in a given area.

Land use

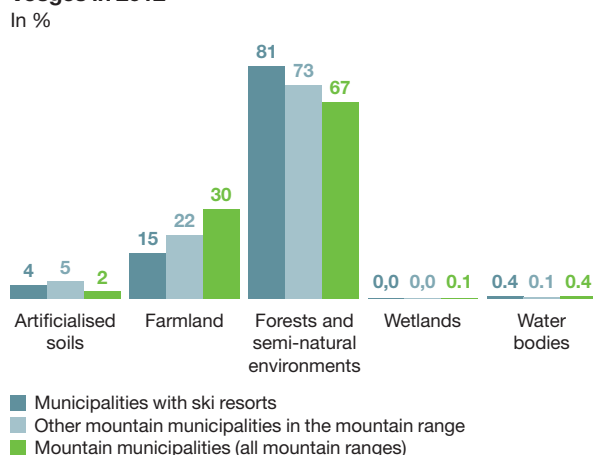
LAND USE

Vosges mountain municipalities are mainly composed of forests and grassland in higher proportions than in other mountain ranges, particularly in municipalities with ski resorts.

On the other hand, the proportion of agricultural land is lower than that of all mountain ranges.

The proportion of developed land (5% outside ski resorts, 4% in municipalities with ski resorts) is substantially higher than for all mountain municipalities as a whole and is close to the national average (6%).

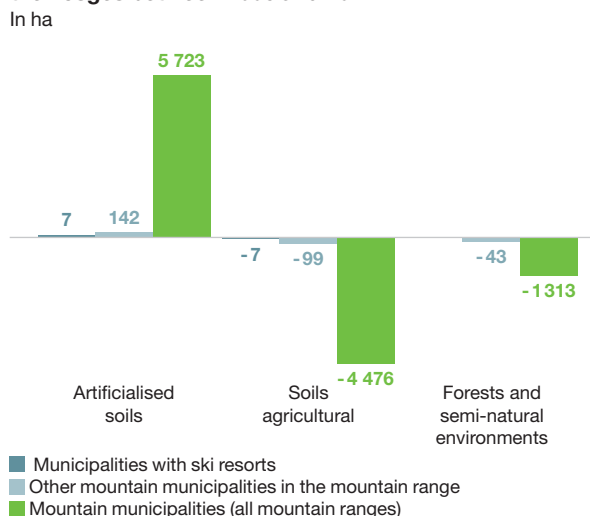
Figure 93: land use in mountain municipalities in the Vosges in 2012
In %



Highlights: on average, 15% of the area of municipalities with ski resorts in the Vosges consisted of agricultural land in 2012.
Sources: CGET; Ministry of Sport, RES; EU-SDES, CORINE Land Cover; STRMTG, Cairn. Processing: SDES

Changes in land use in the Vosges are less marked than in other mountain ranges. Land use has remained largely unchanged overall over the period studied, both in municipalities with ski resorts and in the rest of the mountain area.

Figure 94: trends in land use in mountain municipalities in the Vosges between 2006 and 2012
In ha



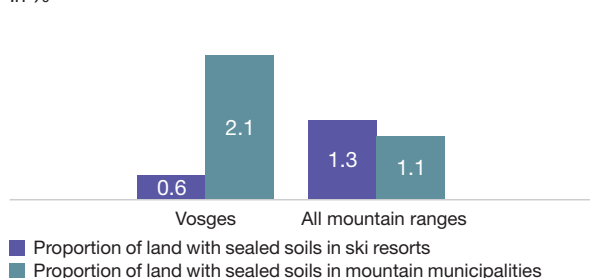
Highlights: between 2006 and 2012, the area of developed land increased by 7 ha in municipalities with ski resorts in the Vosges, while 7 ha of agricultural land disappeared.
Sources: CGET; Ministry of Sport, RES; EU-SDES, CORINE Land Cover; STRMTG, Cairn. Processing: SDES

SOIL SEALING

The proportion of areas with sealed soils in the Vosges mountain area is almost twice the average for mountain municipalities in France. The proportion of land with sealed soils also exceeds the national average (1.3%).

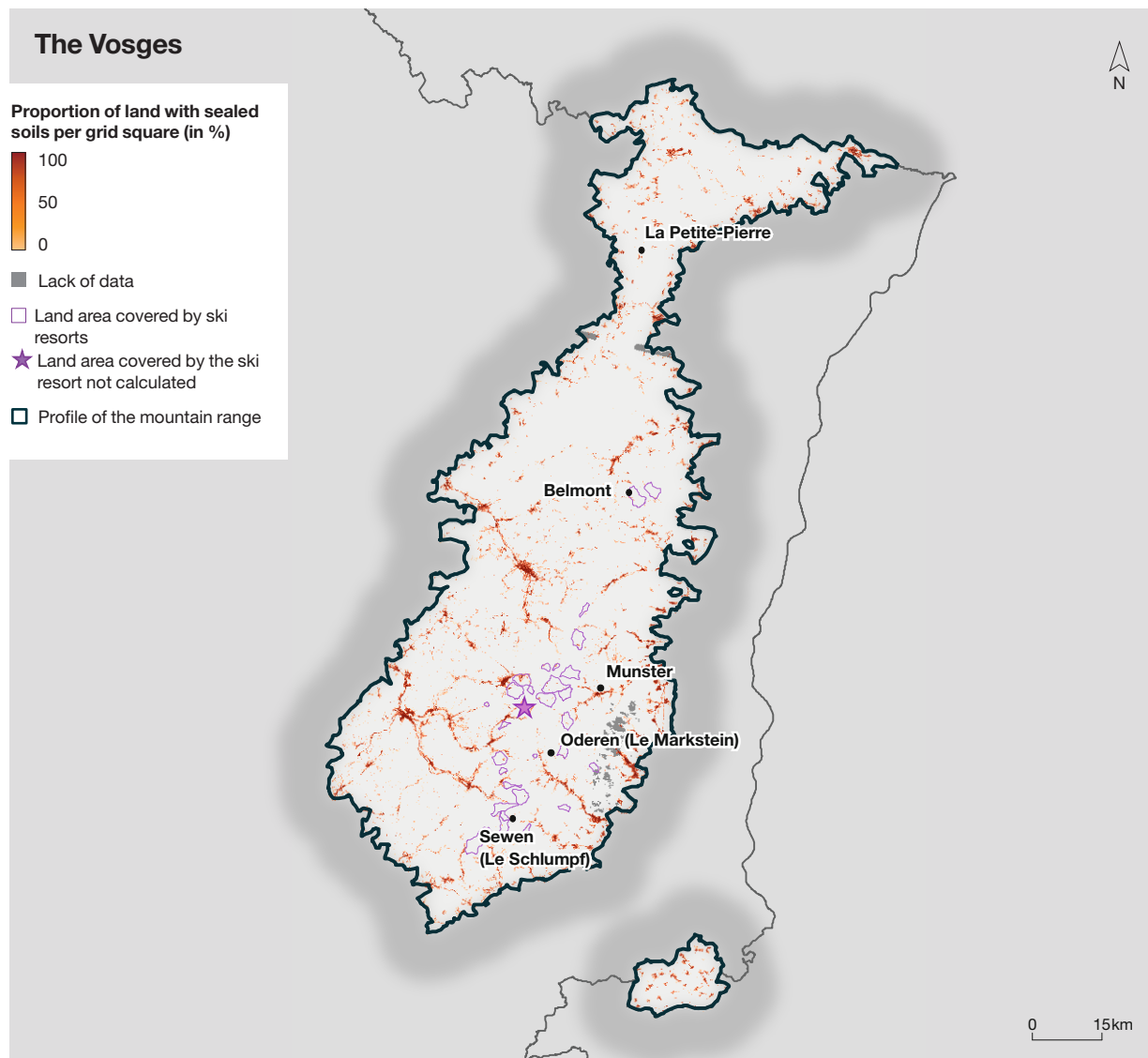
This situation is in sharp contrast with ski resorts, where the proportion of areas with sealed soils is substantially lower, both in comparison with other municipalities in the mountain range, but also in comparison with other ski resorts in France.

Figure 95: proportion of areas with sealed soils in ski resorts and mountain municipalities in the Vosges in 2012
In %



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Map 51: proportion of areas with sealed soils in ski resorts and mountain municipalities in the Vosges in 2012



Note: the "high-resolution" layer that was used maps the percentage of sealed soils in pixels measuring 20 m x 20 m.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Soil sealing

Soil sealing is defined as permanent coverage of the ground with a material that is impermeable to water and air. This can be the result of the construction of roads, buildings or car parks. Sealed soils irreversibly lose their ecological functions, particularly in terms of water storage, and thus notably create the risk of mudslides and water run-off that could lead to flooding.

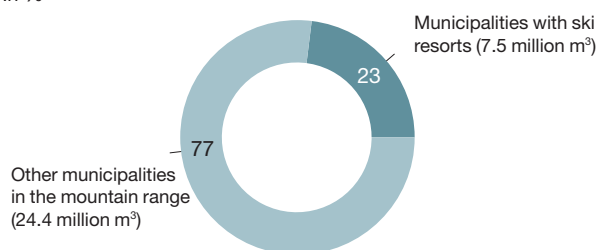
Drinking water

VOLUMES OF FRESH WATER ABSTRACTED FOR DRINKING WATER SUPPLIES IN THE REGION

Almost a quarter of water volumes in the Vosges abstracted for drinking water supplies comes from municipalities with ski resorts. This accounts for more than 7.5 million m³.

Figure 96: volumes of fresh water abstracted for the drinking water supply in mountain municipalities in the Vosges in 2015

In %

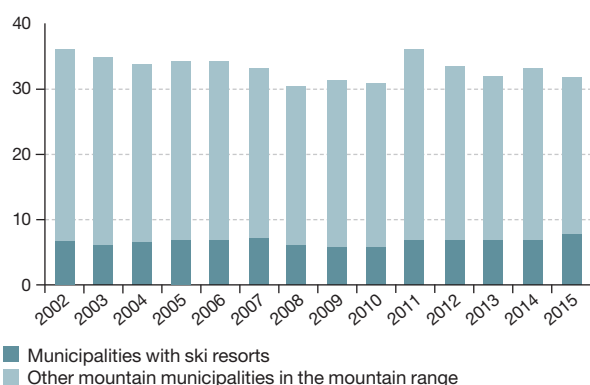


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Between 2002 and 2015, water abstraction for drinking water supplies diminished by 8% throughout the entire mountain area, despite annual fluctuations. This trend is reversed in municipalities with ski resorts where water abstraction for drinking water supplies has increased slightly (+4% for the period under observation).

Figure 97: trends in fresh water abstraction for the drinking water supply in mountain municipalities in the Vosges

In millions of m³



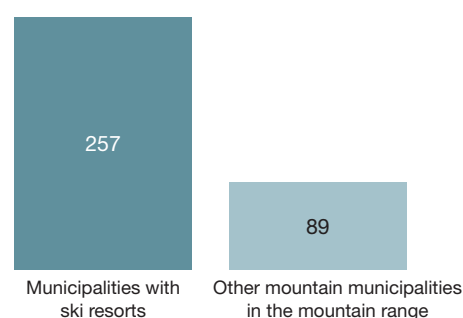
Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

WATER ABSTRACTED FOR DRINKING WATER IN RELATION TO THE MUNICIPALITIES AND THE POPULATION

In the Vosges, abstracted volumes in relation to the number of municipalities are almost three times higher in municipalities with ski resorts than in the other municipalities in the mountain range.

Figure 98: fresh water abstracted for drinking water supplies in the Vosges in 2015 by mountain municipality

In thousands of m³ per municipality

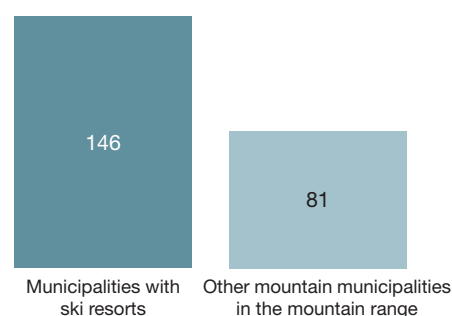


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

In relation to the number of inhabitants, there are also significant divergences between water volumes abstracted for drinking water supplies in municipalities with ski resorts and those in other mountain municipalities in the Vosges. On average, abstracted water amounts to 146 m³ in municipalities with ski resorts, versus 81 m³ in the other municipalities in this mountain range.

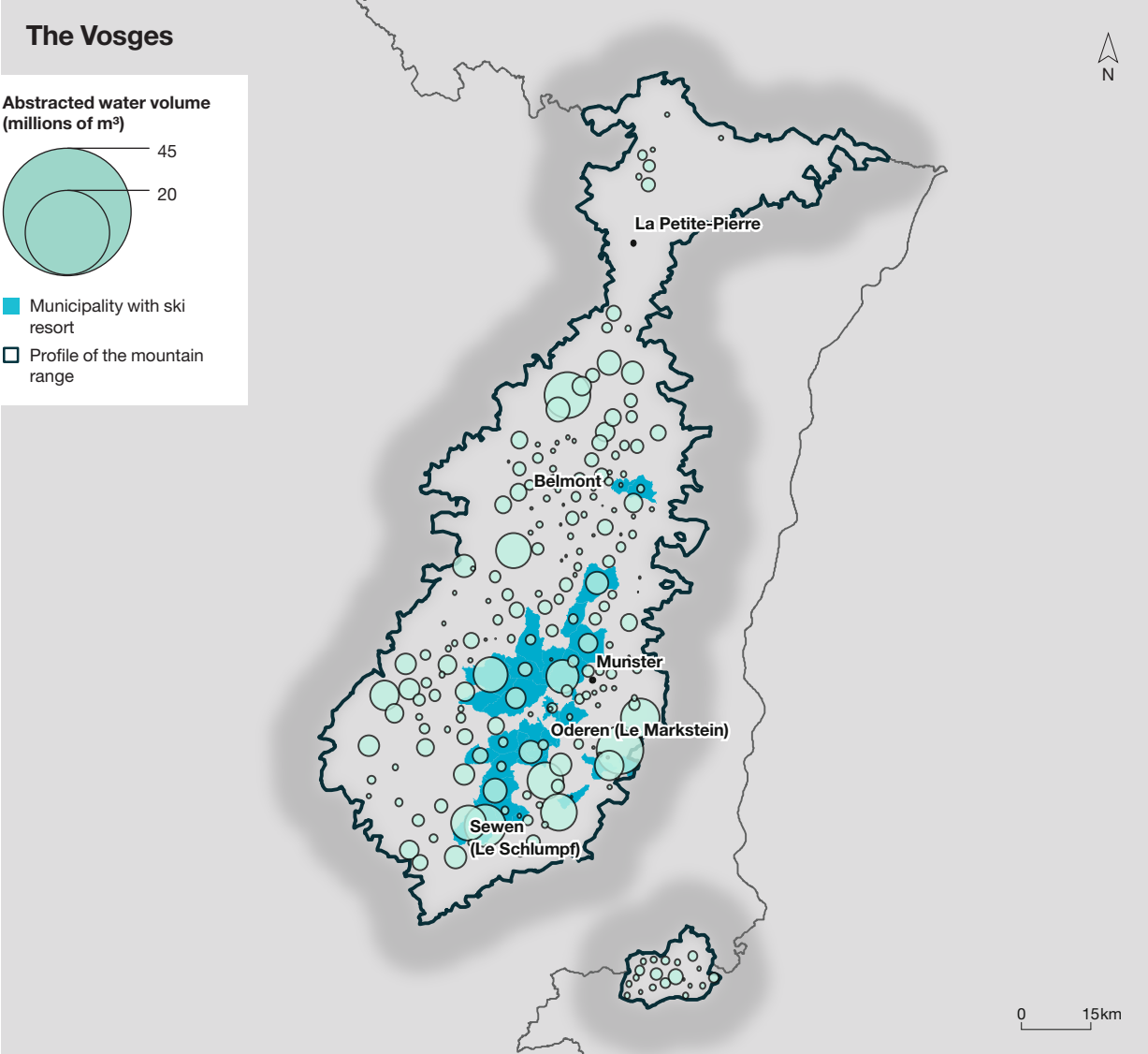
Figure 99: fresh water abstracted for drinking water supplies in the Vosges in 2015 per inhabitant

In m³ per inhabitant



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Map 52: samples of fresh water for the drinking water supply in mountain municipalities in the Vosges in 2015



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Fresh water abstracted for the drinking water supply

Fresh water abstracted for the drinking water supply is equal to the quantities of water taken for the production of drinking water. The withdrawal location is not necessarily the consumption location. Some water abstracted in a municipality may be intended for supplying adjacent areas.

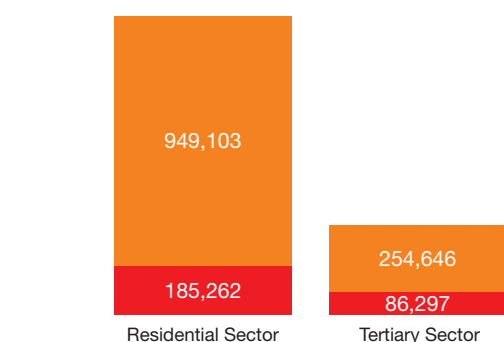
Electricity

ELECTRICITY CONSUMPTION IN MUNICIPALITIES WITH SKI RESORTS

In the Vosges, more than 20% of the electricity consumed by the residential sector and almost one third of the electricity consumed by the service sector originates from municipalities with ski resorts. In total, this account for consumption exceeding 270,000 kWh.

Figure 100: electricity consumption in the residential and service sectors in mountain municipalities in the Vosges in 2016

In kWh

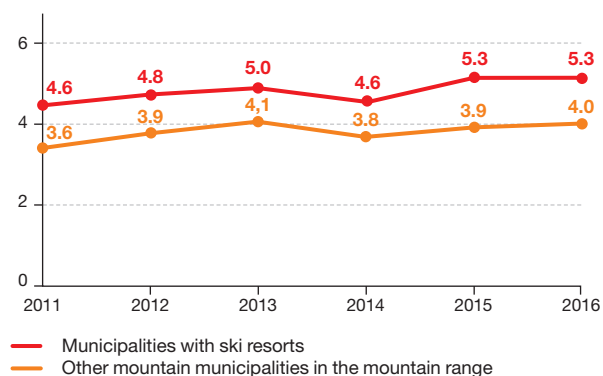


Other mountain municipalities in the mountain range
Municipalities with ski resorts

Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

Figure 101: trends in electricity consumption in the residential and service sectors in the Vosges per inhabitant

In kWh per inhabitant



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES

In relation to the number of inhabitants, accumulated electricity consumption by the residential and service sectors is higher on average in municipalities with ski resorts in the Vosges than in the other municipalities in the region.

Between 2011 and 2016, consumption also increased at a slightly higher rate in municipalities with ski resorts, with an increase of 15% as opposed to 11% in other communities in the Vosges.

ELECTRICAL POWER OF CABLE CARS AND SKI LIFTS

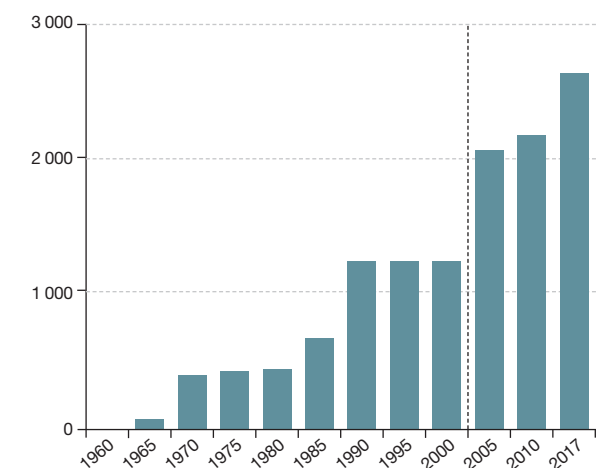
The electrical power of cable cars and ski lifts in the Vosges accounts for 0.3% of the total electrical power of such machinery located in ski resorts throughout France.

In fifty years, the electrical power of cable cars and ski lifts in the Vosges has increased substantially. The greatest increases occurred between 1970 and 1990.

Between 2005 and 2017 usable electrical power continued to increase at a rate which is still constant (+28%).

Figure 102: development of the installed electrical power rating of cable cars and ski lifts in municipalities with ski resorts in the Vosges

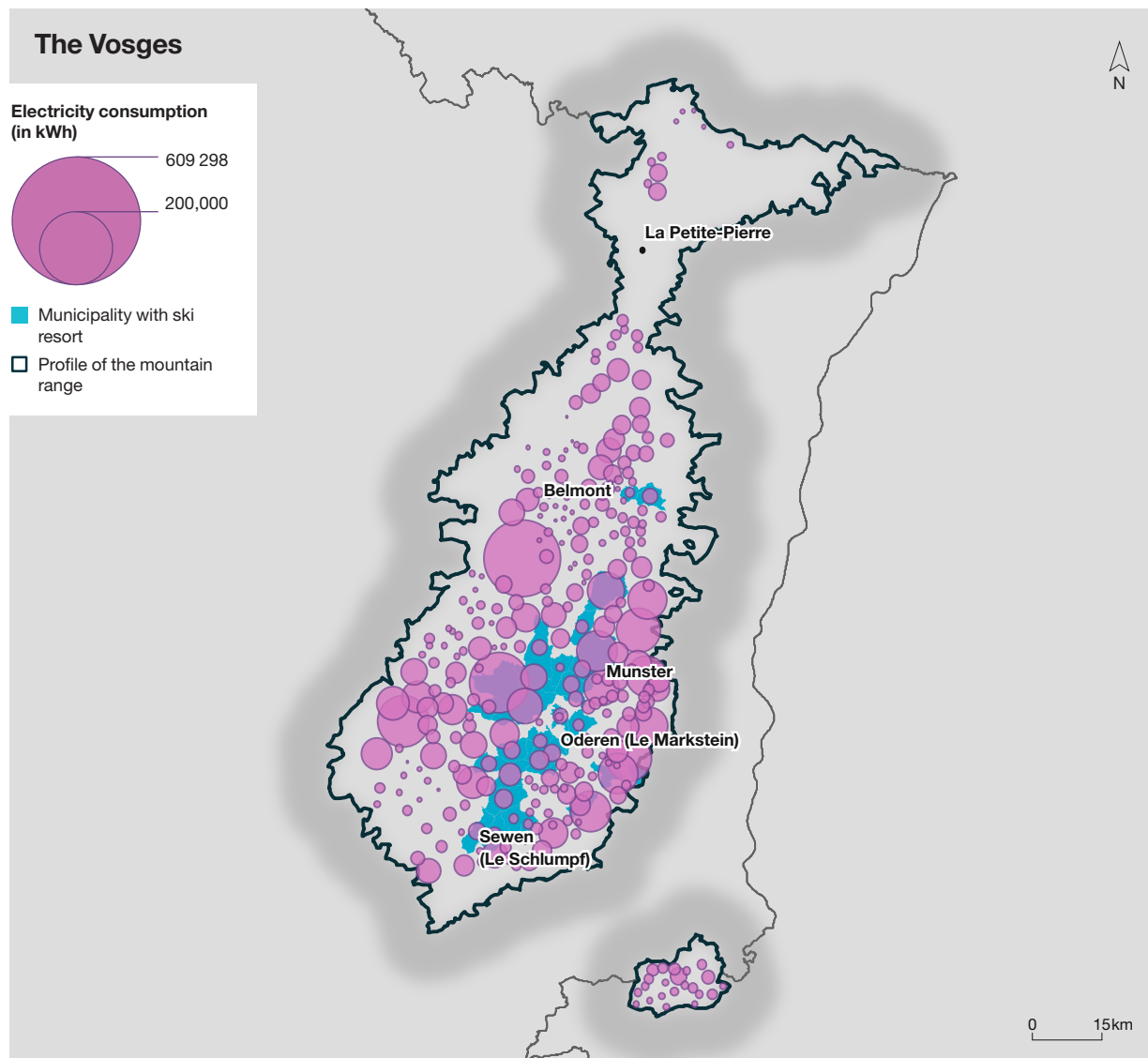
In kWh



Note: break in the series in 2005.

Sources: CGET; STRMTG, Cairn. Processing: SDES

Map 53: electricity consumption in the residential and service sectors in mountain municipalities in the Vosges in 2016



Sources: CGET; Ministry of Sport, RES; SDES, municipal electricity consumption data; STRMTG, Cairn. Processing: SDES.

Electricity consumption in the residential and service sectors

The residential sector corresponds to household electricity consumption The service sector corresponds to electricity consumption for service activities (shops, tourist accommodation, catering, offices, leisure infrastructures, etc.).

Biodiversity

INTERACTION BETWEEN SKI RESORTS AND PROTECTED AREAS

97% of all ski resorts in the Vosges mountain range are located in protected areas. The overlap covers an area of more than 19,000 ha.

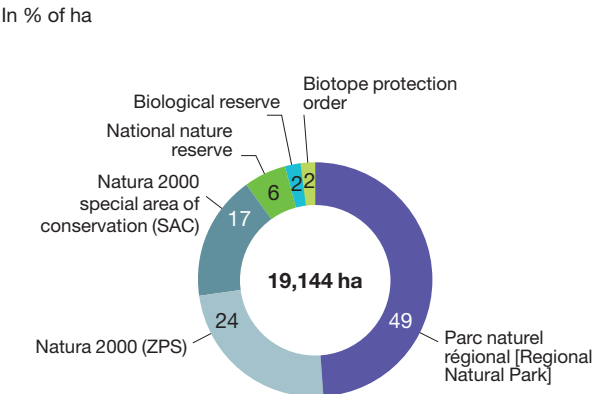
Figure 103: proportion of ski resorts overlapping protected areas in the Vosges in 2017



Note: resorts of which the land area covered could not be calculated are not included.
Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/bases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

In terms of area, the Ballons des Vosges regional nature park and Natura 2000 sites are the main protected areas overlapping with ski resorts.

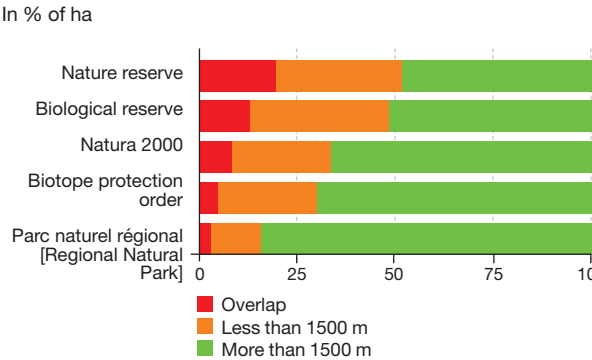
Figure 104: protected areas overlapping ski resorts in the Vosges in 2017 by type of protection



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/bases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

However, in relation to the total area of overlap or close proximity with ski resorts, small-sized protected areas that are strictly protected are the first to be affected by interaction with ski resorts. Nature reserves and biological reserves in the Vosges are particularly affected.

Figure 105: distribution of the surface area of protected areas located less than 1500 m from a ski resort in the Vosges in 2017 in relation to their distance from the resort

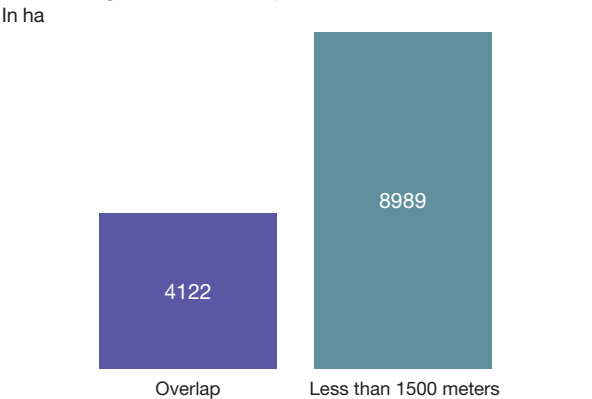


Highlights: 20% of the area of nature reserves located less than 1500 meters from a ski resort overlap with a resort.
Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/bases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

INTERACTION BETWEEN SKI RESORTS AND REMARKABLE NATURAL SITES: CASE OF TYPE 1 ZNIEFF (NATURAL AREAS OF ECOLOGICAL, FLORA AND FAUNA INTEREST)

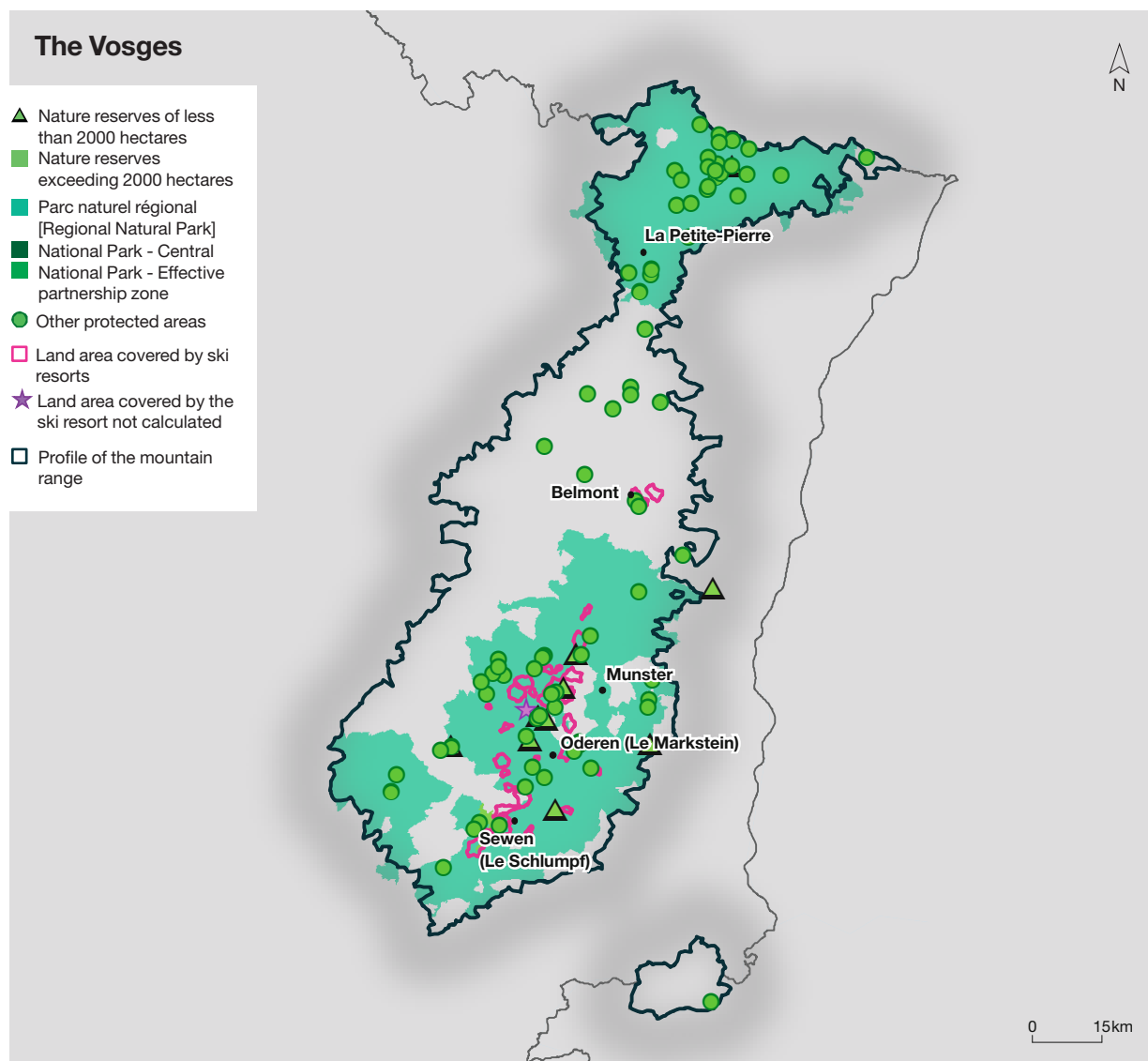
In 2017, more than 13,000 ha of type 1 ZNIEFF areas were located less than 1500 m from a Vosges ski resort, with an overlap of 31% of their area.

Figure 106: surface area covered by type 1 ZNIEFF areas in the Vosges in the vicinity of a ski resort in 2017



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (March 2017 update). Processing: SDES

Map 54: interaction between ski resorts and protected areas (excluding Natura 2000 sites) in the Vosges in 2017

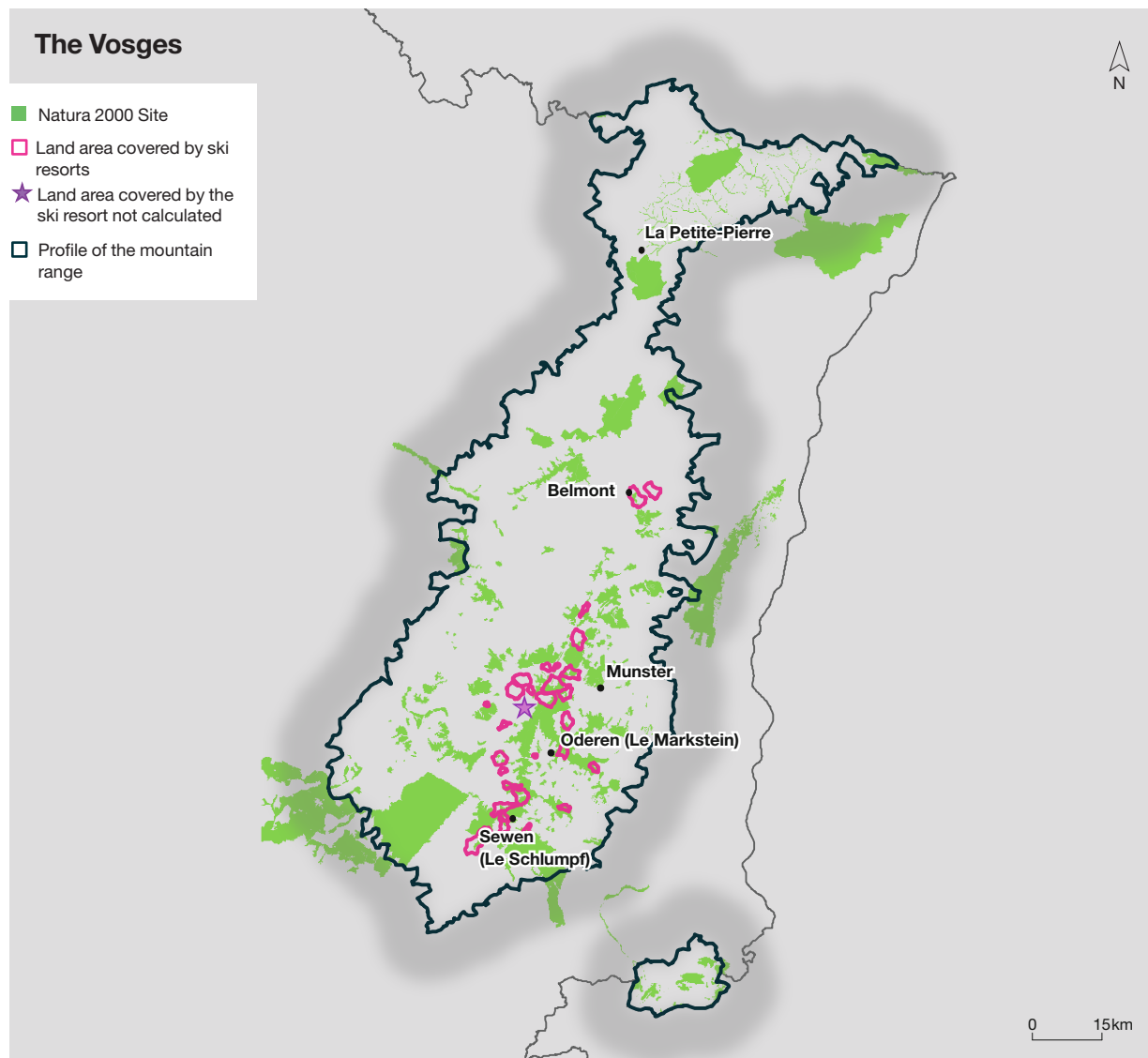


Sources: BDTopo®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "protected areas" (February 2017 update). Processing: SDES

Protected areas (excluding Natura 2000)

The protected areas taken into account (excluding Natura 2000 sites to improve readability) include regulatory provisions referred to as strict protection systems based on prohibiting or limiting certain human activities (central areas of national parks, national nature reserves, regional nature reserves, prefectural biotope protection orders, biological reserves, national hunting and wildlife reserves). They also include contractual management arrangements (national park partnership zones, regional nature parks). The latter are less strict than regulatory provisions. They combine natural heritage conservation and local development and are based on voluntary partnership on the part of local communities.

Map 55: interaction between ski resorts and protected areas (Natura 2000 sites) in the Vosges in 2017

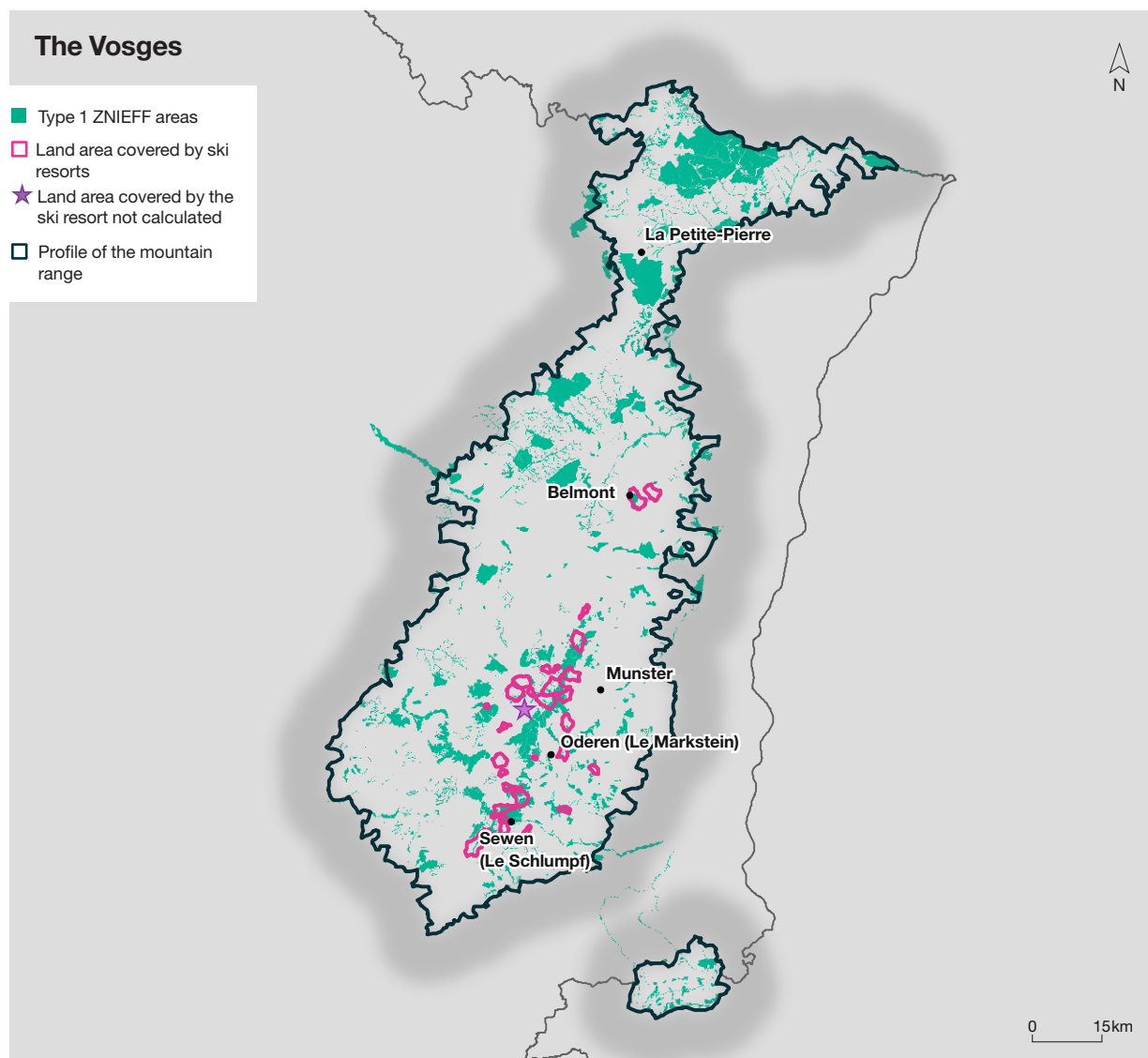


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Natura 2000" (December 2017 update). Processing: SDES

Protected areas: Natura 2000 sites

The Natura 2000 network is a European-level conservation system: it includes special protected areas (SPA) under the "Birds" directive and special areas of conservation (SAC). The purpose of the latter is to conserve habitats and animal species (excluding birds) and plant species of community interest under the "Habitats, Fauna and Flora" Directive.

Map 56: interaction between ski resorts and type 1 ZNIEFF areas in the Vosges in 2017



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (March 2017 update). Processing: SDES

Type 1 ZNIEFF areas

The purpose of the list of natural areas of ecological, fauna and flora interest (ZNIEFF) is to identify remarkable natural or semi-natural environments in France that have high biological capacity and are in a good state of conservation. This knowledge tool, which does not in itself provide protection for these areas, indicates a wealth of biodiversity in the area concerned.

Type 1 ZNIEFF areas are sectors of major biological or ecological interest defined by the presence of species and environments that are rare, remarkable or characteristic of the national or regional natural heritage.

part 6

Corsica



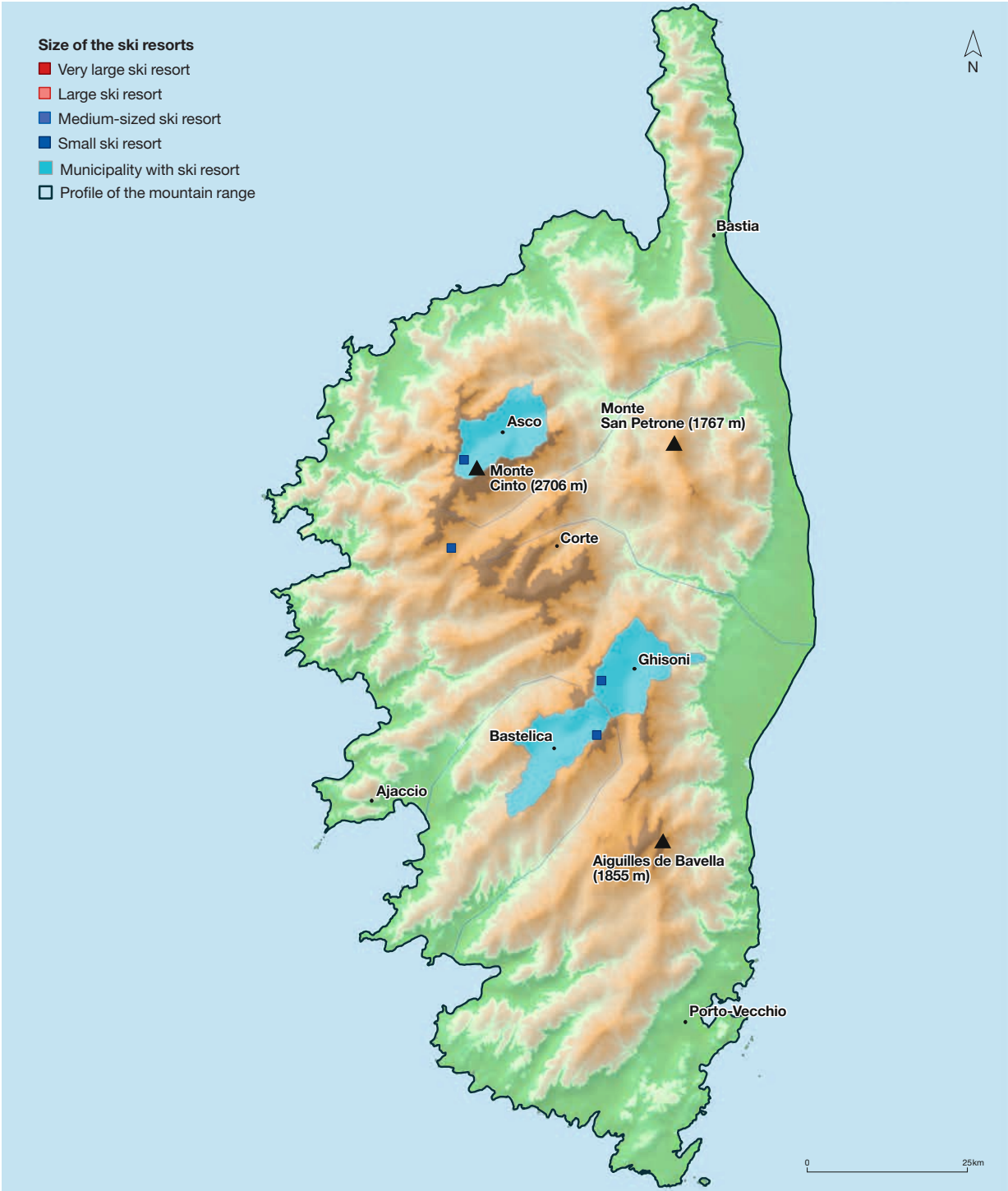
Characteristics of the mountain area



Aerial view of Corsica

AREA	POPULATION	ALTITUDE
809,273 ha	149,451 habitants	Average altitude of the municipalities: 566 m
333 municipalities (2430 ha/municipality on average)	449 inhabitants/ municipality on average	Average altitude of the highest municipality: 1590 m
	18 inhabitants/km ²	

Map 57: ski resorts and municipalities with ski resorts in Corsica in 2017



Note: municipalities are classified according to the sum of the vertical transport feet per hour (VTF/H) ratings of their operational cable cars and ski lifts. They are divided into four groups: small resorts (VTF/H < 2500 km.skiers/h), medium-sized resorts (VTF/H between 2500 and 6000 km.skiers/h), large resorts (VTF/H between 6000 and 15,000 km.skiers/h) and very large resorts (VTF/H > 15,000 km.skiers/h).

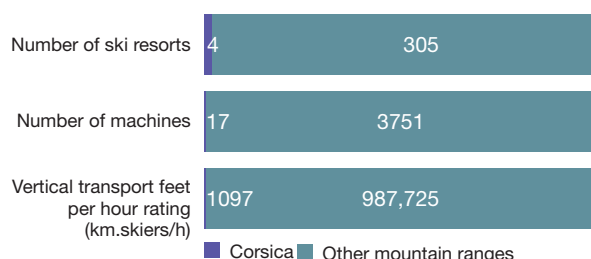
Sources: BDTOPO®; CGET; ©OpenStreetMap; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Ski resorts and municipalities with ski resorts

SKI RESORTS

Corsica has 4 ski resorts in total: Asco, Ghisoni, Val d'Ese and Vergio. Today, only the first three have operational cable cars/ski lifts. These resorts have 17 cable cars/ski lifts and a vertical transport feet per hour rating of about 1,000 km.skiers/h.

Figure 107: characteristics of ski resorts in Corsica in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

These resorts cover a land area amounting to almost 1400 ha, i.e. 0.2% of the Corsican mountain area. They are small in size, with an average area of 342 ha per resort.

Figure 108: land area covered by ski resorts in Corsica in 2017

Land area covered by ski resorts	1370 ha
Average area of ski resorts	342 ha
Proportion of the mountain area	0,2 %

Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

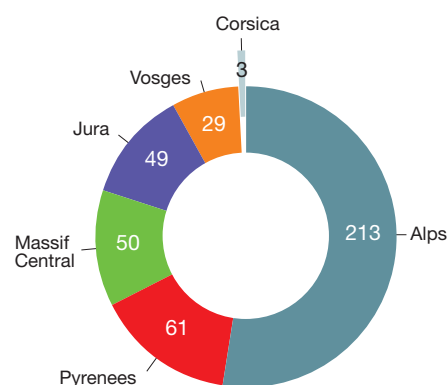
MUNICIPALITIES WITH SKI RESORTS

Municipalities with ski resorts have at least one operational cable car/ski lift or one cross-country skiing area.

Corsica has three municipalities with ski resorts: Asco, Ghisoni and Bastelica.

Figure 109: distribution of municipalities with ski resorts in 2017 for each mountain range

By number of municipalities with ski resorts



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Municipalities with ski resorts do not occupy a substantial area of Corsica. They extend over an area of 38,000 hectares, i.e. 5% of the mountain area. They account for 1% of mountain municipalities in Corsica and less than 1% of the population lives there all the year round.

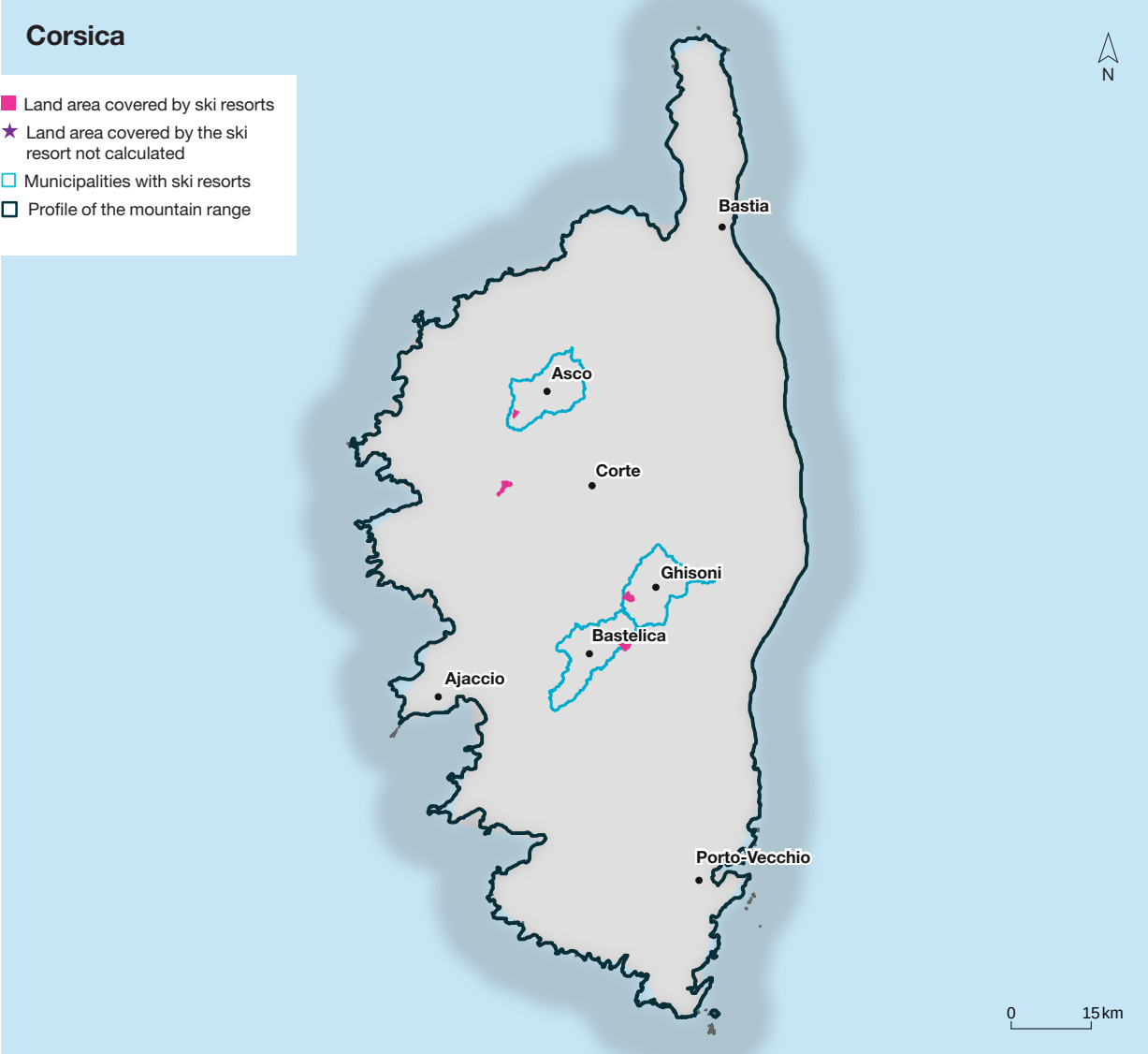
Figure 110: space occupied by municipalities with ski resorts in the mountain area in Corsica in 2017

In %



Sources: CGET; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

Map 58: municipalities with ski resorts and land area covered by ski resorts in Corsica in 2017



Sources: BDTOPO®, 2017; CGET; Ministry of Sport, RES; ©OpenStreetMap; STRMTG, Cairn. Processing: SDES

Land area covered by ski resorts

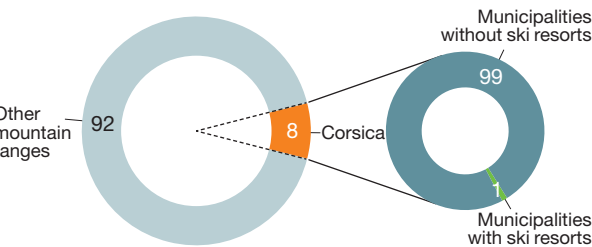
The land area covered by resorts is the estimated surface area of the ski resorts. Their profile was calculated on the basis of the area covered by geo-localized cable cars and ski lifts and from the location of surrounding tourist accommodation facilities and buildings in the ski resort.

Tourism

ACCOMMODATION CAPACITY AND TOURIST NUMBERS

With more than 420,000 beds in 2017, Corsica accounts for 8% of beds for mountain tourism of mainland France. The latter are mainly located outside municipalities with ski resorts, which comprise 1% of the tourist accommodation capacity of the mountain range.

Figure 111: tourist accommodation capacity of mountain municipalities in Corsica in 2017
In %

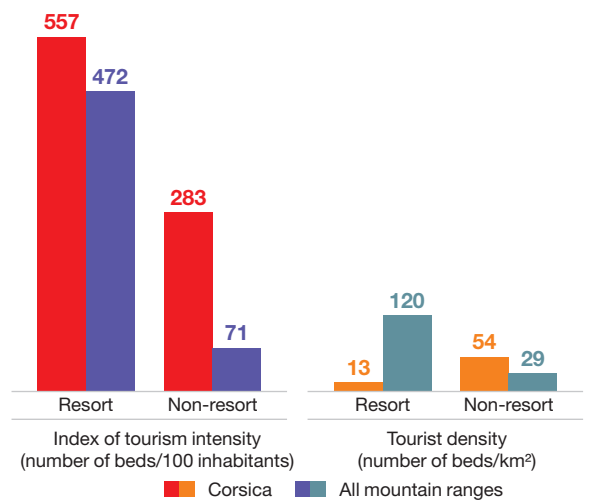


Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

PRESSURE FROM TOURISM

In Corsica, variations in population associated with tourism, expressed by the index of tourism intensity, are higher in mountain municipalities, whether they have ski resorts or not. In the tourist season, the population outside ski resorts can quadruple on average. In ski resorts, it can be 6.5 times that.

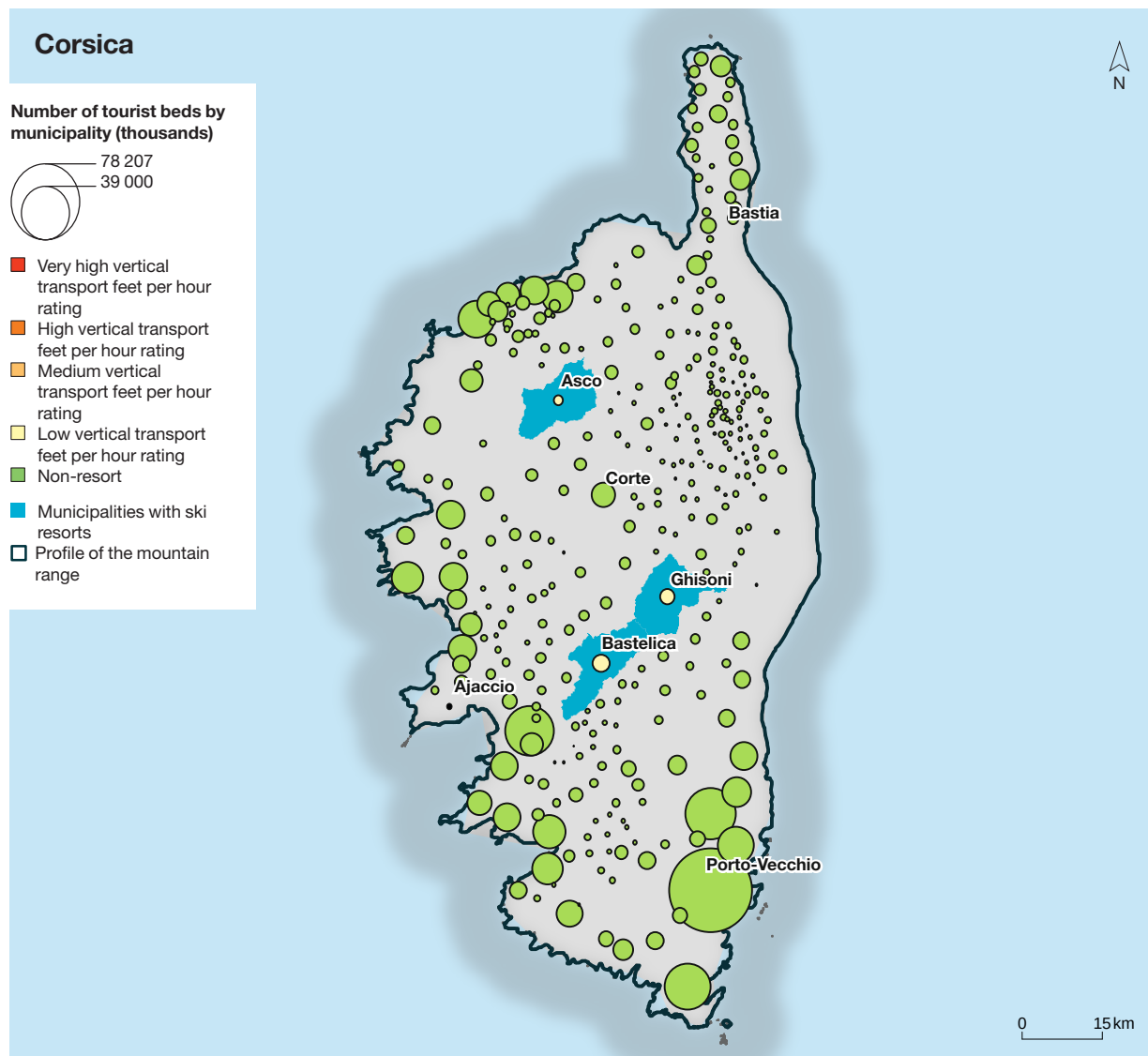
Figure 112: index of tourism intensity and tourist density in mountain municipalities in Corsica in 2017



Highlights: on average, municipalities with ski resorts in Corsica have an index of tourism intensity of 557 beds per 100 inhabitants and a tourist density of 13 beds per km².
Sources: CGET; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Ministry of Sport, RES; STRMTG, Cairn. Processing: SDES

With 13 beds per km² on average, tourist density in municipalities with ski resorts in Corsica is four times higher than the average for other mountain municipalities in Corsica. Outside the ski resorts, tourist density in Corsican mountain municipalities is almost twice as high as the average for all mountain ranges as a whole.

Map 59: tourist accommodation capacity of mountain municipalities in Corsica in 2017

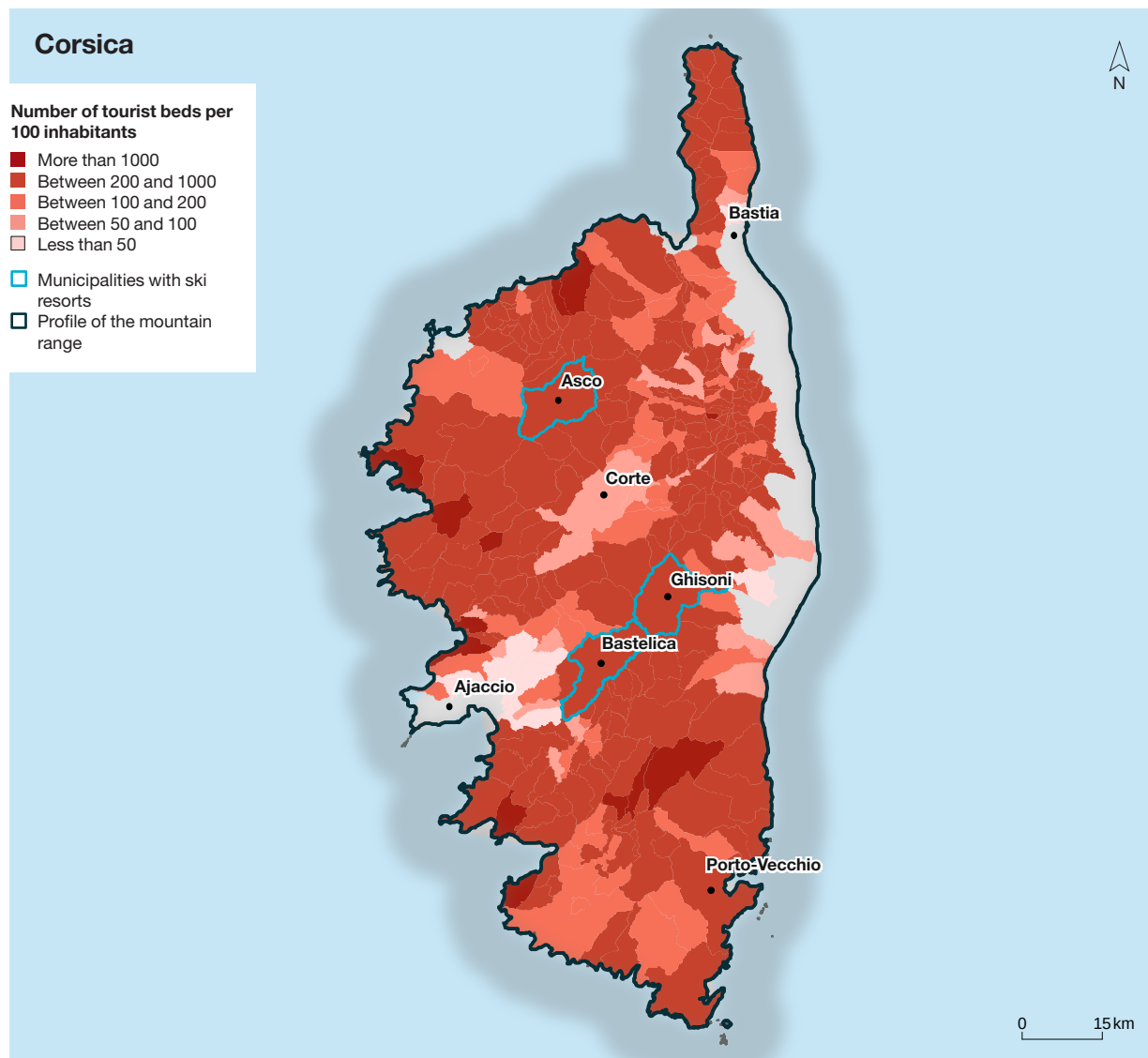


Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Tourist accommodation capacity

Tourist accommodation capacity defines the number of tourist beds located in a municipality. This indicator includes tourist beds in paid accommodation facilities (hotels, camping sites, holiday residences, holiday villages, youth hostels, sports centers, etc.) and in non-paid accommodation facilities (second homes). Private tourist accommodation (Airbnb type) is not taken into consideration. The ratios defined by Insee have been used to estimate the number of tourist beds for hotels (two beds per room), camping sites (three beds per camping pitch) and second homes (five beds per second home).

Map 60: index of tourism intensity of mountain municipalities in Corsica in 2017

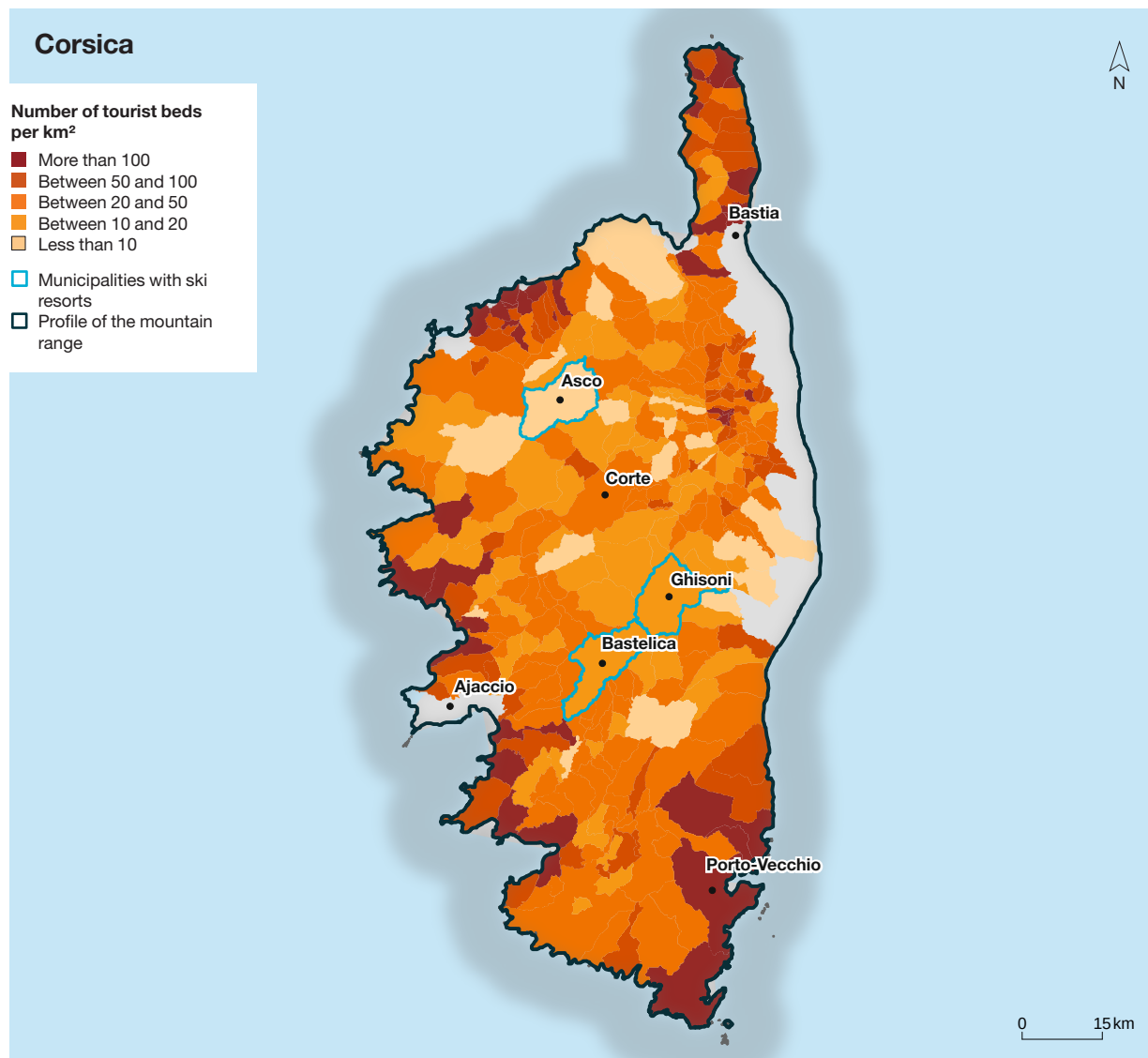


Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Index of tourism intensity

The index of tourism intensity is an indicator of tourist pressure or tourist intensity. This is the ratio of the number of tourist beds in a given area to its resident population. This indicator expresses the theoretical capacity of an area to increase its population in terms of accommodating tourists. An index equal to 100 means that the area has a tourist accommodation capacity equivalent to its permanent population and could therefore double its population.

Map 61: tourist density of mountain municipalities in Corsica in 2017



Sources: CGET; Ministry of Sport, RES; Ministry of Sport, RES; STRMTG, Cairn; Insee-DGE, municipal tourist accommodation capacity; Insee, RP; Processing: SDES

Tourist density

Tourist density is the ratio between the number of tourist beds in a given area and its surface area. This indicator is used to estimate the spatial concentration of tourist accommodation in a given area.

Land use

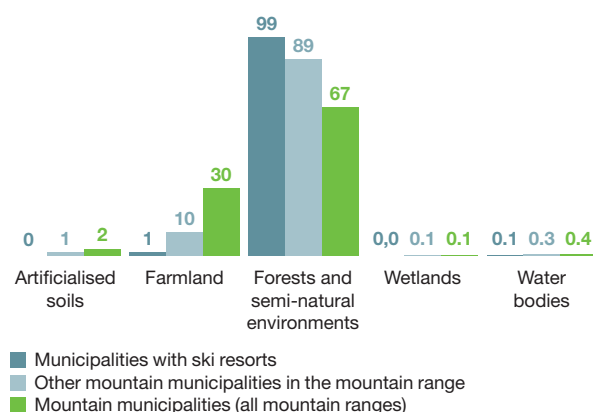
LAND USE

Corsican mountain municipalities are mainly composed of forests and grassland in substantially higher proportions than in other mountain ranges, particularly in municipalities with ski resorts. However, the proportion of agricultural land is considerably lower.

The proportion of developed land is less than that of the mountain municipalities as a whole.

Figure 113: land use in mountain municipalities in Corsica in 2012

In %

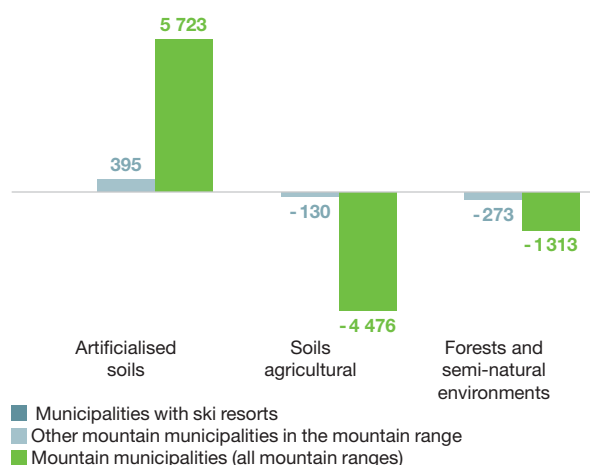


Highlights: on average, 99% of the area of municipalities with ski resorts in Corsica consisted of forests and semi-natural environments in 2012.
Sources: CGET; Ministry of Sport, RES; EU-SDES, CORINE Land Cover; STRMTG, Cairn. Processing: SDES

Developed areas are increasing in Corsican mountain municipalities, while agricultural land is decreasing substantially. Forest and grassland areas are also decreasing, but in lower proportions. No change was observed in land use in municipalities with ski resorts between 2006 and 2012.

Figure 114: trends in land use in municipalities in Corsica between 2006 and 2012

In ha



Highlights: between 2006 and 2012, the area of developed land increased by 395 ha in municipalities without ski resorts in Corsica, while 130 ha of agricultural land disappeared.
Sources: CGET; Ministry of Sport, RES; EU-SDES, CORINE Land Cover; STRMTG, Cairn. Processing: SDES

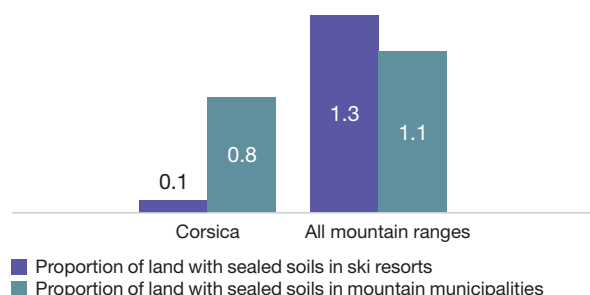
SOIL SEALING

The proportion of areas with sealed soils in the Corsican mountain area is less than average for mountain municipalities in mainland France.

The proportion of land with sealed soils is very low in Corsican ski resorts (0.1% of their area).

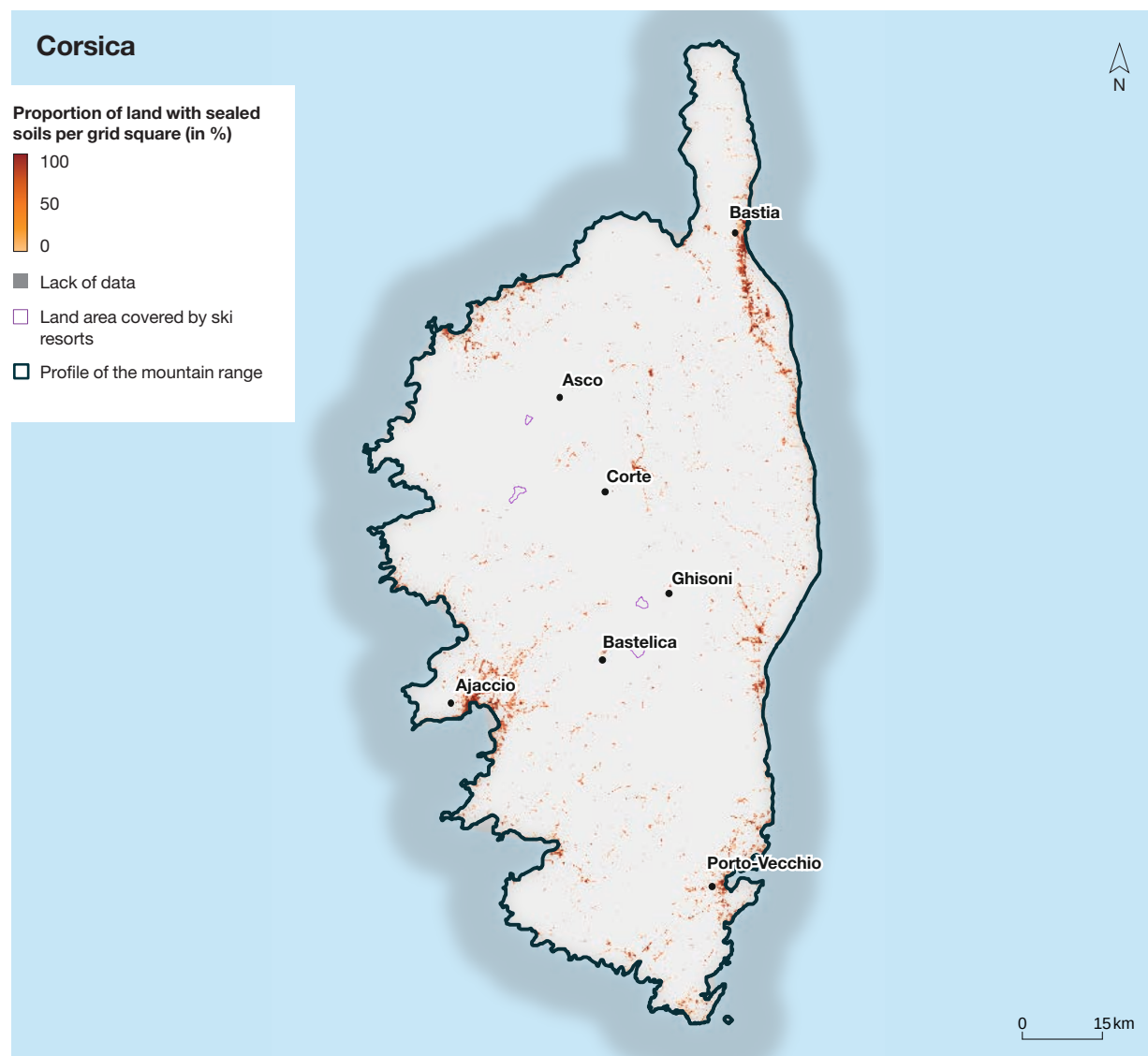
Figure 115: proportion of sealed soil areas in ski resorts and mountain municipalities in Corsica in 2012

In %



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Map 62: proportion of areas with sealed soils in ski resorts and mountain municipalities in Corsica in 2012



Note: the "high-resolution" layer that was used maps the percentage of sealed soils in pixels measuring 20 m x 20 m.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; EU-SDES, high-resolution layers, 2012, STRMTG, Cairn. Processing: SDES

Soil sealing

Soil sealing is defined as permanent coverage of the ground with a material that is impermeable to water and air. This can be the result of the construction of roads, buildings or car parks. Sealed soils irreversibly lose their ecological functions, particularly in terms of water storage, and thus notably create the risk of mudslides and water run-off that could lead to flooding.

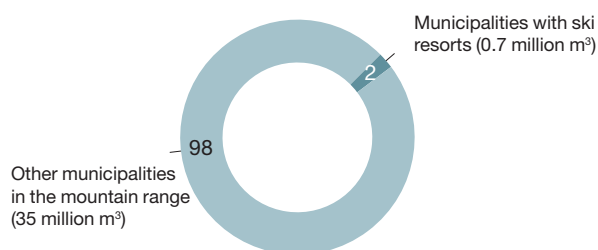
Drinking water

VOLUMES OF FRESH WATER ABSTRACTED FOR DRINKING WATER SUPPLIES IN THE REGION

A total of 2% of water volumes in Corsica abstracted for drinking water supplies comes from municipalities with ski resorts. This accounts for more than 700 million m³.

Figure 116: volumes of fresh water abstracted for the drinking water supply in mountain municipalities in Corsica in 2015

In %

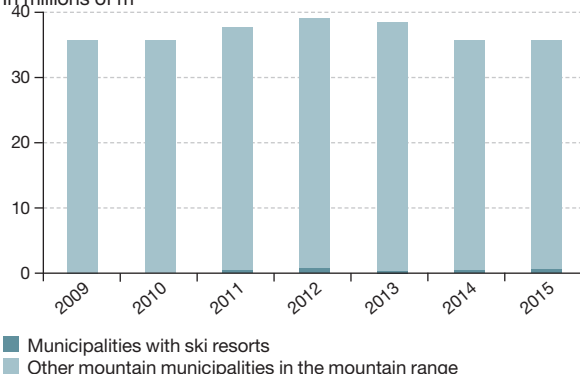


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Between 2009 and 2015, water abstraction for drinking water supplies remained largely unchanged overall throughout the entire mountain area, but with annual fluctuations.

Figure 117: trends in fresh water abstraction for the drinking water supply in mountain municipalities in Corsica

In millions of m³



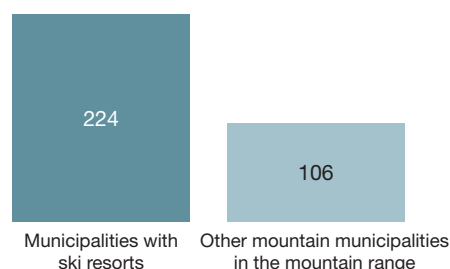
Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

WATER ABSTRACTION FOR DRINKING WATER SUPPLIES ON A MUNICIPAL SCALE AND IN RELATION TO THE POPULATION

In Corsica, abstracted water volumes in relation to the number of municipalities are almost twice higher in municipalities with ski resorts than in the other mountain municipalities.

Figure 118: fresh water abstracted for drinking water supplies in Corsica in 2015 by mountain municipality

In thousands of m³ per municipality

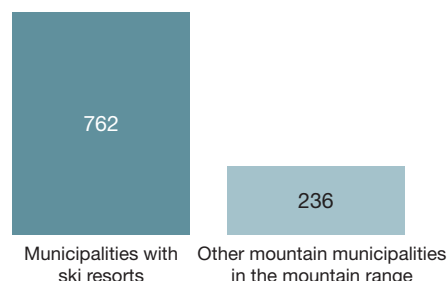


Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

In relation to the number of inhabitants, there are also significant divergences between water volumes abstracted for drinking water supplies in municipalities with ski resorts and those in other mountain municipalities. On average, 762 m³ of water is abstracted in municipalities with ski resorts, versus 236 m³ in the other municipalities in this mountain range.

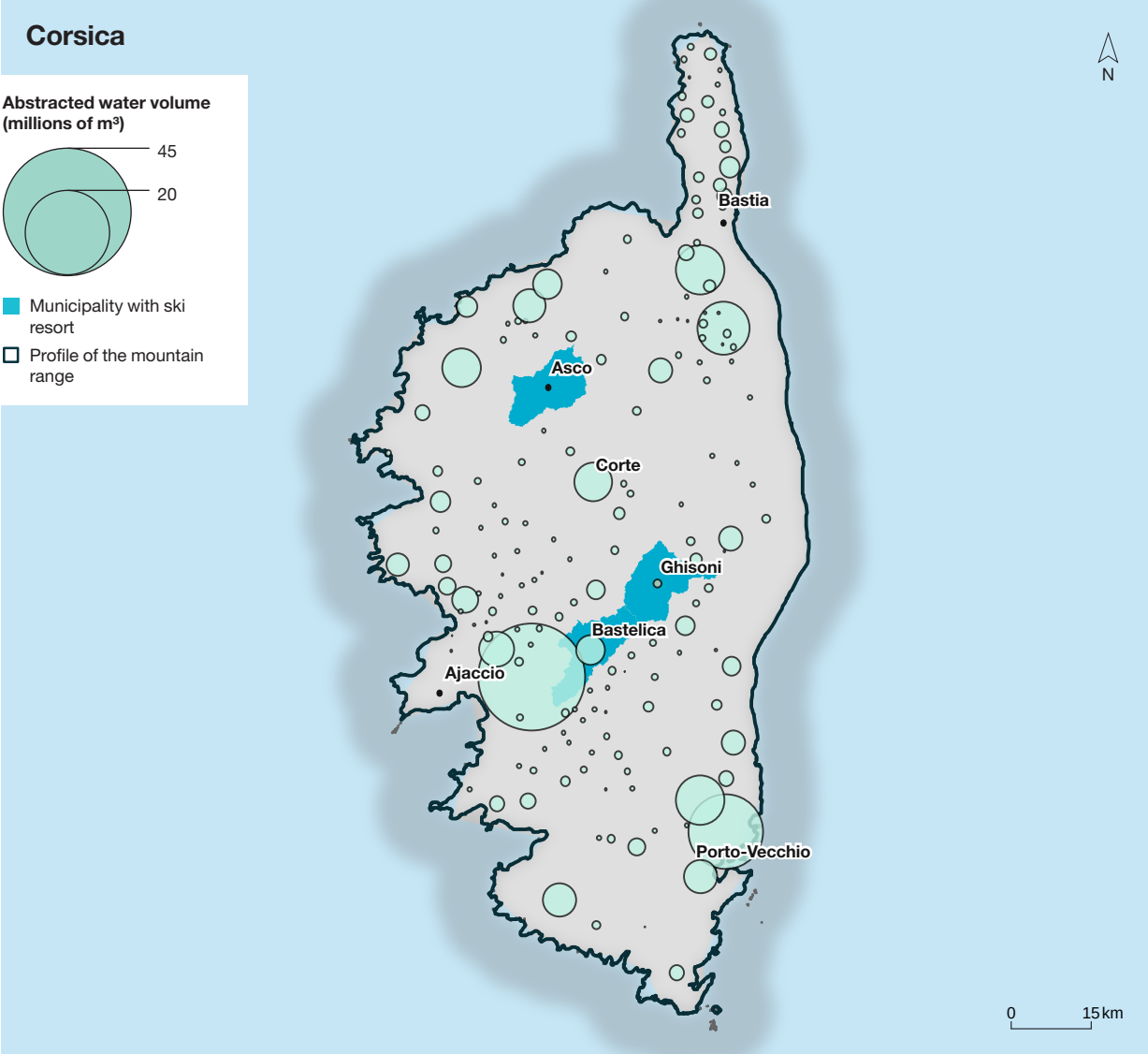
Figure 119: fresh water abstracted for drinking water supplies in Corsica in 2015 per inhabitant

In m³ per inhabitant



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Map 63: fresh water abstraction for the drinking water supply in Mountain municipalities in Corsica in 2015



Sources: CGET; Ministry of Sport, RES; Onema, BNPE; STRMTG, Cairn. Processing: SDES

Fresh water abstracted for the drinking water supply

Fresh water abstracted for the drinking water supply is equal to the quantities of water taken for the production of drinking water. The withdrawal location is not necessarily the consumption location. Some water abstracted in a municipality may be intended for supplying adjacent areas.

Biodiversity

INTERACTION BETWEEN SKI RESORTS AND PROTECTED AREAS

The four Corsican ski resorts are located in protected areas. The overlap between the ski resorts and the protected areas covers about 1800 ha.

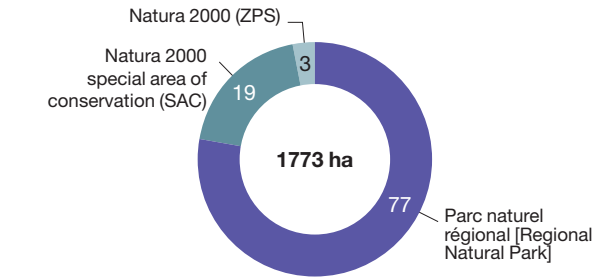
Figure 120: proportion of ski resorts overlapping protected areas in Corsica in 2017
In %



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/bases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

In terms of area, the Corsica regional nature park is the main protected area affected by overlap with ski resorts.

Figure 121: protected areas overlapping with ski resorts in Corsica in 2017 by type of protection
In % of ha

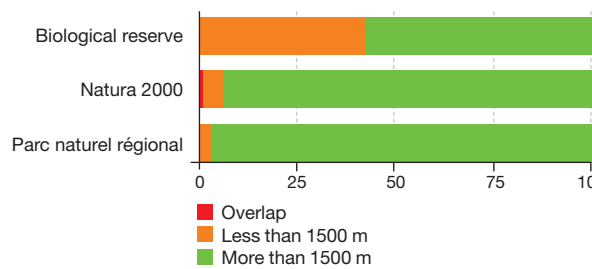


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/databases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

However, in proportion to their area, small-sized protected areas that are strictly protected are the most affected by this interaction with ski resorts.

More than one third of the area of biological reserves affected by close proximity to ski resorts in Corsica is located less than 1500 m from these resorts.

Figure 122: distribution of the surface area of protected areas located less than 1500 m from a ski resort in Corsica in 2017 in relation to their distance from the resort
In % of ha



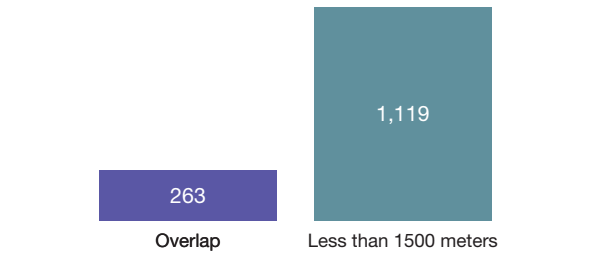
Highlights: 1% of the area of Natura 2000 sites located less than 1500 m from a ski resort overlaps with a resort.

Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/bases "protected areas" (February 2017 update) and Natura 2000 (December 2017 update). Processing: SDES

INTERACTION BETWEEN SKI RESORTS AND REMARKABLE NATURAL SITES: CASE OF TYPE 1 ZNIEFF (NATURAL AREAS OF ECOLOGICAL, FLORA AND FAUNA INTEREST)

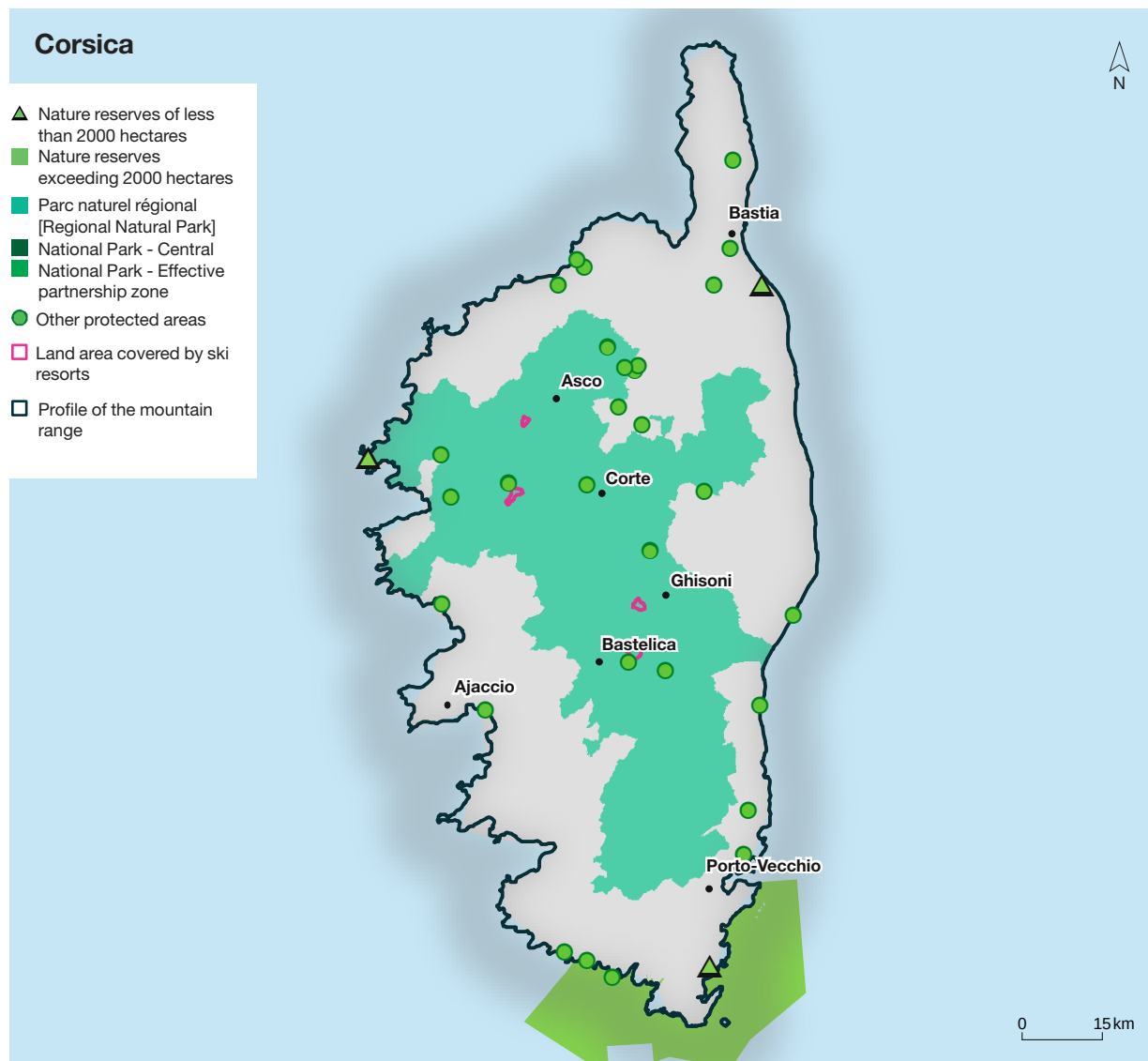
In 2017, more than 1300 ha of type 1 ZNIEFF areas were located less than 1500 m from a Corsican ski resort, with an overlap of 19% of their area.

Figure 123: area covered by type 1 ZNIEFF areas in Corsica in the vicinity of a ski resort in 2017
In ha



Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (March 2017 update). Processing: SDES

Map 64: interaction between ski resorts and protected areas (excluding Natura 2000 sites) in Corsica in 2017

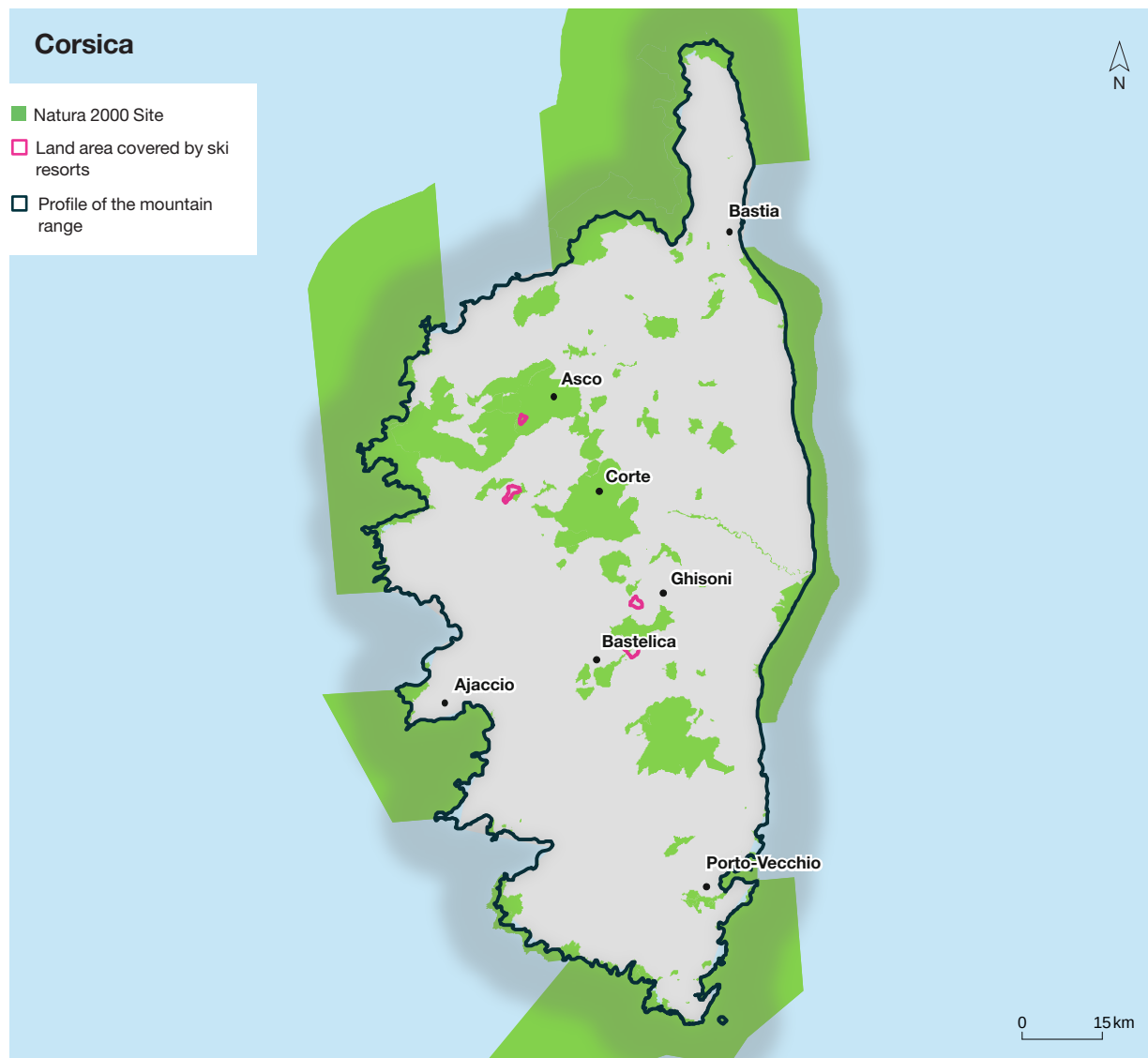


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "protected areas" (February 2017 update). Processing: SDES

Protected areas (excluding Natura 2000)

The protected areas taken into account (excluding Natura 2000 sites to improve readability) include regulatory provisions referred to as strict protection systems based on prohibiting or limiting certain human activities (central areas of national parks, national nature reserves, regional nature reserves, prefectural biotope protection orders, biological reserves, national hunting and wildlife reserves). They also include contractual management arrangements (national park partnership zones, regional nature parks). The latter are less strict than regulatory provisions. They combine natural heritage conservation and local development and are based on voluntary partnership on the part of local communities.

Map 65: interaction between ski resorts and protected areas (Natura 2000 sites) in Corsica in 2017

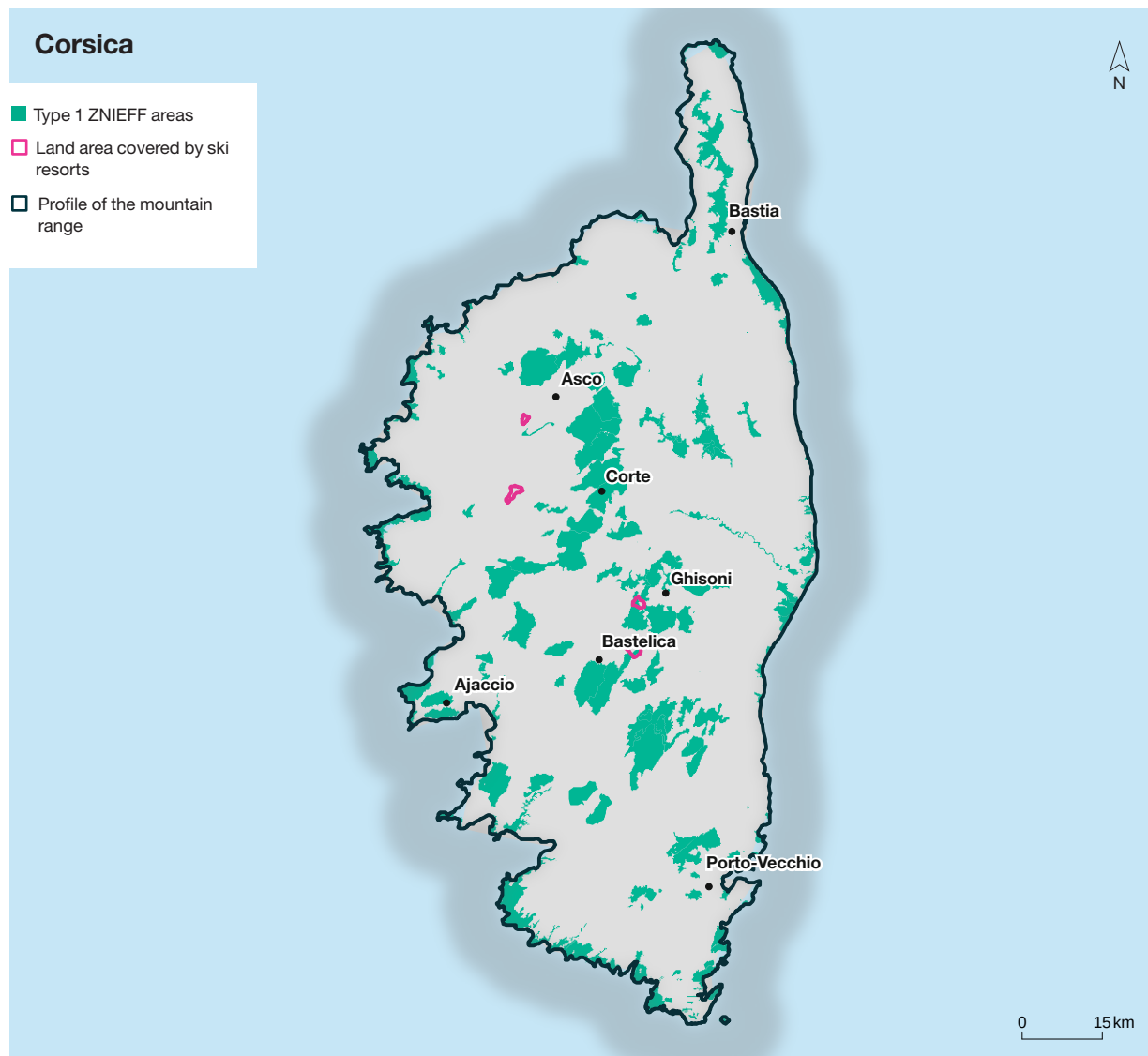


Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Natura 2000" (December 2017 update). Processing: SDES

Protected areas: Natura 2000 sites

The Natura 2000 network is a European-level conservation system: it includes special protected areas (SPA) under the "Birds" directive and special areas of conservation (SAC). The purpose of the latter is to conserve habitats and animal species (excluding birds) and plant species of community interest under the "Habitats, Fauna and Flora" Directive.

Map 66: interaction between ski resorts and type 1 ZNIEFF areas in Corsica in 2017



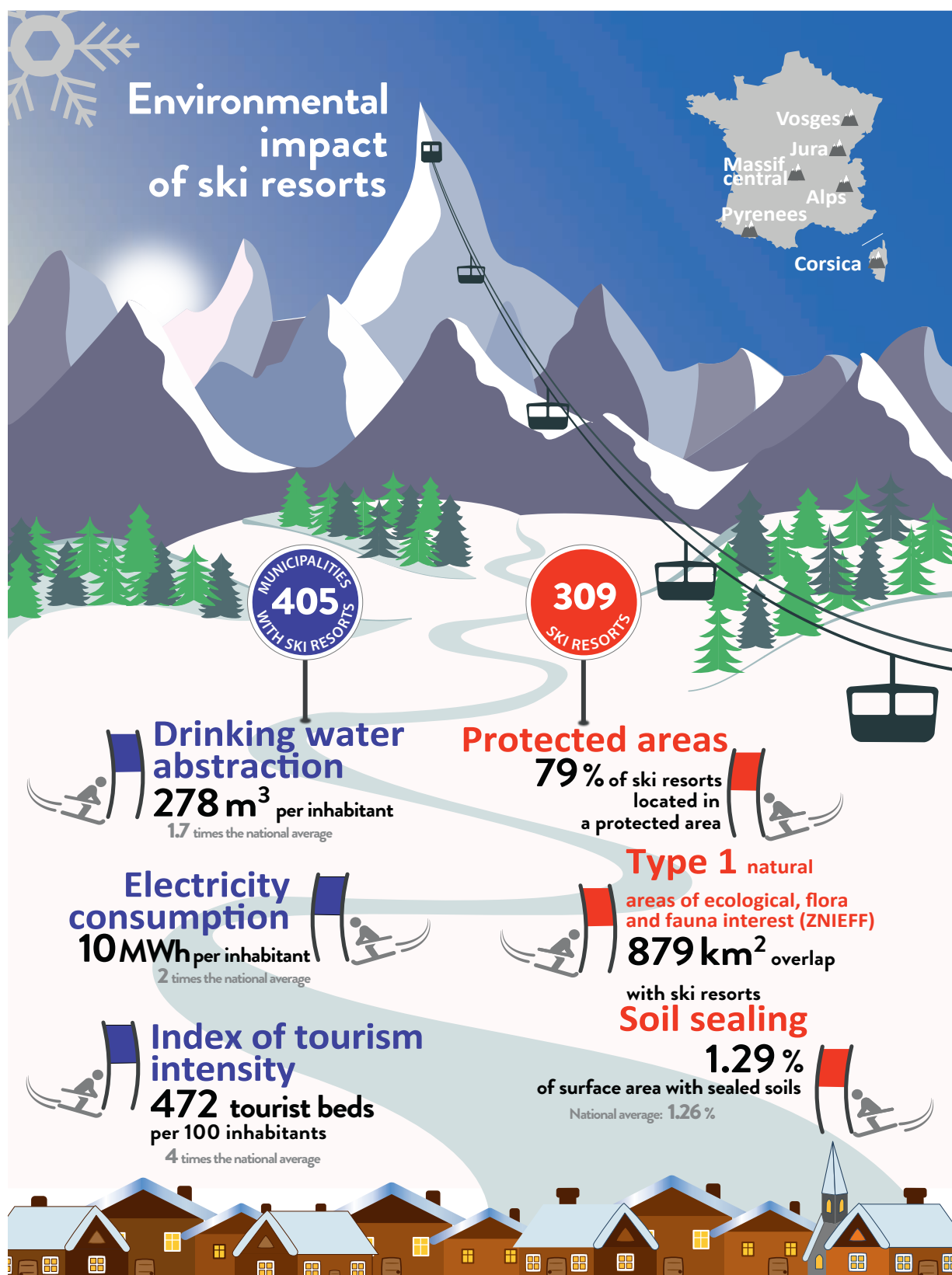
Sources: BDTOPO®, 2017; CGET; ©OpenStreetMap; STRMTG, Cairn; UMS PatriNat, INPN/database "Znieff" (February 2017 update). Processing: SDES

Type 1 ZNIEFF areas

The purpose of the list of natural areas of ecological, fauna and flora interest (ZNIEFF) is to identify remarkable natural or semi-natural environments in France that have high biological capacity and are in a good state of conservation. This knowledge tool, which does not in itself provide protection for these areas, indicates a wealth of biodiversity in the area concerned.

Type 1 ZNIEFF areas are sectors of major biological or ecological interest defined by the presence of species and environments that are rare, remarkable or characteristic of the national or regional natural heritage.

Key data



Appendices

- Definitions
- Abbreviations
- Bibliography
- Useful Links



Definitions

Mountain municipalities: all municipalities classified as being in mountain areas on the basis of the provisions of Council Regulation N° 1257/1999 of 17 May 1999 on support for rural development and Council Directive 76/401/EEC of 6 April 1976.

Municipality with a ski resort : in this publication, a municipality referred to as being “with (a) ski resort(s)” is a municipality that runs at least one operational cable car/ski lift listed in the Cairn (computer catalogue of cable car/ski lifts) database of the Cable Car/Ski Lift and Guided Transport Technical Department (STRMTG) database or with at least one cross-country ski facility identified in the list of sports facilities (RES).

Vertical transport feet per hour rating: this unit is used as a matter of convention. It is the product of the authorized hourly flow rate of the machinery (expressed in passengers/hour or skiers/hour) and the height difference (measured in km). This indicator has been used in order to classify ski resorts and municipalities with ski resorts into four categories depending on the classification used by Domaines skiabiles de France (French Ski Facilities). The sum of the vertical transport feet per hour (VTF/H) ratings for each entity was used to define their sites:

- Low VTF/H: < 2 500 km.skiers/h;
- Medium VTF/H: between 2500 and 6000 km.skiers/h;
- High VTF/H: between 6000 and 15,000 km.skiers/h;
- Very high VTF/H: > 15,000 km.skiers/h;

Installed electrical power: the rated power of the main motor of cable cars/ski lifts, expressed in kW.

Cable cars/ski lifts: The Tourism Code (Article L 342-7) defines cable cars/ski lifts as “*all public passenger transport appliances based on funicular or rack railways, cable cars, ski lifts or any other machine using load-bearing or hauling cables*”. This publication refers to cable cars/ski lifts from the Cairn database and covers three types of machinery: cable cars, ski lifts and moving walkways.

Ski resort: in this publication, the profile of ski resorts is based on the land area covered by the cable cars/ski lifts and the location of the surrounding tourist accommodation. Ski resorts have been classified according to their size on the basis of the vertical transport feet per hour rating of their cable cars/ski lifts.

Massif area: a mountain range encompasses mountain areas and immediately adjacent areas (foothills, planes).

Mountain area: Article 18 of Regulation 1257/99 defines a mountain area as an area handicapped by altitude, gradient and/or climate with the effect of seriously restricting possibilities for land use and generally increasing the cost of all works.

Abbreviations

DB	Database
BNPE	Banque Nationale des Prélèvements Quantitatifs en Eau (national water abstraction database)
CAIRN	Catalogue Informatisé des Remontées mécaniques Nationales (computer catalogue of national cable cars/ski lifts)
CGEDD	Conseil général de l'Environnement et du Développement durable (General Council for the Environment and Sustainable Development)
CGET	Commissariat général à l'égalité des territoires (Office for the equal treatment of regions)
CLC	CORINE Land Cover
DSF	Domaines skiables de France (French Ski Areas)
INPN	Inventaire national du patrimoine naturel (National inventory of natural heritage)
MNHN	Muséum national d'histoire naturelle (French National Museum of Natural History)
MP	Moment de puissance (vertical transport feet per hour rating)
ONEMA	Office national de l'eau et des milieux aquatiques (national office for water and aquatic environments)
PNR	Parc Naturel Régional (regional natural park)
RES	Recensement des Equipements Sportifs (list of sports facilities)
RNCFS	Réserves Nationales de Chasse et de Faune Sauvage (national hunting and wildlife reserve)
RP	Recensement de la Population (population census)
STRMTG	Service Technique des Remontées Mécaniques et des Transports Guidés (cable car/ski lift and guided transport technical department)
SDES	Service de la Donnée et des Études Statistiques (data and statistical studies department)
UMS PATRINAT	Unité Mixte de Service Patrimoine Naturel (combined service unit for natural heritage)
ZNIEFF	Zone Naturelle d'Intérêt Écologique, Faunistique et Floristique (natural area of ecological, fauna and flora interest)
ZSC	Zone Spéciale de Conservation (special area of conservation)
ZPS	Zone de Protection Spéciale (special protected area)

Bibliography

- Anguier C., Simon A. (2017), *Tourisme : un moteur de développement pour les économies alpines*, L'économie des montagnes, Insee Dossier Auvergne-Rhône-Alpes n° 1, 3 p.
- Badré M., Prime J-L., Ribière G. (2009), *Neige de culture : état des lieux et impacts environnementaux, note socioéconomique*, CGEDD, 152 p.
- Balouzat B., Lavergne H. (2016), *Une activité touristique fortement concentrée dans les zones de montagne*, Insee Analyse Auvergne-Rhône-Alpes n° 17, 4 p.
- Cour des comptes (2018), *Les stations de ski des Alpes du Nord face au réchauffement climatique : une vulnérabilité croissante, le besoin d'un nouveau modèle de développement*, rapport public annuel 2018, 1 341 p.
- Delorme F. (2014), *Du village-station à la station-village. Un siècle d'urbanisme en montagne*, In Situ, journals.openedition.org, 18 p.
- Domaines skiables de France (2017), *Indicateurs et analyses 2017*, 8 p.
- François H. (2012), *Atlas des stations du massif des Alpes*, Irstea, 97 p.
- Gauche M., *Water in ski resorts: a resource under pressure*, CGDD/SDES, *Datalab Essentiel*, mars 2019, 4 p.
- Giulietti S., Romagosa F., Fons Esteve J., Schröder C. (2018), *Tourism and the Environment. Towards a reporting mechanism in Europe*, ETC/ULS Report 01/2018, European Environment Agency, 112 p.
- Kraszewski M., Gauche M., *Géolocalisation des stations de ski et identification des communes supports de stations. Guide méthodologique*, Document de travail n° 41, SDES, avril 2019, 20 p.
- Lévêque A. (2015), *Les communes abritant des espaces naturels protégés*, CGDD/SDES, *Chiffres et statistiques n° 706*, 11 p.
- Odit France (2009), *Les chiffres clés du tourisme de montagne en France*, 7^e édition, Observation touristique, Odit France, 61 p.
- Pasquier J-L. (2017), *Les prélèvements d'eau douce en France : les grands usages en 2013 et leur évolution depuis 20 ans*, CGDD/SDES, *Datalab*, 22 p.
- STRMTG (2017), *Les remontées mécaniques. Investissements, parc et trafic 2017*, ministère de la Transition écologique et solidaire, ministère chargé des Transports, 36 p.

Useful Links

- Banque Nationale des Prélèvements Quantitatifs en Eau (BNPE) (national bank of quantitative water abstraction)
www.bnpe.eaufrance.fr
- Cairn database (computer catalogue of national cable cars/ski lifts)
www.strmtg.developpement-durable.gouv.fr/base-de-donnees-cairn-a398.html
- Base de données Capacité des communes en hébergement touristique en 2018 (municipal tourist accommodation capacity database 2018)
www.insee.fr/fr/statistiques/2021703
- Base de données géographique (geographical database) CORINE Land Cover (CLC)
www.statistiques.developpement-durable.gouv.fr/corine-land-cover-0
- Données cartographiées sur les aires protégées et les zones d'intérêts (map data on protected areas and areas of interest)
http://geoidd.developpement-durable.gouv.fr/geoclip_stats_o3/index.php?profil=FR#l=fr;v=map1
- Observatoire des territoires (regional observatory)
www.observatoire-des-territoires.gouv.fr/observatoire-des-territoires/fr/node
- Observatoire national sur les effets du changement climatique (Onerc) (national observatory on the effects of climate change)
www.ecologique-solidaire.gouv.fr/observatoire-national-sur-effets-du-rechauffement-climatique-onerc
- Recensement des équipements sportifs, espaces et sites de pratiques (RES) (list of sports equipment, areas and sites)
www.data.gouv.fr/fr/datasets/recensement-des-equipements-sportifs-espaces-et-sites-de-pratiques/
- Service de la donnée et des études statistiques (CGDD/ministère de la Transition écologique et solidaire) (data and statistical studies department of the General Commission on Sustainable Development at the Ministry for an Ecologically and Inclusive Transition)
www.statistiques.developpement-durable.gouv.fr



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Mountain regions are the first to witness the effects of climate change: permafrost degradation, retreating glaciers, reduced snow cover, increased risk of natural disasters, etc.

As municipalities have developed business based on snow tourism, they now face the issue of adapting to the consequences of climate change. This issue is supplemented by the environmental problems facing attractive tourist destinations located in natural areas: increased pressure on resources due to peak tourist periods, development of land areas due to the construction of tourist accommodation and leisure infrastructures, pressure on biodiversity in these areas, complex sanitation management, etc. The environmental atlas of ski resorts and municipalities with ski resorts examines these issues and provides summary data and highlights for each mountain range.



Environmental atlas of ski resorts and municipalities with ski resorts



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