

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.1 - Basic data and selection criteria:

Country	Italy
Region (NUTS 2)	Valle d'Aosta
District/Province (NUTS 3)	Aosta
Name of Pilot Area	Mountain Community Monte Cervino
Area (km²)	335,61
Population	17.118
Participating Municipalities	12
Names (LAU2)	Antey-Saint-André, Chambave, Chamois, Châtillon, Emarèse, La Magdeleine, Pontey, Saint-Denis, Saint-Vincent, Torgnon, Valtournenche, Verrayes

Table 01 - Basic Data

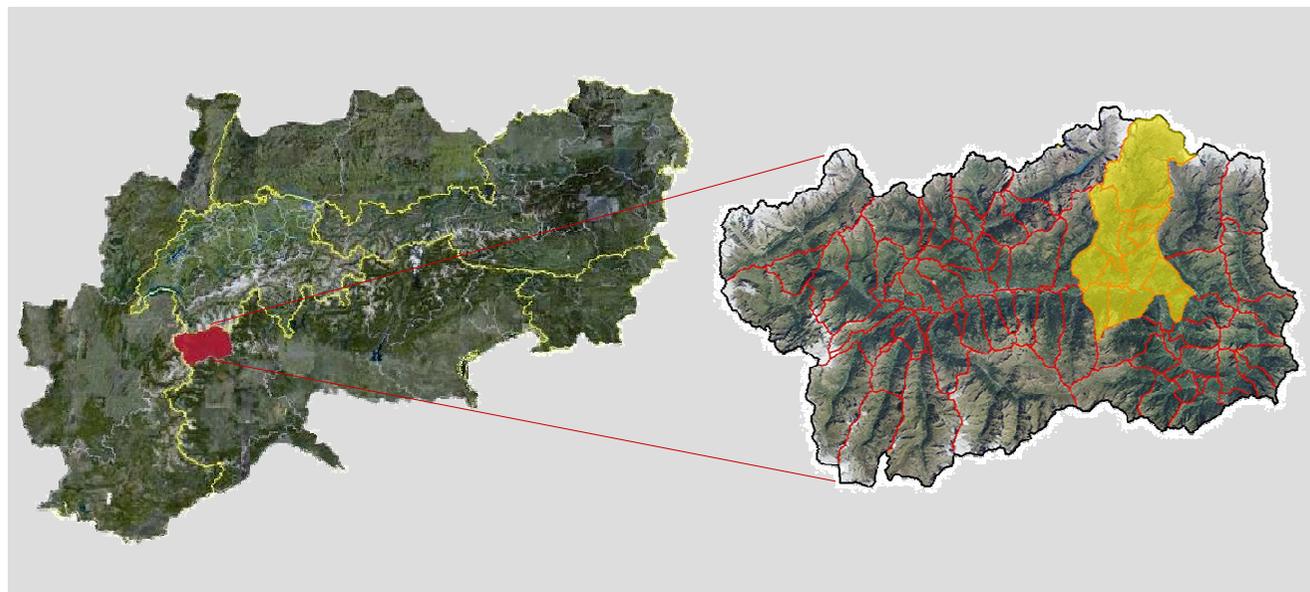


Figure 01 - Location of the pilot area in the alpine territory

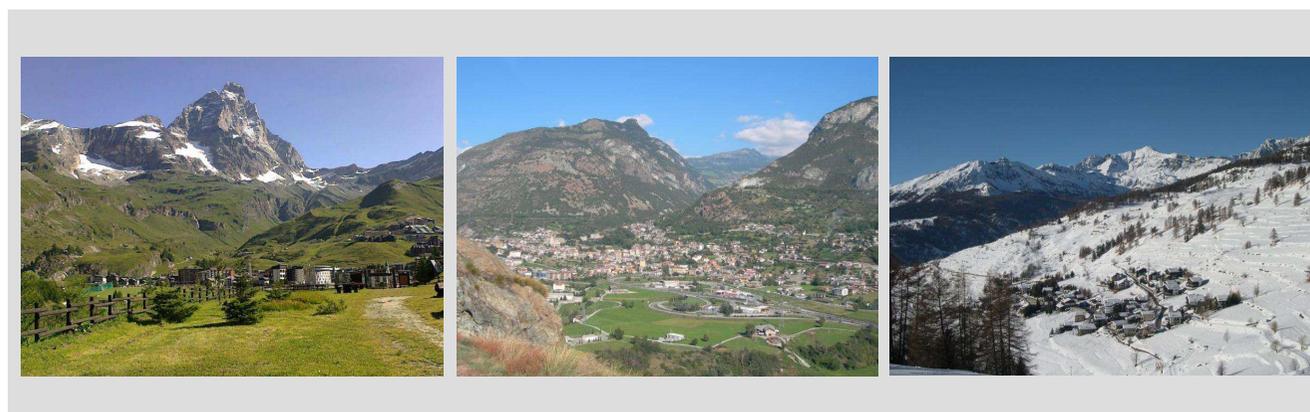


Figure 02 - Impression of the pilot area

A.2 Urbanistic & energetic analysis of the pilot areas

Description of the pilot area

Situated in the north-west corner of the Alps, the Mountain Community Monte Cervino covers the whole basin of the Marmore stream and a section of the Dora Baltea valley about 10 kilometres long around the confluence of the two waterways. Within this territorial area there are a number of environments: from pastures on the slopes on the other side of the Valtournenche, to the floodplains at the bottom of the valley, not forgetting the arid areas or the damp peat bogs, the woods and forests or the vineyards and chestnut groves. Within the Mountain Community there are three mountain groups:

- the Monte Rosa range, which slopes progressively from the 3,900 metres of the “Gobba di Rollin”, to the 1,500 metres circa of the group of “Monte Obré-Mont Ros”;
- the chain constituted by the Matterhorn (Cervino), the “Grandes and Petites Murailles”, the peaks of “Balanselmo” and “Tsan”;
- the group of “Mont Avic” which rises on the other side of the Dora Baltea, on the less favourable slope of the valley, and reaches a height of just over 3,000 metres above sea level.

The Mountain Community is accessed from National road n. 26 descending from Aosta in the direction of Torino. At Châtillon, the road branches into Regional road n. 46 that leads to the Valtournenche.

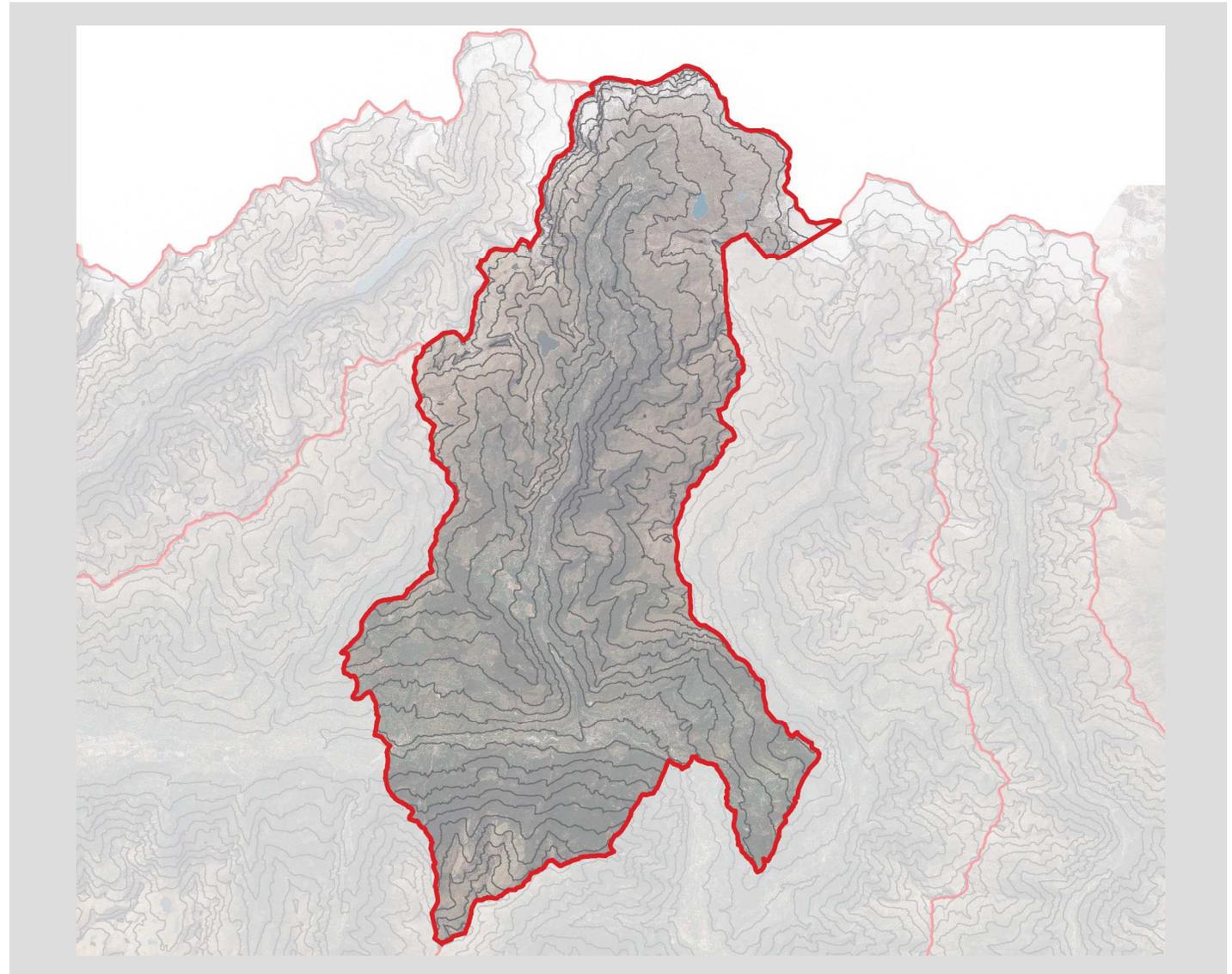


Figure 03 - Map of the pilot area - Scale 1:250.000

A.2 Urbanistic & energetic analysis of the pilot areas

Land use of the pilot area

The Mountain Community Monte Cervino, as well as, more generally, the environment of the Valle d'Aosta region, can be divided into systems with homogeneous or similar landscape features both corresponding to specific morphological forms (the plain, the lower slope area, the high slope peaks) and the horizons of altitudinal vegetation (hill, mountain, subalpine and alpine snowline). The flat area comprises the area mostly inhabited and transformed by recent anthropogenic developments of the central valley. It consists of a fluvial strip, historically occupied by rural development with the growth of fodder crops and fruit and now subjected to a strong residential and infrastructure pressure. The settlement system, with a traditional rural matrix, is constituted by a plurality of settlements interrelated with the context of agricultural infrastructure networks that often still exist. This system, in particular in Valtournenche, is currently affected by the development of tourism.

In the *adret*, which is the main exposure of the valley, the landscape of the lower slope extends much higher than in the *envers*, which is less favourably exposed and has more woodlands. The upper portions of the Valtournenche slope include areas with a dominant forest cover; in this area there are even areas not covered by woods, but ecologically and from the landscape point of view associated with them, such as clearings, fallow, small traditional communities, often in a state of abandon or converted for seasonal tourism. The highest portions of the Mountain Community are defined by the high peaks and vast basins that include areas often only marginally affected by human activity represented by the great traditional systems of grazing and the more recent facilities for downhill skiing.

From the upper portion of the subalpine horizon, characterised by spontaneous vegetation mostly of bushes and grasslands used for summer grazing, the transition towards the alpine horizon is often blurred. In the alpine horizon, due to the extremely rough climatic conditions and the limited development of the land, a cover of low vegetation dominates, which becomes more and more discontinuous until it reaches the snowline, and it disappears completely at the limit of permanent snow, that can be fixed in the Aosta Valley at around 3,000 m a.s.l.

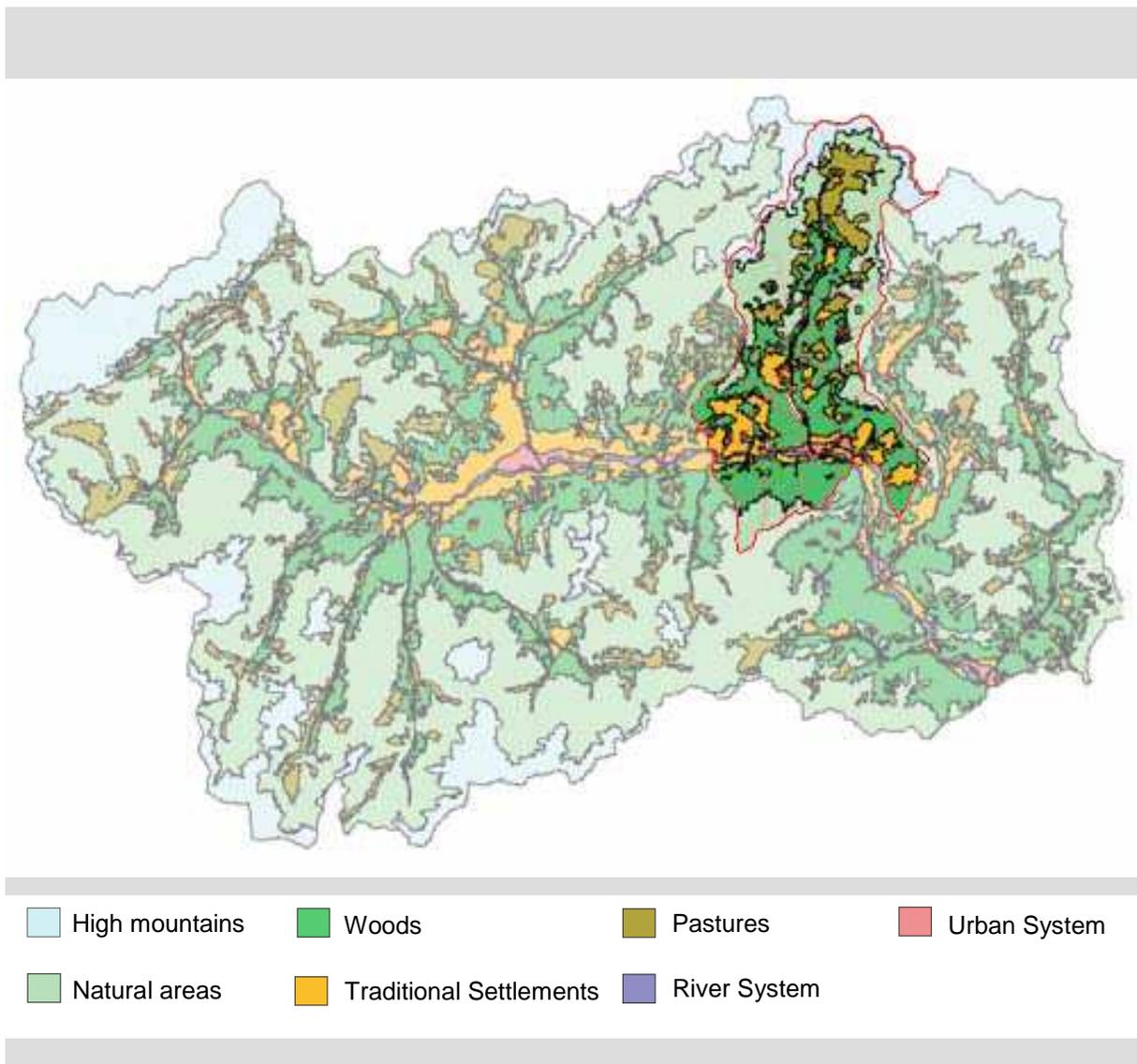


Figure 04 - Land use Map of the pilot area and the region according to CORINE - Scale —

A.2 Urbanistic & energetic analysis of the pilot areas

Transportation network of the pilot area

The high spatial distribution of settlements in the area and the concentration of activities and services in the central valley, in particular in Aosta, creates an average-high demand for mobility, although the number of inhabitants of the Mountain Community (and, more generally, of the Region) is limited.

The strong predominance of private transport over public transport is also significant. This situation could be explained by the high dispersion of the villages across the territory, by a past policy of tax exemption on fuel and by a public transport system which has particular difficulties in a mountain region and is not always able to respond to the needs of its users.

In the Municipalities most affected by seasonal tourism transport management is made more difficult by the discontinuity of transport flows that generate traffic and congestion especially in busy periods.

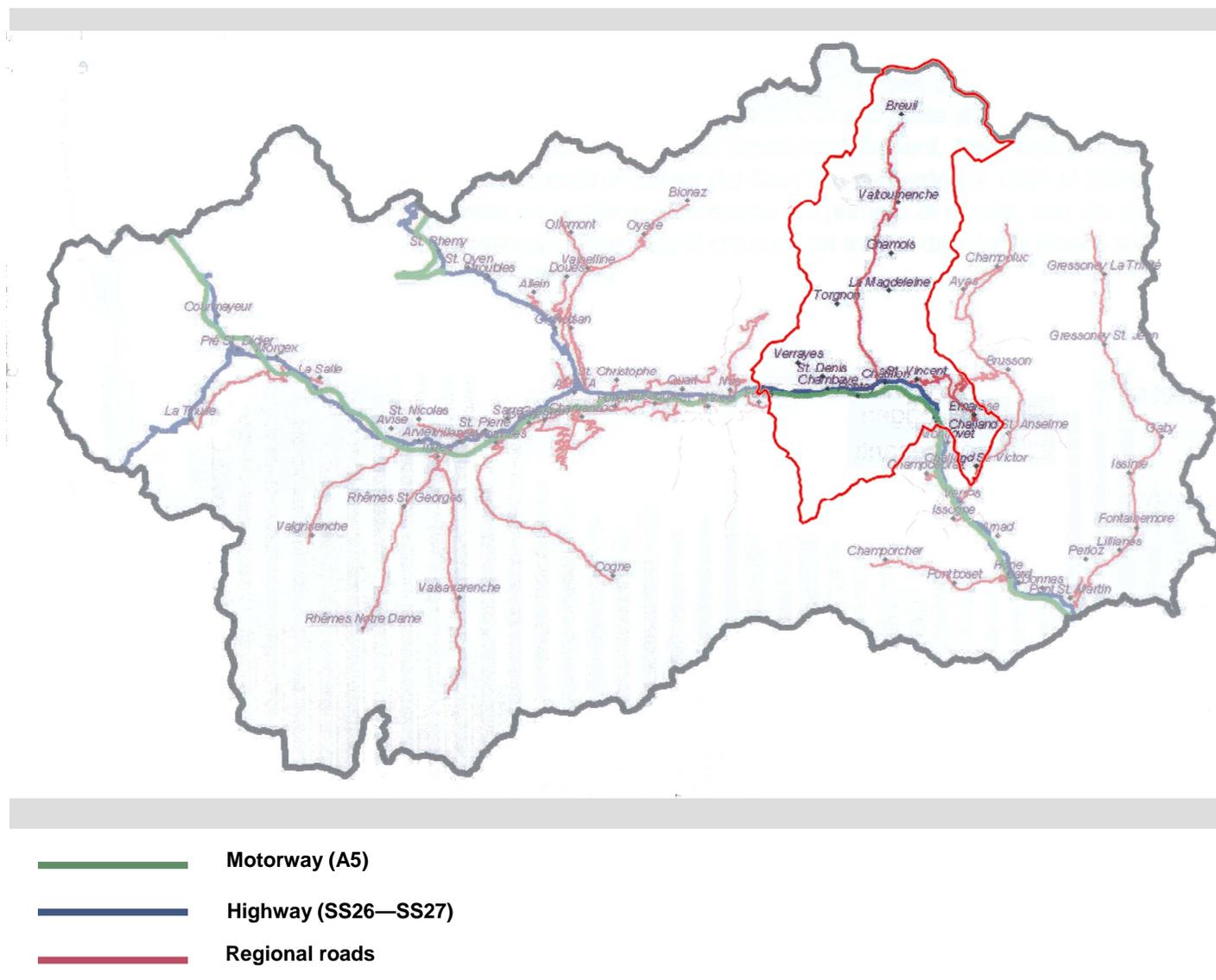


Figure 05 - Transportation network in the pilot area - Scale —

A.2 Urbanistic & energetic analysis of the pilot areas

Inter-municipal dimension

The selected territory is a mountain community: a local territorial institution established by the Italian law of the 3 December 1971, n. 1102 and now governed by art. 27, D. Lgs. 267 of the 18th August 2000 (Consolidation Act on Local Authorities). The mountain community is a public body with mandatory membership, constituted by order of the President of the regional government between mountain municipalities.

The Mountain Community Monte Cervino, as defined by its Statute updated in 2010, is a local body operating in an associated form and undertaking Municipal functions as well as providing basic services for the population and it represents the implementation tool of regional policies for the mountains. Among the various activities, the Mountain Community aims at human, social, cultural and economic development of its territorial area through a general policy of re-balancing and developing current and potential resources. Furthermore, it undertakes, in an associated form, functions that are a Municipal responsibility which, because of their technical and dimensional characteristics, cannot be undertaken by the Municipal Council in an optimum way. The Mountain Community, in collaboration with interested Municipal Councils, promotes and coordinates activities, undertakes works of interest to the district in the environmental, agricultural, economic, productive, commercial, tourist as well as the social, cultural and sporting sectors. The Mountain Community Monte Cervino groups 12 Municipal Councils that have different territorial, economic and infrastructural characteristics that make analysis stimulating and rich in important data that can be studied and compared.

A.2 Urbanistic & energetic analysis of the pilot areas

Relevance of the selected pilot area and first remarks to challenges and potentials

The Mountain Community Monte Cervino is constituted by a portion of territory which, thanks to the multiple characteristics of its territory and settlements, is profoundly representative of the Valle d’Aosta region and of that of the whole alpine chain. Shown below are the distinctive elements that distinguish the area and have thus been chosen for the description:

- **landscape and settlement type:** the Municipal Councils and the Mountain Communities are distributed across the territory that extends from the sub-region of the “Plaine” (Plain) to that of the “Montagne” (Mountain). The settlements, the urban, territorial and landscape structures of this area are numerous and diverse; from, for example, the analysis of a small mountain settlement, such as the Municipality of Chamois, to that of the Municipality of Saint-Vincent with its distinctive town-like characteristics. Within the pilot area different “local units” can be seen, as defined in the PTP, characterised by homogeneity and by a strong identity of place:
 - the “*adret*” (favourable sunny slope) of the central valley, which includes the Municipalities of Verrayes, Saint-Denis and Torgnon, is characterised by a particular relationship between the built settlement and the land destined for agriculture and livestock rearing. In these Municipalities rural systems, cultivated with vineyards can be seen located on small terraces of the slope, important “*villes*” (towns) and “*villages*” (villages) are situated on large grassy terraces with steep woods and there are also isolated assets of historical-documentary interest; In the strip of land of the high “*adret*” there are hollows with historical settlements even of notable size and their associated meadows with a dense network of historical itineraries and relevant signs of agricultural landscape (terracing, “*rus*”, etc.).
 - the Municipalities of Châtillon and Saint-Vincent, on the valley floor, are characterised by infrastructure, with traditional settlements and productive sprawl near the course of the della Dora Baltea river where it meets the Marmore stream; each of the two Municipalities have “*bourgs*” there are budding buildings and a notable urban expansion. Above the urban area, on the hillside, there is a series of well-preserved traditional settlements. Within this area, extending also onto the “*envers*” the (less favourable slope of the valley) are large wooded areas with few settlements, here the situations vary in their balance between the natural system and the pressure of human activities: from the diffuse critical situation in the urban areas where ecological corridors are becoming more and more rare, climbing the strip of hillside at Châtillon with its traditional microsystems, reduced number of transformations and natural elements that have not been altered much, to the specific critical situations due to human pressure and consumption in the hillside areas.
 - the lower reaches of the Valtournenche (Antey-Saint-André, Chamois, Châtillon, La Magdeleine, Saint-Denis, Torgnon, Valtournenche) are characterised by a tree-like structure where the trunk is represented by the Marmore stream the branches of which connect the other Municipalities. This section of the territory, with Antey-Saint-André at its centre, is distinguishable in different sections of the landscape: the valley floor is constituted by settlements with modest development connected to the traffic brought by the ski resorts higher up the valley; the branch of Torgnon is marked by settlements located on the terraces e slopes showing the agricultural landscape and altered by the sometimes incisive expansion of the tourist resorts that work through the two seasons, with ski slopes and ski lifts; the secondary branch develops higher up the mountainside, with valleys and hollows, it is characterised by glaciers, meadows and some traditional settlements; the left side of the slope has terraces with settled hollows, meadows and seasonal settlements, wooded areas and higher still up the mountainside there are grassy hollows and lake environments.

A.2 Urbanistic & energetic analysis of the pilot areas

The tourist sprawl around Torgnon, Antey-Saint-André, La Magdeleine, Chamois constitute a minor polycentric resort, where each centre connects to the valley independently. The local unit that covers the area from the Municipality of Valtournenche to the Matterhorn (Monte Cervino), at the head of the valley, is constituted by a strong contrast between nature and tourist resorts. The functional relations are concentrated in the two pole tourist resorts of Breuil Cervinia and Valtournenche, on the road axis that brings access to the area as well as to the requirements of the tourist resorts which from the settlements can take the tourists to the higher altitude resorts. Within this area 4 distinctive zones can be highlighted: the high altitude hollow of Breuil dominated by glaciers and affected by a large tourist resort which is highly urbanised; the area of Valtournenche, an important tourist resort characterised by traditional settlements located on terraces along the Marmore valley, by the historical centre of the town and by sites of natural and landscape interest; the left slope of the valley with terraces and hollows with extensive areas of equipped meadows; the high areas of the right slope with a network of meadows, a great resource for livestock rearing, with numerous well-preserved “*mayen*” (*mountain pastures*) still in use.

- **diversified economic sectors:** another factor that makes the area interesting is the variety of economic sectors that have developed there; in the Municipalities of the “Plaine” (plain) the industrial and service sectors emerge, while in the valley of Valtournenche the dominant sectors are agriculture, livestock-rearing and tourism. The array of sectors present in the intermunicipal area allow us to undertake specific evaluations on the diverse uses of land and resources, how they are used by the population, on the energy flows both in/out and on the future potential for intervention and development. Furthermore, the great tourist development present in some Municipalities of the area allows us to undertake some specific analyses on the hotel-accommodation sector, with an examination also of the residential sector regarding the discontinuous use of buildings used as holiday homes (compared to the continuous use of buildings by the resident population).
- **transport infrastructure:** the urban hub of Châtillon and Saint-Vincent, a regional pole for services, is an important place for exchange between the railway and road transport as well as a junction for the lateral valley of the Valtournenche. In fact, infrastructure for transport present in the area includes the national road n. 26 which branches at Châtillon into the regional road n. 46 which follows the lateral valley of Valtournenche; furthermore, the Municipality of Châtillon has both access to the Torino-Aosta Motorway as well as a railway station. Among the particular aspects of the transport system, the Municipality of Chamois must be highlighted as a village that cannot be reached by car. The presence of intermodal exchange hubs and the presence of diverse forms of transport and access to the Municipalities allow us to evaluate the current state of transport, identifying development potential of new forms of sustainable transport.
- **renewable energy systems:** within some Municipalities of the Mountain Community renewable energy systems have been installed (photovoltaic, wind energy and mini-hydroelectric systems, etc.) and some important initiatives have also been undertaken in the field of sustainable transport, energy-saving and energy efficiency.

A.2 Urbanistic & energetic analysis of the pilot areas

Possible capitalisation effects

One of the activities foreseen by the European project AlpBC is the capitalisation of the experiences and the results achieved in the course of other European projects. The present analysis undertaken on the whole region and in a more detailed manner on the pilot intermunicipal area has its roots in the data collected and elaborated in the European project **AlpHouse**, *Alpine building culture and ecology* and it adopts the methodology of that project. The studies undertaken by the various project partners of the AlpHouse project regard the theme of energy requalification of existing buildings and led the Valle d'Aosta to collect numerous good practices and transnational experiences that need to be disseminated throughout the regional reality. The production of the publication “*Quaderno per il recupero energetico - Raccolta di casi studio per interventi sul patrimonio edilizio tradizionale*” (Workbook for energy recovery – Collection of case studies on the tradition building stock) allowed us to start from the examples identified in AlpHouse, concluding in a collection of building techniques present in traditional buildings and the different techniques available for energy optimisation. The AlpBC project is presented as the next step: the study that will be undertaken will be at intermunicipal level and the drafting of the energy balance of the area, will highlight important considerations on the state of conservation of the building stock, on the potential regarding requalification and on the various solutions of intervention for energy optimisation. In this phase, therefore, the results obtained in AlpHouse will be very important. The contents of the workbook for energy recovery will be further developed and elaborated in the AlpHouse center, through the organisation of training days aimed at professionals and local companies, with a view to develop local know-how, and also to develop a short local production cycle in the construction sector. Other important European projects that AlpHouse aims to capitalise on are the following:

- **ALPenergy_ Virtual Power System e Smart Grid applicate allo Spazio Alpino** (Alpine Space Programme 2007-2013): the project, which ended in December 2011, had as its objective the analysis, project design and development of new virtual supply systems (VPS), for intelligent management of the electricity network in mountain areas. In the territorial area of Saint-Denis a pilot project was undertaken with the implementation of the concept of Virtual Power System, through the sampling of the electricity consumption data of public and private building as well as data of electricity produced by the photovoltaic systems and the mini-hydroelectric systems present in the Municipality, in the context of the rational use of energy produced by renewable sources.
- **Renerfor** (Alcotra 2007-2013): the strategic project Renerfor, which ended in March 2013, had the objective of promoting cooperation initiatives for the development of renewable energy sources (wood and water), energy saving and the reduction of greenhouse gases in the cross-border territory between Italy – France. During the project an analysis of the current situation in each country area was undertaken regarding the exploitation of renewable energy sources, the study and the hypothetical development scenarios according to estimates of potential. Furthermore, the project focused attention on forestry resources, analysing the potential for the development of the production cycle as well as defining common methodologies to support planning, as well as the hydroelectric resource with particular reference to the analysis of the environmental aspects and the authorisation criteria for the systems.

A.2 Urbanistic & energetic analysis of the pilot areas

Expected impact based on stakeholder constellation

The activities foreseen in the AlpBC project have different objectives with the involvement of and raising awareness of numerous stakeholders. One of the main activities foreseen for the Mountain Community Monte Cervino is the drawing up of the energy balance of the pilot area; from the definition of the strong and weak points of the current situation, it will go on to the development of an integration strategy for urban planning using the concepts of energy efficiency and building culture. The results achieved will be made available to local administrators in the form of guidelines and technical indications. One of the main objectives is to make the local administration aware of the current state of energy consumption within the Municipal territory, to show the potential for development and optimisation of the use of resources and energy efficiency as well as the interventions possible at Municipal level and above to enhance the value of the territory.

Another important activity will be carried on in the context of the AlpHouse Center which foresees two main activities: a consultation desk with the theme of energy requalification of tradition buildings for the general public, companies and professionals with the organisation of training days to exchange experiences in the energy field. Through the organisation of a conference, the Participative Symposia, the results of the project will be disseminated among all the local regional administrators, as well as all the players involved in the sector and the general public.

The methodology desired, useful for achieving valid results which are applicable to real-life, foresees a close collaboration with local administrators. In fact, sharing the experience is very important, not only in the phase dedicated to sharing results and action strategies, but also, initially, in the phase dedicated to undertaking the analysis, the energy balance and during the development of the strategy, comparing the results with the effective needs, problems and ideas for intervention that an administrator can offer with a deep knowledge of his/her own territory.

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.2 - Basic analysis and data of the pilot area

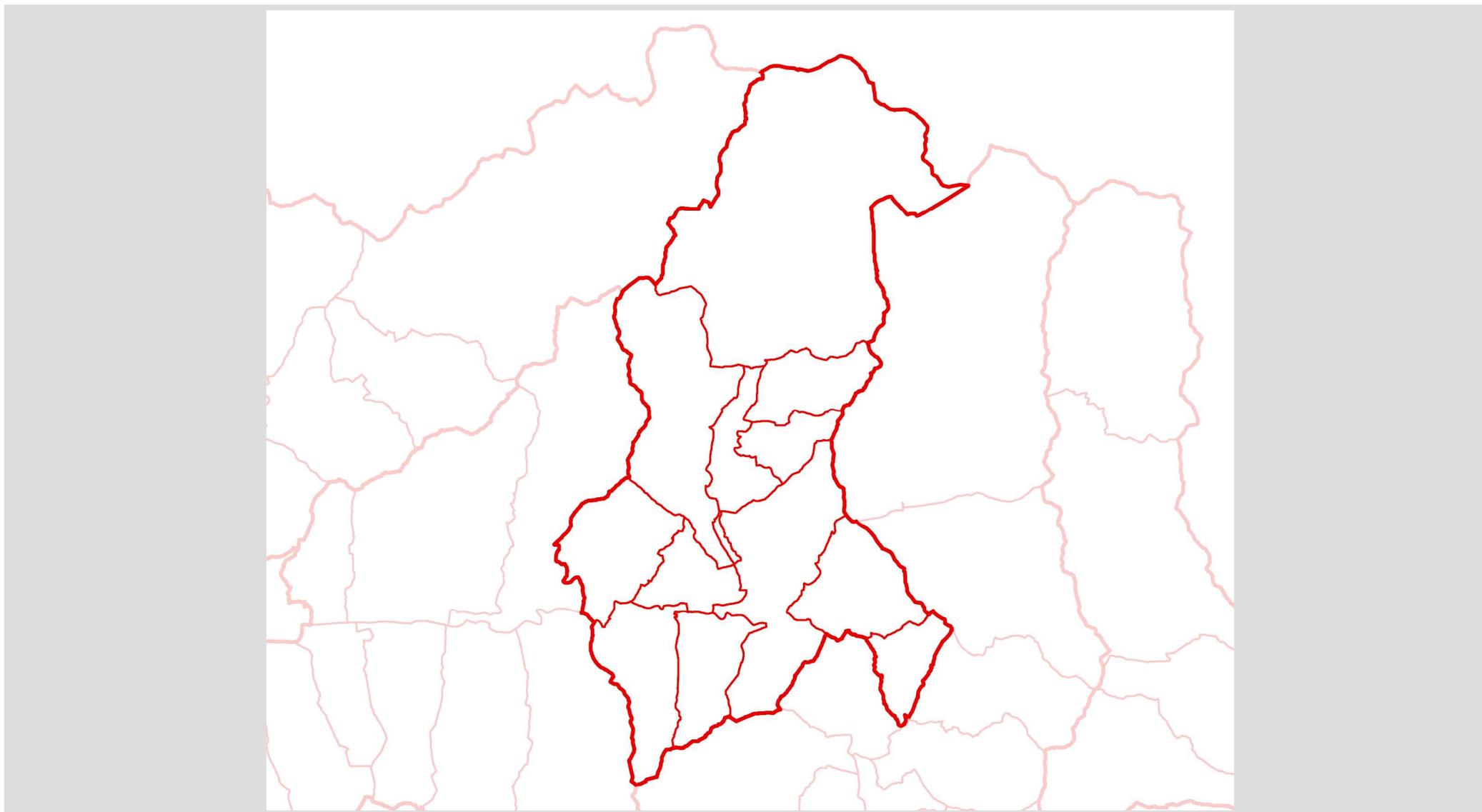


Figure 06 - Map of the pilot area Municipalities - Scale 1:250000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Antey-Saint-André
Area (km ²)	11,8
Inhabitants/km ²	53,05
Population 2011	626
0-19	117
20-29	64
30-59	281
60 or older	164
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 02 - Basic Data

Short description

Antey-Saint-André is the first Municipality in the Valtournenche, the ancient “*Val Tornenchia*”, which rises from Châtillon and goes as far as the Matterhorn (Monte Cervino), it is marked by the route of the Marmore river. The Municipality, situated at 1,074 metres above sea level, is an important tourist resort which has a mild climate as it is sunny and protected from the wind; the natural landscape is dominated by vast pastures overlooked by conifer woods, with a very suggestive view of the Matterhorn. Within the Municipality there is an electricity power plant that exploits the water of the Marmore river which was built and came into use in 1926. The village, made up of numerous hamlets, has ancient origins which date back to the pre-Roman era. The Parish church, in Romanesque style, is dedicated to Saint Andrew, the Patron Saint; its bell-tower is built upon the remains of one of the towers of the castle of Cly (belonging to the House of Challant) to which the barons of Antey belonged until the 13th century, they successively passed under the House of Savoy who then had control of the area, as it which was on an important communication route to “Colle del Teodulo” (Theodul Pass) that leads to the Vallese region in Switzerland. The “*ru du pain perdu*” is an interesting ancient aqueduct that dates back to the 16th century which carried water from the Marmore river towards the fields of the mid-valley area, the majestic arches of the aqueduct running flush to the mountainside are clearly visible both from the Municipality of Torgnon and from the opposite slope of the mountainside.

Within the Municipality there are numerous historical settlements and “raccards”, traditional buildings in stone and wood. Antey-Saint-André, which was once a typical mid-altitude mountain village, today has become a prestigious tourist resort, especially appreciated during the summer season.

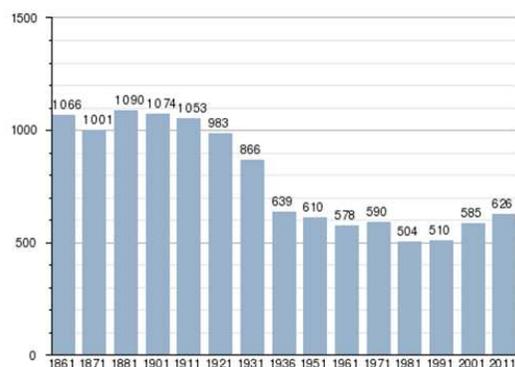


Table 03 - Chart of population development 1861-2011

A.2 Urbanistic & energetic analysis of the pilot areas

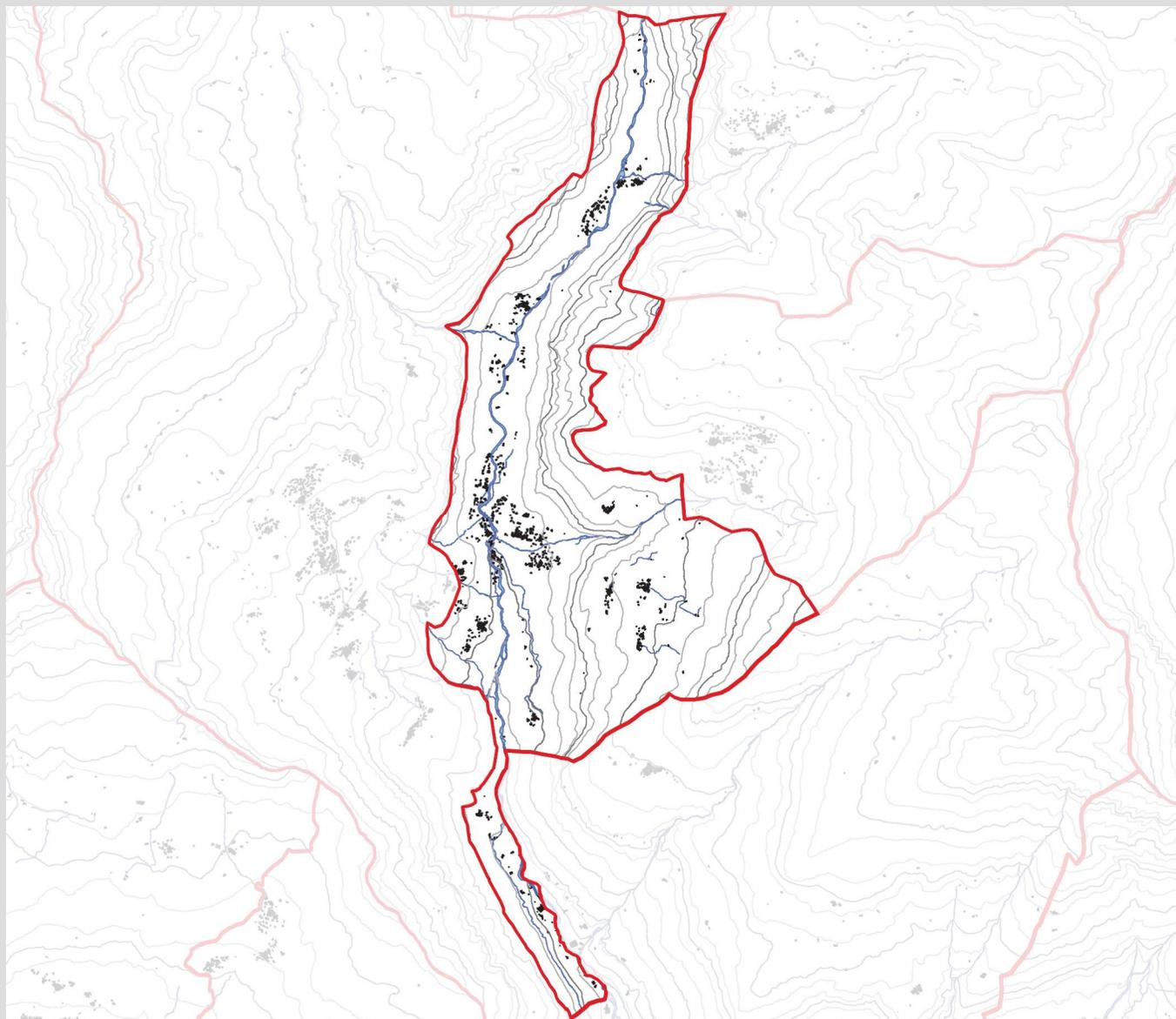


Figure 07 – Antey-Saint-André – Map of settlements and isohypses – Scale 1:60000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Chambave
Area (km²)	21
Inhabitants/km²	44,71
Population 2011	939
0-19	166
20-29	95
30-59	400
60 or older	278
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 04 - Basic Data

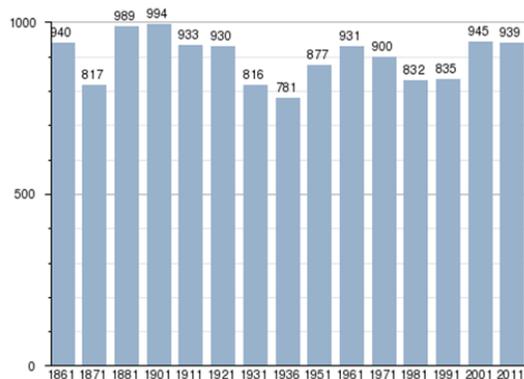


Table 05 - Chart of population development 1861-2011

The Municipality of Chambave is situated in the central valley at an altitude of 486 metres above sea level; the municipal territory, characterised by a specific micro-climate with very little rainfall, extends on the right bank (*adret*) as well as on the left bank (*envers*) of the Dora Baltea. The “*adret*”, goes to an altitude of 800 metres above sea level with land that has been cultivated with vines since antiquity and from which some of the most famous wines of the Valle d’Aosta are produced. The “*envers*”, reaches, with the peak of Mont Avic, 3,006 metres above sea level; on this slope of the mountain the land is given over to meadows and chestnut groves up to an altitude 800 metres, above which there are conifer woods.

Most surely inhabited in the distant past, Chambave conserves traces of its Romanesque roots in its remains and place names. The Parish church of San Lorenzo (St. Laurence) dates back to medieval times, already mentioned in 1100; of this Romanesque church only the lower part of the bell-tower remains, while the current church dates from the mid. 18th century. Initially the village centre of Chambave was situated slightly west of its current position, in the place known as Champagne (which is now part of the Municipality of Verrayes), but a flood destroyed it towards the end of the 11th century. The new village centre was then built on the present location and it became an important centre for trade, as a marketplace and fairground, Chambave was an important trading post thanks to its position on the Roman road to Gaul and because of its role as seat of the Lords of Cly. From the 1300s onwards Chambave began to be renowned for its vineyards and wine production. Among the most interesting villages to note is *Chandianaz*, near which there is a S.I.C. (Sito di Importanza Comunitaria – Site of Community Importance) rich in plant species with steppe origin and a unique site in the Valle d’Aosta for the large number of orchids that grow there.

A.2 Urbanistic & energetic analysis of the pilot areas

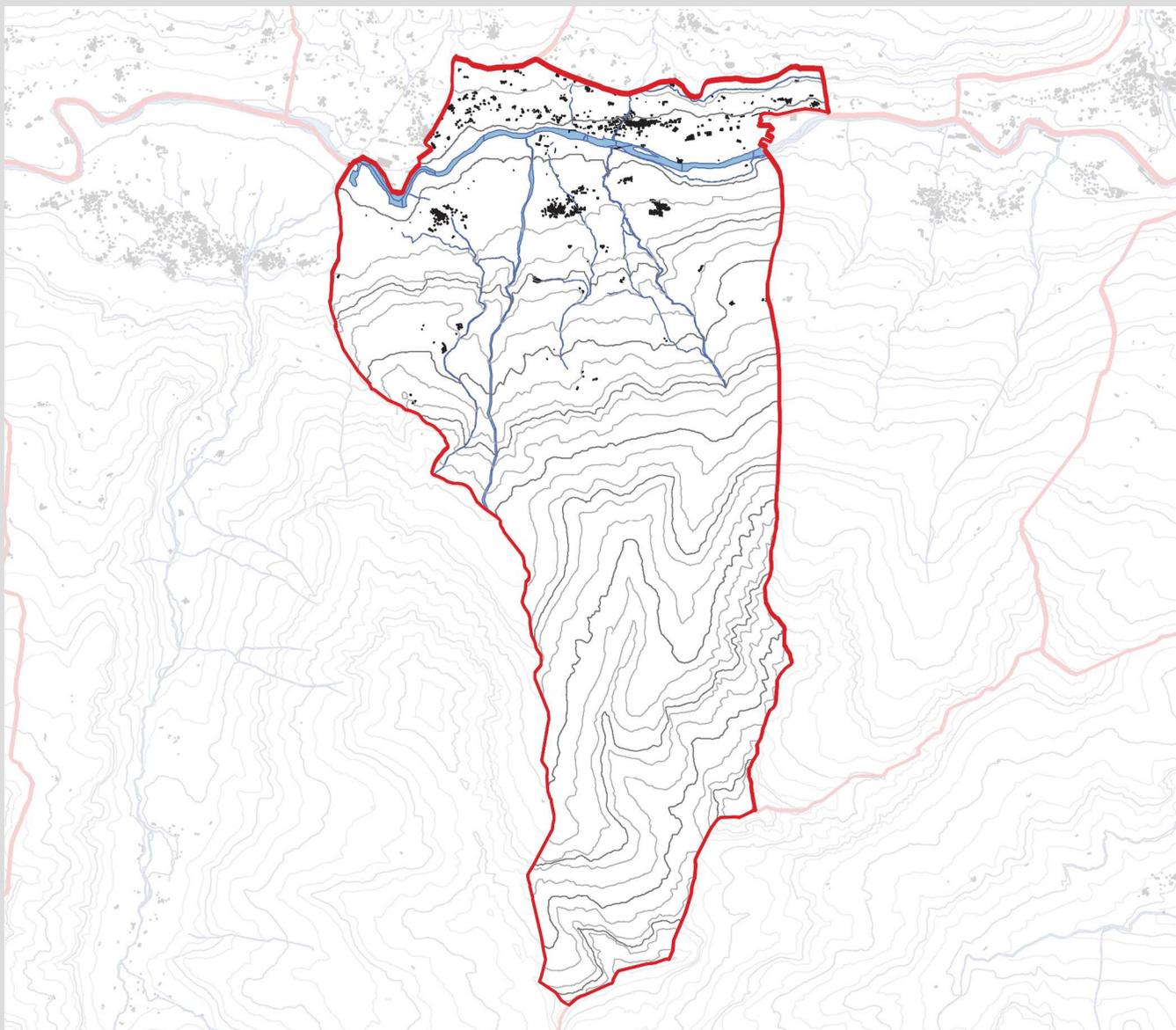


Figure 08 – Chambave – Map of settlements and isohypses – Scale 1:60000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Chamois
Area (km²)	14
Inhabitants/km²	6,71
Population 2011	94
0-19	11
20-29	6
30-59	43
60 or older	34
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 06 - Basic Data

Chamois, situated at 1,815 metres above sea level, is found on the left side of the Marmore river, in the middle of the valley that has the Matterhorn at its head, this Municipality is the highest in the Valle d'Aosta and one of the highest in Italy. Today it is connected to the valley floor by means of a cable car that starts at Buisson (Antey-Saint-André); alternative ways of reaching the village are via the twisting mule track “Les Seingles” which can be accessed on foot or via the path called “percorso energia” (energy path) that starts in the Municipality of La Magdeleine and is accessible on foot or by bicycle through a “bike sharing” service. No vehicles circulate in the village of Chamois, in fact, in 2006 it was designated as “Perla delle Alpi” (Pearl of the Alps) and it belongs to a constellation of locations throughout the Alps that brings together mountain areas which are amongst the most beautiful in Europe that are united in the common aim of promoting territorial protection and car-free transport.

Chamois was not inhabited in the pre-Roman and Roman eras, notwithstanding the fact that numerous traces of prehistoric and protohistoric settlements have been found in the Valtournenche. Probably the first colonisers settled in the area in a stable manner during the early Middle Ages, when progressive population expansion after the year 1000 provoked the breaking up and population of wide areas that were previously uninhabited or exploited only seasonally for transhumance.

In the 14th century Chamois was a fief of the House of Challant-Monjovet: which constituted an anomaly as all the other villages of the Valtournenche belonged to the Lords of Challant-Cly. The village has maintained all the characteristics of a small alpine village, with historic traditional architecture in wood and stone and narrow roads that pass through the village. Tourism is the main activity; in winter the ski resort of Chamois offers slopes for alpine skiing that are over 16 km in length.

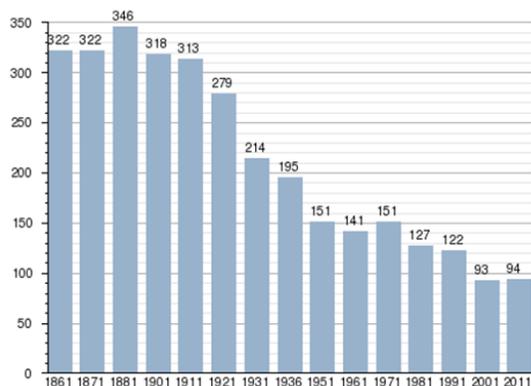


Table 07 - Chart of population development 1861-2011

A.2 Urbanistic & energetic analysis of the pilot areas

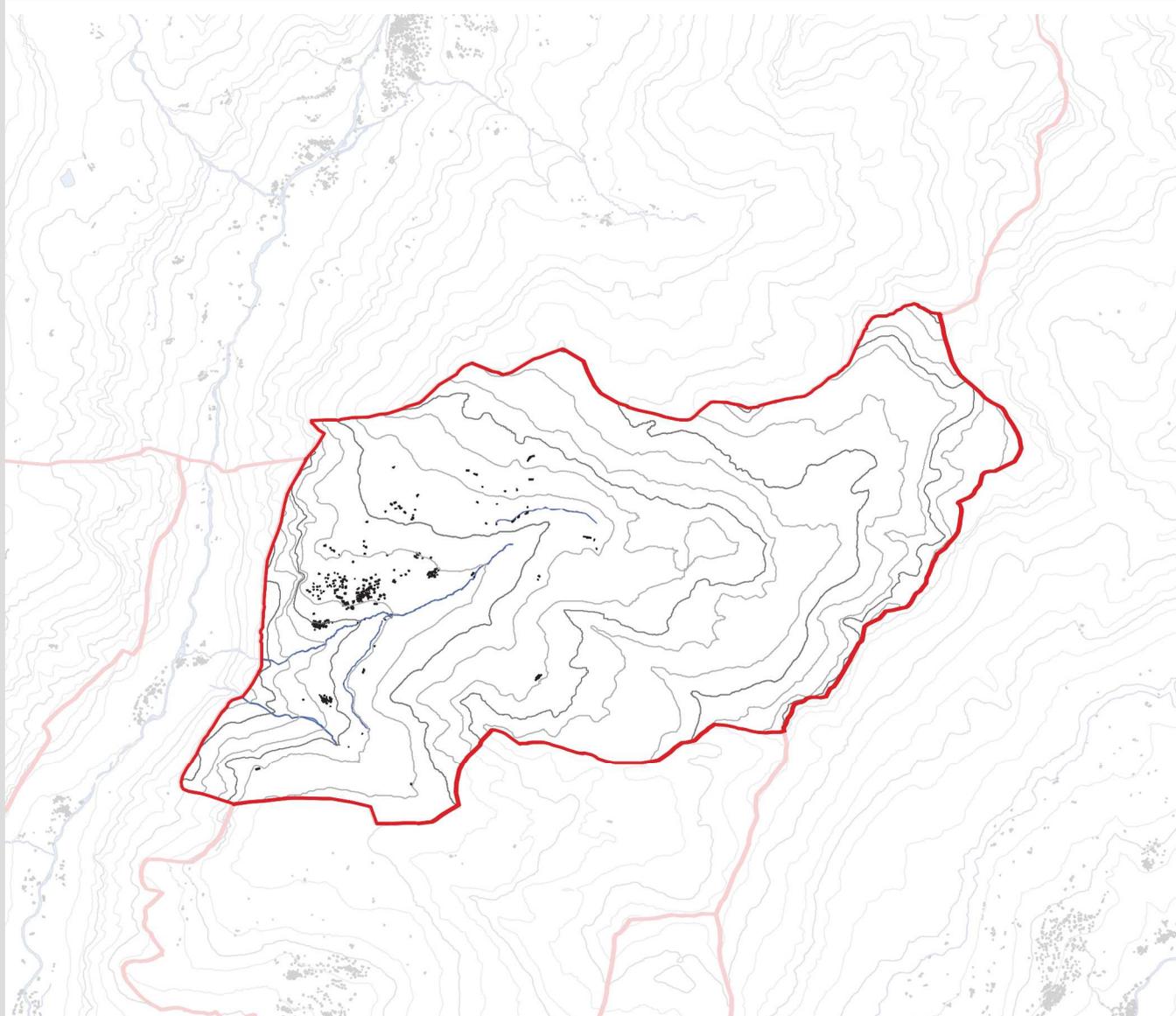


Figure 09 – Chamois – Map of settlements and isohypses – Scale 1:50000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Châtillon
Area (km²)	39,77
Inhabitants/km²	124,37
Population 2011	4946
0-19	892
20-29	471
30-59	2197
60 or older	1386
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 08 - Basic Data

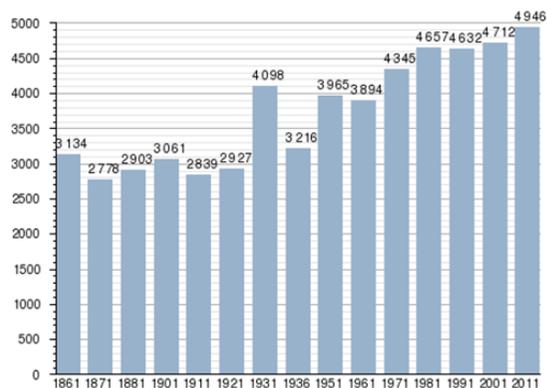


Table 09 - Chart of population development 1861-2011

The Municipality of Châtillon is situated in the central valley of the region, at 549 metres above sea level, at the point of confluence with the Valtournenche, and it extends onto an ample dell along both sides of Dora Baltea and the Marmore rivers. Monte Zerbion and the Tantané to the north, Monte Barbeston and the Lyan to the south are the peaks that delimit the vast territory of Châtillon. The slopes of the "adret" and the flanks of Monte Zerbion are covered with alpine meadows, pastures and villages. On the "envers" side, along the slopes of Monte Barbeston, deciduous and coniferous forests dominate and protect ancient villages. Châtillon was already inhabited in pre-Roman times, and the area, in the Middle Ages, became a fief of the House of Challant, who left important traces, and on their bequest two castles were built: the first, is today property of the Passerin d'Entrèves Counts, was built around the middle of the 13th century, while the second castle, Ussel, was built in 1350. A third castle, which belong to Baron Gamba was built in 1901. The village centre guards a group of buildings that date back to the 16th and 17th centuries and in some villages the rural settlements and numerous medieval towers (Conoz, Néran, La Tour) are still visible and well-preserved. The role of Châtillon as an industrial centre began to develop in the 14th century, with the exploitation of the iron mines in Ussel, which reached their maximum output in the 1700s. As well as the metal industry, Châtillon has a great tradition in the textile industry (notably the company "Soie de Châtillon", founded in 1917, then renamed "Società Anonima Italiana per le Fibre Tessili Artificiali S.p.A"., specialised in the production of man-made fibres) as well as the manufacturing sector. Throughout the centuries Châtillon has also occupied a role as a trade hub, because of its geographic position at the beginning of the Valtournenche, its frequent exchanges with the Vallese region in Switzerland through the Theodul Pass. Châtillon is also a tourist resort rich in historical, artistic and landscape attractions. Over the past thirty years there has been a notable amount of building development that has extended, fan-like, over vast areas of the hillside and "plaine" (plain).

A.2 Urbanistic & energetic analysis of the pilot areas

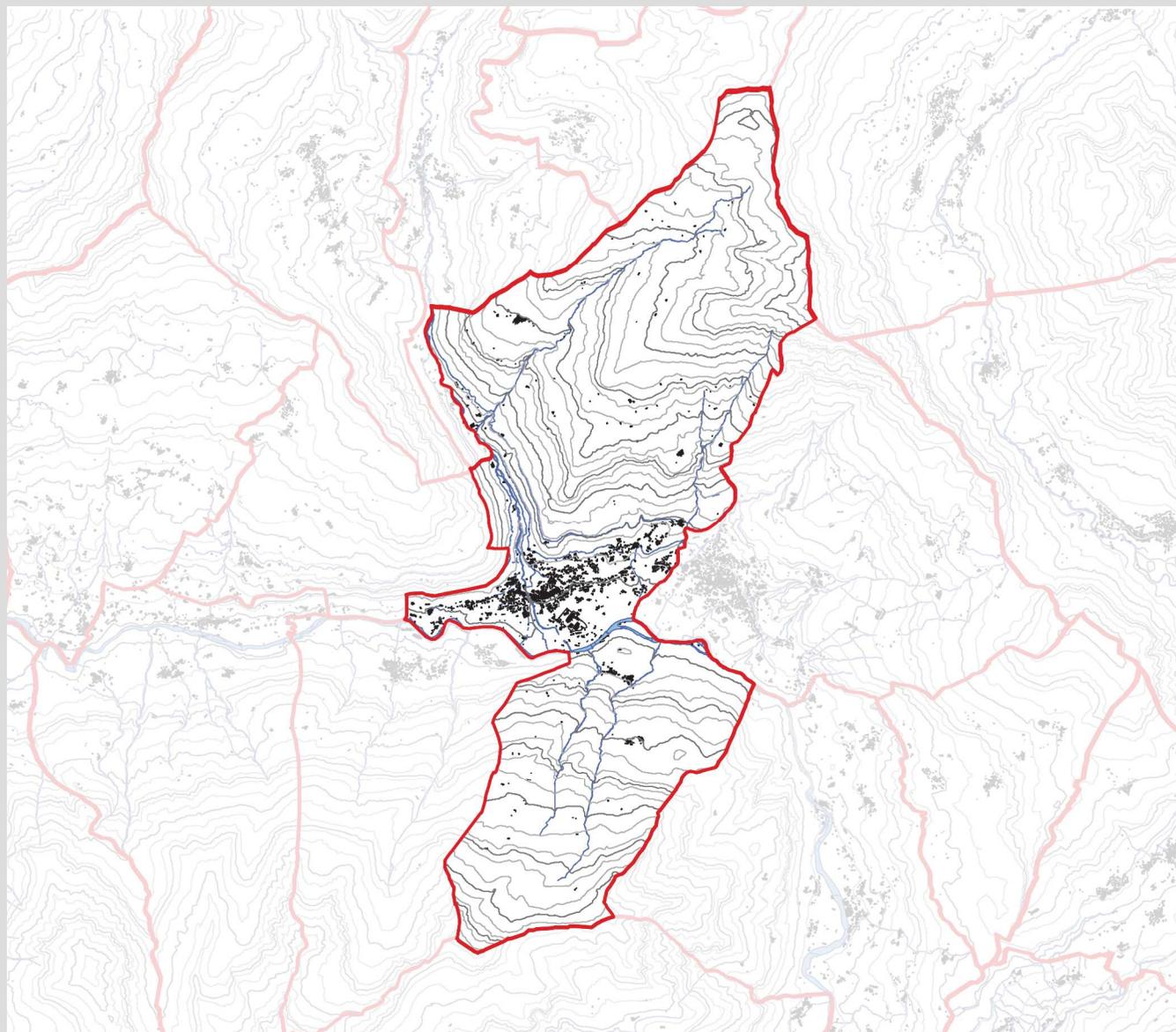


Figure 10 – Châtillon – Map of settlements and isohypses – Scale 1:100000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Emarèse
Area (km²)	10,06
Inhabitants/km²	22,17
Population 2011	228
0-19	45
20-29	21
30-59	95
60 or older	67
People in paid work	
Main economic sectors	
Number of SMEs of the	

Emarèse is a small Municipality at 1040 metres above sea level, it sits in a wide dell overlooking Saint-Vincent, in a sunny spot sheltered from the wind. From Emarèse it is possible to admire the peaks of the Becca di Viou and of the Mont Torché, the imposing mountain chain that stretches from the Rosa dei Banchi to Mont Emilius and the Ruitor, and finally with a view of Mont Blanc. While towards the lower reaches of the valley it is possible to admire the Municipalities of the Central Valley.

From the mid. 1700s Emarèse began to be known for its gold and asbestos mines and until the 1970s the local economy was influenced by asbestos processing at the Società Italiana Amianto. On the municipal territory, in addition to the quarry, there is the mine dump of inert materials containing asbestos; in 2011 the plan for reclamation and safety of the main site Chassan-Settarme was approved, it is now awaiting implementation. Today, one of the main economic activities is agriculture. At the Col di Joux, not far from the centre of the Municipality, it is possible to continue along the road over the mountain and down into the Val d'Ayas. Moreover, at Col di Joux there are some ski lifts that during the winter season are used for alpine skiing, there is also a cross-country ski trail.

Table 10 - Basic Data

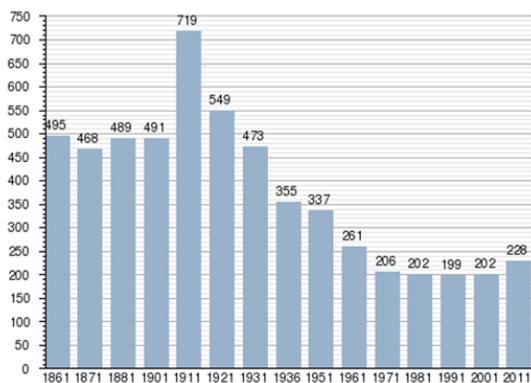


Table 11 - Chart of population development 1861-2011

A.2 Urbanistic & energetic analysis of the pilot areas

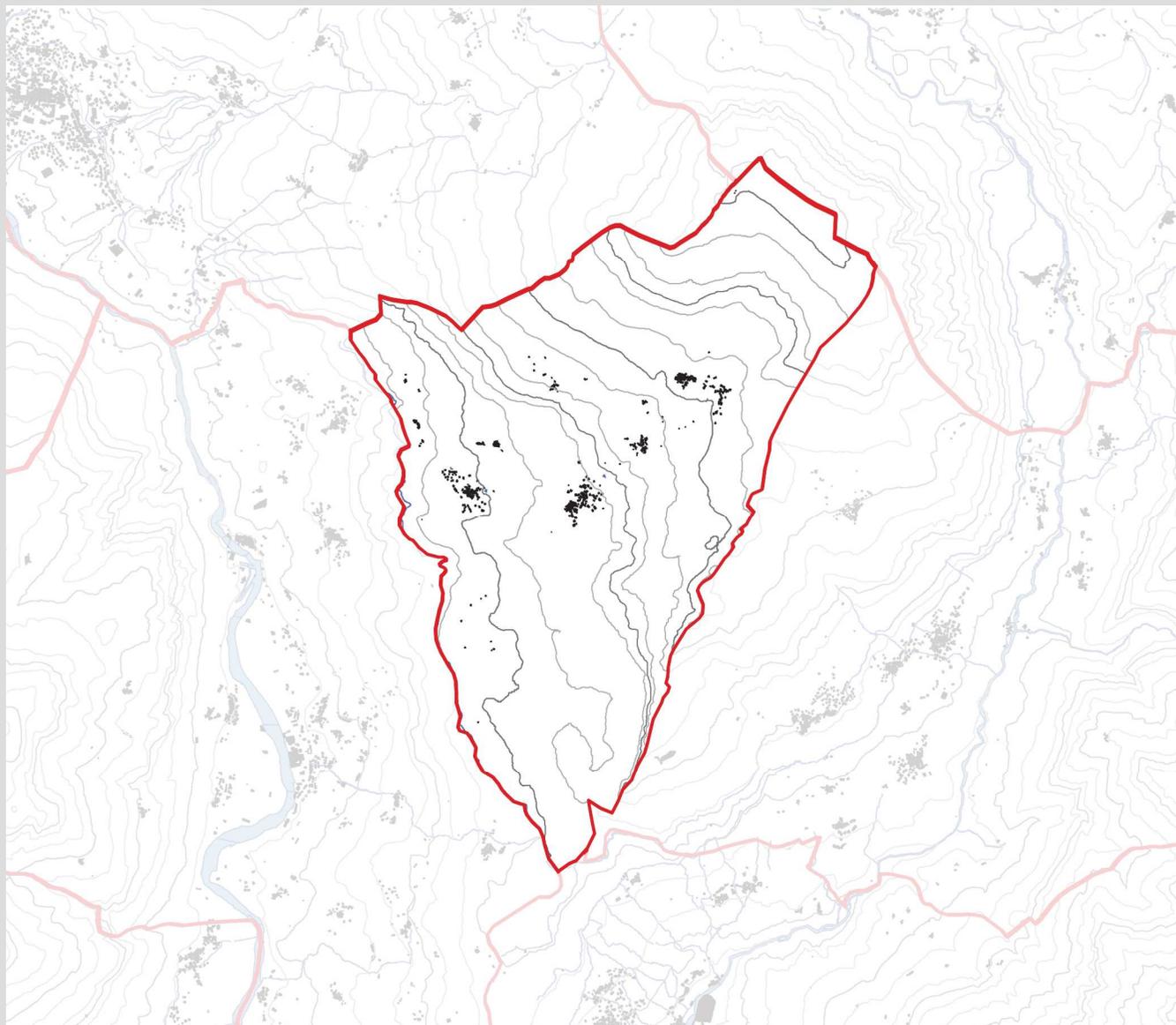


Figure 11 – Emarèse – Map of settlements and isohypses – Scale 1:50000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	La Magdeleine
Area (km²)	8
Inhabitants/km²	14,5
Population 2011	111
0-19	19
20-29	9
30-59	53
60 or older	30
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 12 - Basic Data

La Magdeleine is located at an altitude of 1,644 metres above sea level on a panoramic moraine terrace, on the left bank of the Marmore river, in the middle of the Valtouranche; it is one of the smallest Municipalities in the Aosta Valley, an interesting example of mountain urban planning. In fact, it is a group of five small “hameaux” (hamlets) made up of wood and stone architecture, simple and harmonious, built on a human scale and linked to the surrounding environment. The historical centre of the “hameau” (hamlet) of Vieu is one of the more characteristic and interesting examples of mountain settlements in the Aosta Valley, due to the layout of the buildings and because their structure is based on the working needs of those times.

In the Municipality of La Magdeleine there are eight mills, powered by the water of a small stream, which date back to the eighteenth century; guided tours along the “sentiero dei mulini” (mill path) allows the discovery of the various buildings and their functions. Furthermore, there are some bread ovens that are still working as well as several interesting chapels.

The presence of archaeological finds, discovered at an altitude of more than 2,000 metres on the flank of Monte Tantané suggests that the site was already in use during the early Iron Age. In the Middle Ages La Magdeleine was under the Lords of Cly and it was economically linked to Châtillon.

During the winter season La Magdeleine is a small ski resort, equipped with easy slopes and a cross-country ski trail.

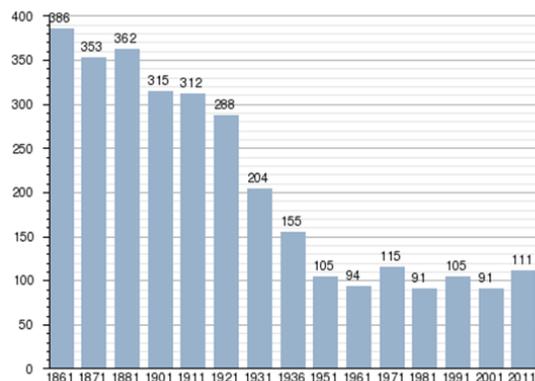


Table 13 - Chart of population development 1861-2011

A.2 Urbanistic & energetic analysis of the pilot areas

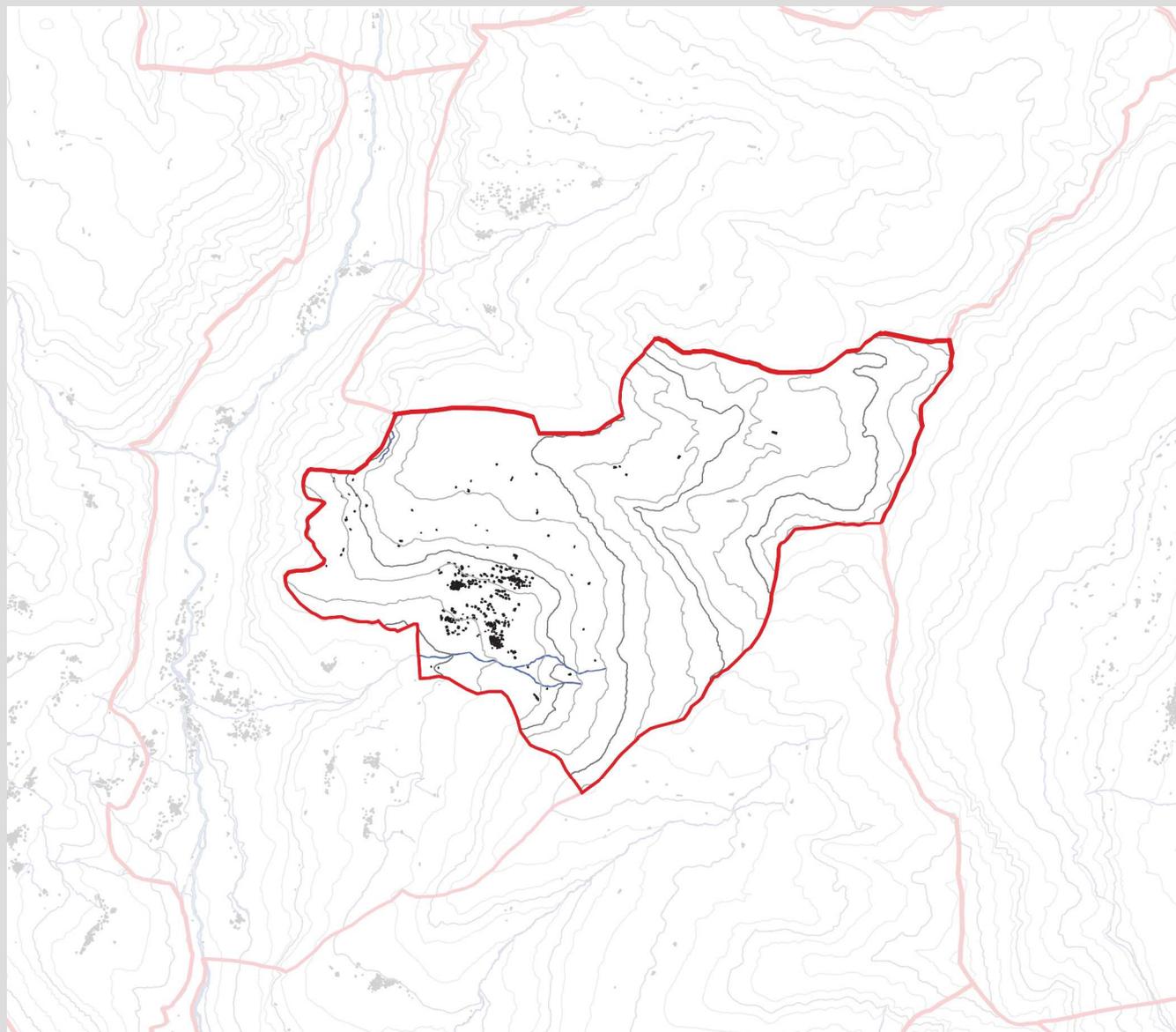


Figure 12 – La Magdeleine – Map of settlements and isohypses – Scale 1:50000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Pontey
Area (km²)	15
Inhabitants/km²	55,67
Population 2011	818
0-19	177
20-29	83
30-59	369
60 or older	189
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 14 - Basic Data

Pontey, located at 523 metres above sea level, is the only Municipality in the Mountain Community entirely placed on the right bank of the Dora Baltea river, at the foot of Monte Barbeston and Mont Ruvic, it lies directly opposite the Municipalities of Châtillon and Saint-Denis. The territory includes the basins of the Molinaz, Eau-Noire and Vau rivers. Low down on the mountainside, along the Dora Baltea river, there are meadows alternating with the industrial and artisanal area, at a mid-level on the mountainside there are numerous settlements, and on the higher level forests cover the mountainside up as far as the glacial threshold of the Valmeriana, where an alpine landscape appears. The architecture of some villages shows the traces of ancient buildings and there are still some "raccards". This Municipality has very ancient origins and owes its name to the Romans, who called it "Ponticulus", (little bridge), probably because of a construction of this type that characterised the village, but of which today there is no trace.

Pontey is considered one of the typical villages of the "envers" of the Aosta Valley. In fact, the position of the village on the right bank of the central valley means that the area is subject to a microclimate different from the other villages located on the left bank. During the winter the mountains on which the village is built create a shadow over the Municipality for 2 months, from 20 November to 30 January the village is without direct sunlight and for this reason the temperatures are lower. However, during the summer season the sun rises earlier than the "adret" side and sets later. In the municipal area are still some quarries of serpentine in business and two hydro-electric plants have been installed.

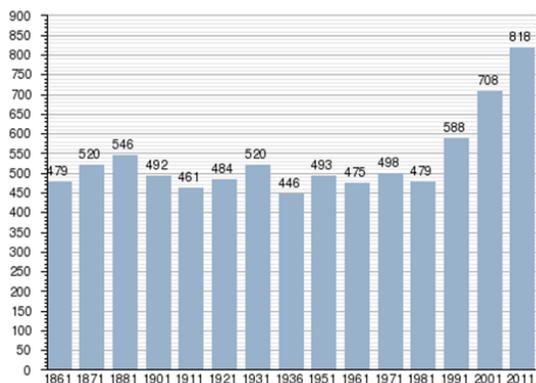


Table 15 - Chart of population development 1861-2011

A.2 Urbanistic & energetic analysis of the pilot areas

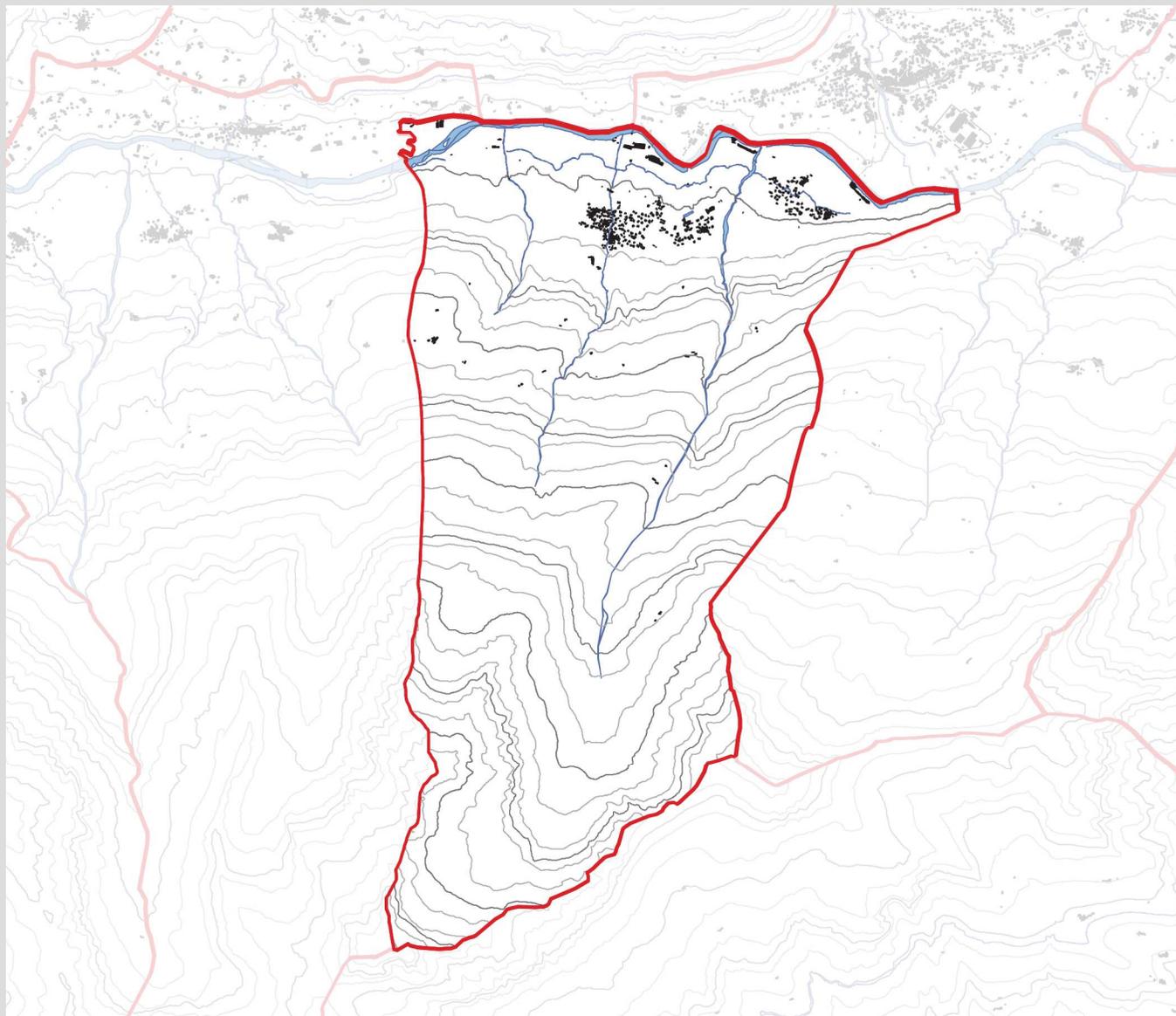


Figure 13 – Pontey – Map of settlements and isohypses – Scale 1:50000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Saint-Denis
Area (km²)	11
Inhabitants/km²	33,55
Population 2011	382
0-19	76
20-29	32
30-59	179
60 or older	95
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 16 - Basic Data

Saint-Denis is located on a wide sunny dell, on the "adret" of the central valley of the region, on a real terrace on the left bank of the Dora Baltea river, at 809 metres above sea level., The fortification of the castle of Cly is on a rocky spur near the village centre.

Saint-Denis was probably already inhabited in the late Neolithic period and during the Roman times it was a transit zone also dedicated to wine cultivation. The territory of the Municipality of Saint-Denis developed greatly from the Middle Ages onwards when the area was ruled by the House of Challant and from 1376 it was ruled directly by the Counts of Savoy. Around the middle of the XVII century, the Lord of Cly abandoned the manor, decreeing its decline, after having built a new manor in the lower village of Chambave.. Since then, thanks also to the presence of "rus", the irrigation canals that bring water from glaciers to the arid areas, livestock rearing, initially sheep and goats and later on cattle has become the main economic activity of the local population along with vine cultivation. In recent years, also thanks to sustainable development strategies, Saint-Denis has been developing activities that include the development of local potential according to the demands of modern tourism, enhancing historical buildings and the natural features of the area. To witness its flourishing agricultural past there are still numerous mills and bread ovens found in the Municipality.

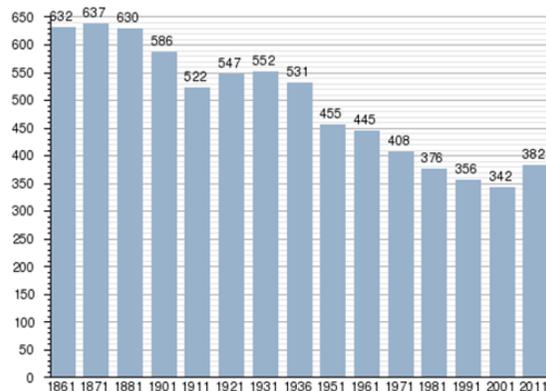


Table 17 - Chart of population development 1861-2011

A.2 Urbanistic & energetic analysis of the pilot areas

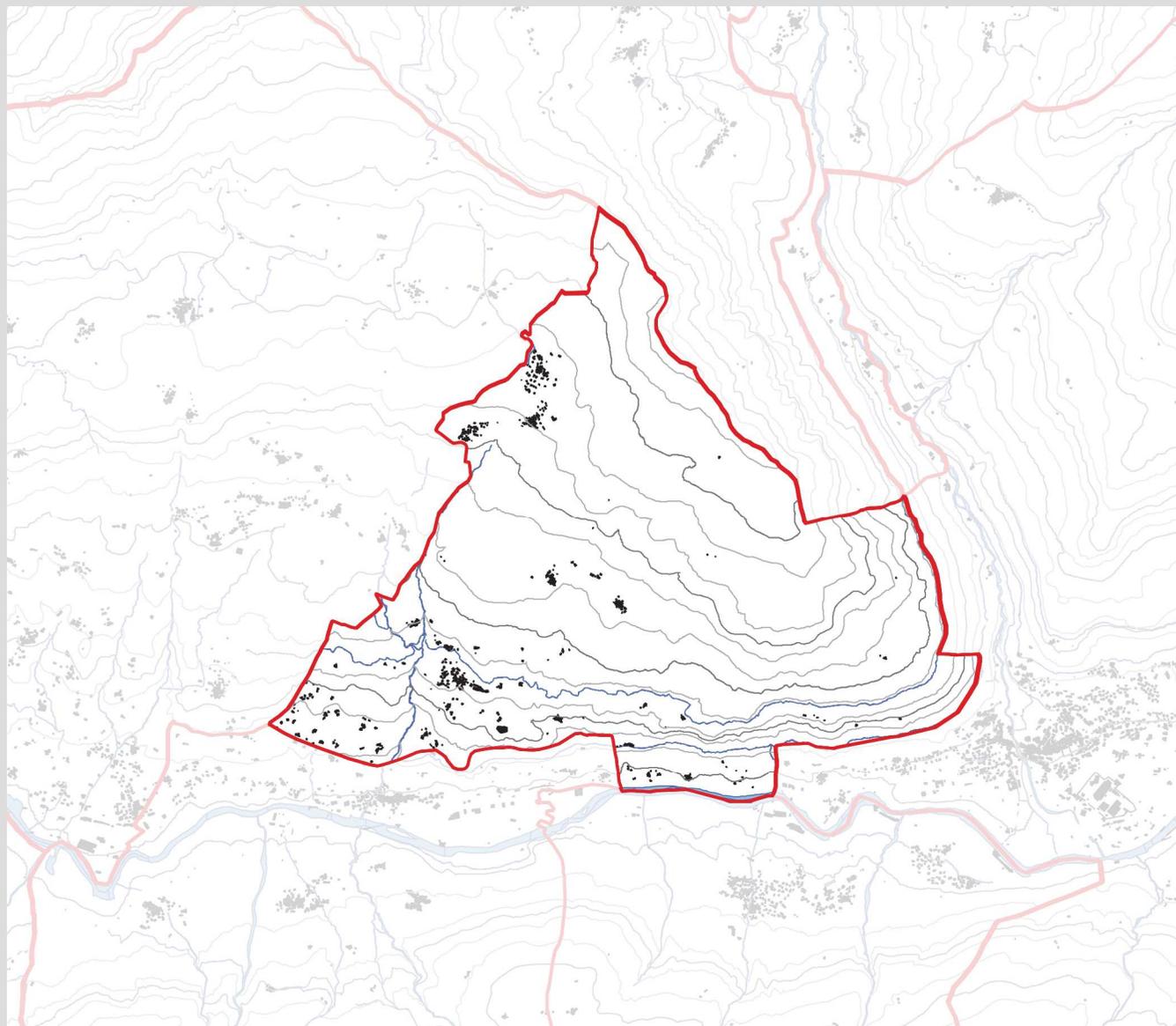


Figure 14 – Saint-Denis – Map of settlements and isohypses – Scale 1:50000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Saint-Vincent
Area (km²)	20,81
Inhabitants/km²	230,03
Population 2011	4654
0-19	738
20-29	416
30-59	2113
60 or older	1387
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 18 - Basic Data

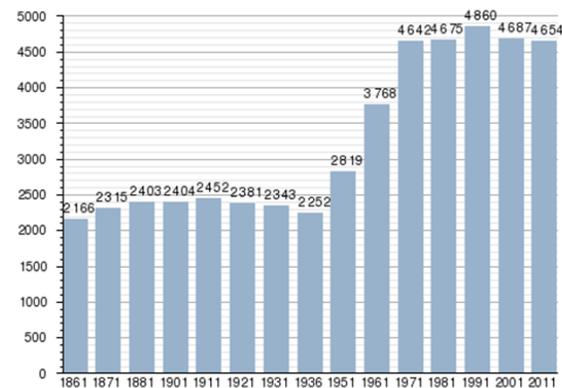


Table 19 - Chart of population development 1861-2011

Saint-Vincent is situated in a wide dell on the left bank of the Dora Baltea river at 575 metres above sea level, in the stretch of valley between Monte Zerbion and the “ Testa di Comagna”. The territory of Saint-Vincent is situated in the exact stretch where the valley bends at a right-angle towards the south; its slopes are opposite two valley openings, which increase the light and lower the horizon. Within the municipal territory there are several groups of hamlets distributed over the mountainside from an altitude of 400 metres a.s.l up to 1,600 metres a.s.l. Saint-Vincent enjoys a particularly mild climate, such to be defined as “la Riviera delle Alpi” (the Riviera of the Alps) and it is one of the most renowned resorts of the Valle d’Aosta. As well as the archaeological testimony from the pre-Roman era, there is also the Romanesque church of “San Vincenzo” (St. Vincent), built by Benedictine monks in the 11th century, with its museum of sacred art that has rare and precious objects..

In 1770 a naturalist abbot discovered the properties of the “Fons Salutis”, a spring of water with therapeutic properties; the spa started the tourist development of the village, thanks also to the construction of the road called the “Monjovetta”. In 1947 to further support the tourist attractions on offer the Casino de la Vallée was opened, it is one of the most famous and one of the largest casinos in Europe.

Even in summer the particularly favourable climate and a rich natural heritage encourage the exploration of numerous paths and tracks through the green landscape and among the villages perched on the slopes to discover their common characteristics, among which the ancient buildings in wood and stone, chapels, bread ovens and mills.

A.2 Urbanistic & energetic analysis of the pilot areas

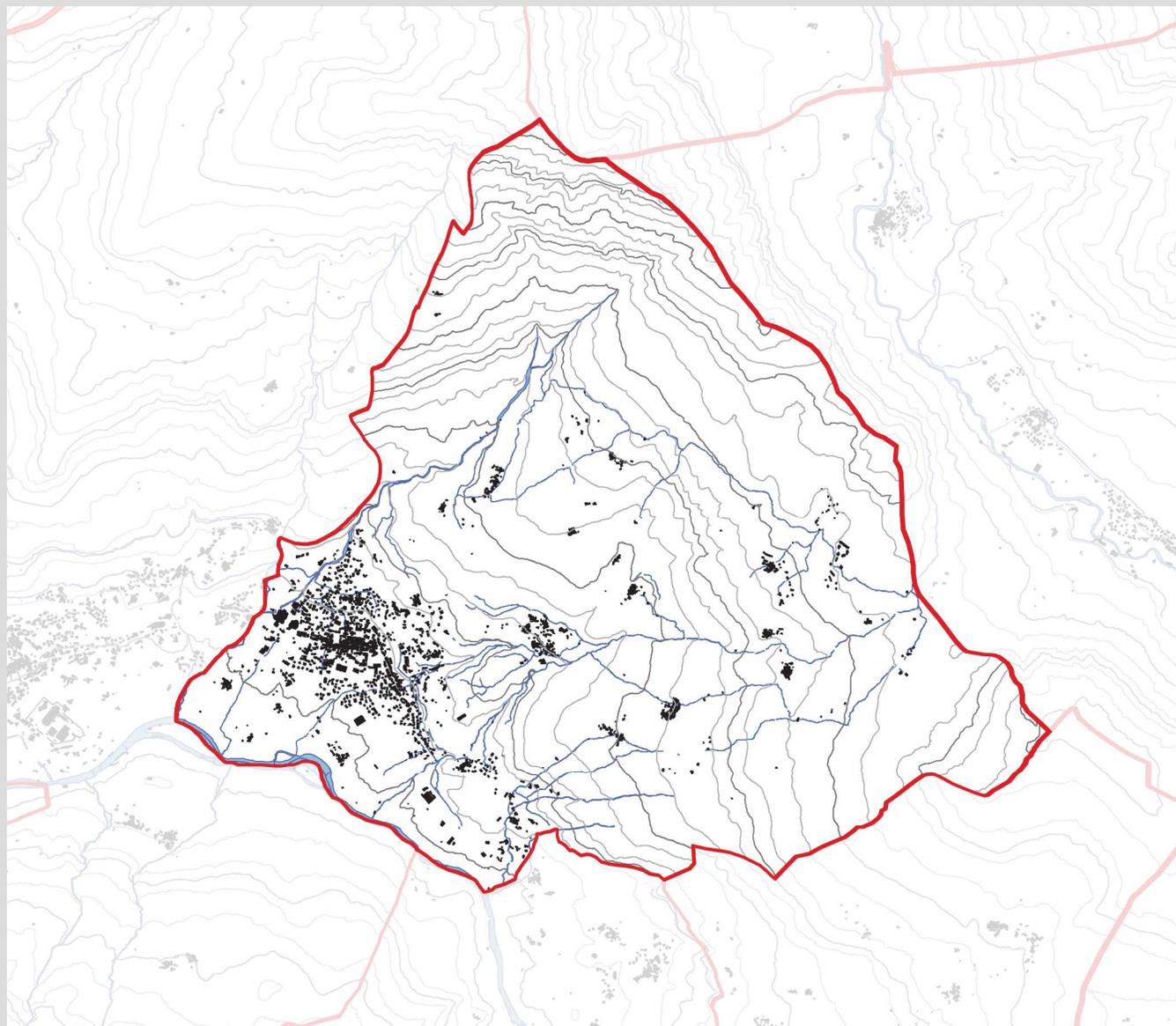


Figure 15 – Saint-Vincent – Map of settlements and isohypses – Scale 1:50000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Torgnon
Area (km²)	42
Inhabitants/km²	12,33
Population 2011	517
0-19	94
20-29	55
30-59	209
60 or older	159
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 20 - Basic Data

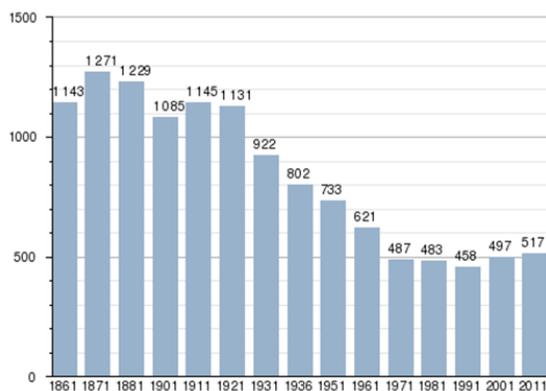


Table 21 - Chart of population development 1861-2011

Torgnon extends on the right bank of the Marmore river at an altitude of 1,489 metres above sea level. Torgnon is an ancient village scattered in numerous hamlets distributed on an ample sunny moraine terrace that conserve aspects of characteristic alpine architecture. The favourable exposure to the sun, the mild climate and high-end hotel-accommodation facilities mean this resort is well-frequented. As well as tourism, agriculture and livestock rearing still represent a rich source of sustenance. From the nearby “Colle di Saint-Pantaléon” (St. Pantaleon Pass) the view encompasses the whole Valtournenche, with the “Grandes Murailles”, the Matterhorn and the Breithorn as well as the central valley. On the other side of the Pass it is possible to descend through a huge sunny dell to the village settlements of Saint-Denis and Chambave.

Torgnon is full of historical attractions. In Chaté and Chatrian two protohistoric settlements have been discovered which show that Torgnon was already inhabited in the period prior to Roman domination. From medieval times the Municipality was under the Lords of Cly, whose rule extended across the Alps, as far as Sion in Switzerland. Later on the fiefdom to which Torgnon belonged was conquered by the House of Savoy who administered it for circa 200 years through a Lord of the manor. In 1550 it was surrendered to the Moralis family, then to the Fabri family, the Roncas family and finally to the Bergera family, who in 1750 relinquished once and for all the feudal rights on the Municipality of Torgnon. From the feudal period there are still the irrigation canals, among which there is the “rû du pan perdu”, the rascards, the mill at Étiroi and the e le remains of the hospice at Chavacour, which was located on the road that connected Torgnon with the nearby Vallese region in Switzerland. One of the main economic resources of Torgnon is tourism, especially winter tourism, thanks to the ski area close to the village. The ski area for alpine skiing is reasonably large and enjoys splendid exposure to the sun while being sheltered from the North wind; the cross-country ski tracks offer the choice of various lengths.

A.2 Urbanistic & energetic analysis of the pilot areas

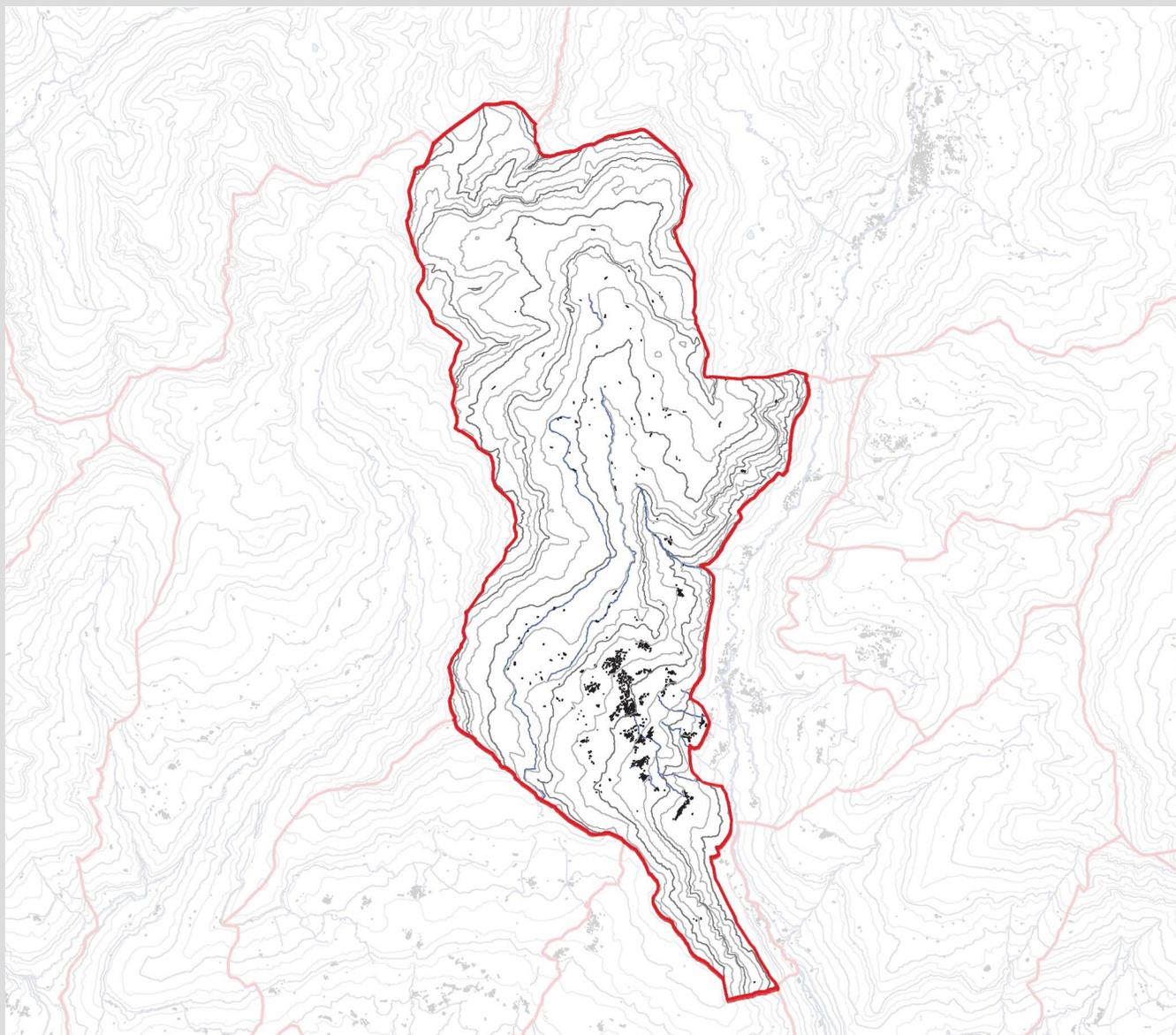


Figure 16 – Torgnon – Map of settlements and isohypses – Scale 100000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Valtournenche
Area (km²)	15
Inhabitants/km²	18,8
Population 2011	2147
0-19	397
20-29	196
30-59	1037
60 or older	517
People in paid work	
Main economic sectors	
Number of SMEs of the	

Table 22 - Basic Data

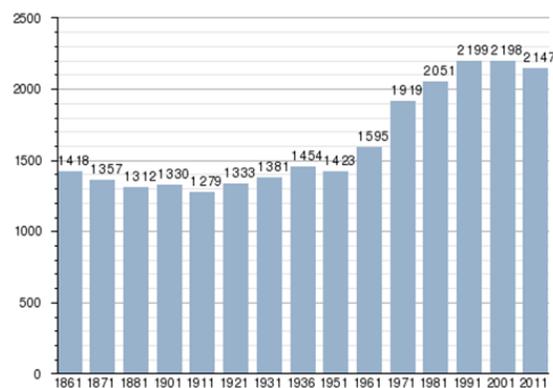


Table 23 - Chart of population development 1861-2011

Valtournenche is situated at 1,542 metres above sea level, on the left bank of the Marmore river and it occupies the higher part of the valley that bears the same name, among huge meadows and conifer woods. The Municipality borders, to the south, the Municipality of Antey-Saint-André and Chamois, and to the north, the Municipality of Zermatt, in the Mattertal (Switzerland). The village centre (Pâquier) is located in a dell in the higher part of the valley; the settlement is scattered over a steep slope and it has a notable altitude gap, which increases even more if the six hamlets separated from the village are taken into consideration, going from 1.330 metres a.s.l of Moulin, to the 1,700 metres a.s.l. of Loz and to the 1,860 metres a.s.l. of Les Perrères, and the village of Breuil-Cervinia, at the foot of the Matterhorn at an altitude of between 2,005 and 2,200 metres a.s.l. Within the Municipal territory, at an altitude of 3,488 metres a.s.l. the weather station of Plateau Rosa can be found, which is the highest in Italy. The climate of Valtournenche is alpine: the winters are characterised by temperatures that rarely rise above 0°C; snowfall is frequent while the summers the rainfall is neither heavy nor scarce; with temperatures around 20 °C. The first traces of human settlement date back to prehistory, between the late Neolithic and the Early Bronze age. In the Middle Ages the territory of Valtournenche belonged to the Lords of Cly and it gained importance because of trade across the Theodul Pass; later the territory passed under the House of Savoy. The village was of particular importance in the 19th century due to the growing passion for mountaineering, and the presence of the Matterhorn at the head of the valley drew the attention of many mountaineers, including foreigners, because of its particular form and the difficulty it posed for climbing. Breuil - Cervinia is an important hamlet of the Municipality, situated at 2,000 metres a.s.l., it has always been an integral part of the Valtournenche community: the Breuil dell with its pastures and its primitive dwellings constituted, in the past, the arrival point at the foot of the Matterhorn and the departure point for crossing of Theodul Pass. Once this area was only accessible after many hours on foot, but notwithstanding this, the might of the mountains and the beauty of the landscape have attracted both academics and mountaineers. In the 1930s there were only a few buildings in the dell of Breuil: the small church, a bar, a couple of hotels and a few private villas. In 1936 the first cable car Breuil-Plan Maison was built, which was the start of the development of what would be one of the more important international ski areas. The most important economic activity of Valtournenche is tourism, especial winter tourism; other important activities are the production of typical local products and the generation of hydroelectric energy. During the summer there are numerous trekking trails and excursions available in the area.

A.2 Urbanistic & energetic analysis of the pilot areas

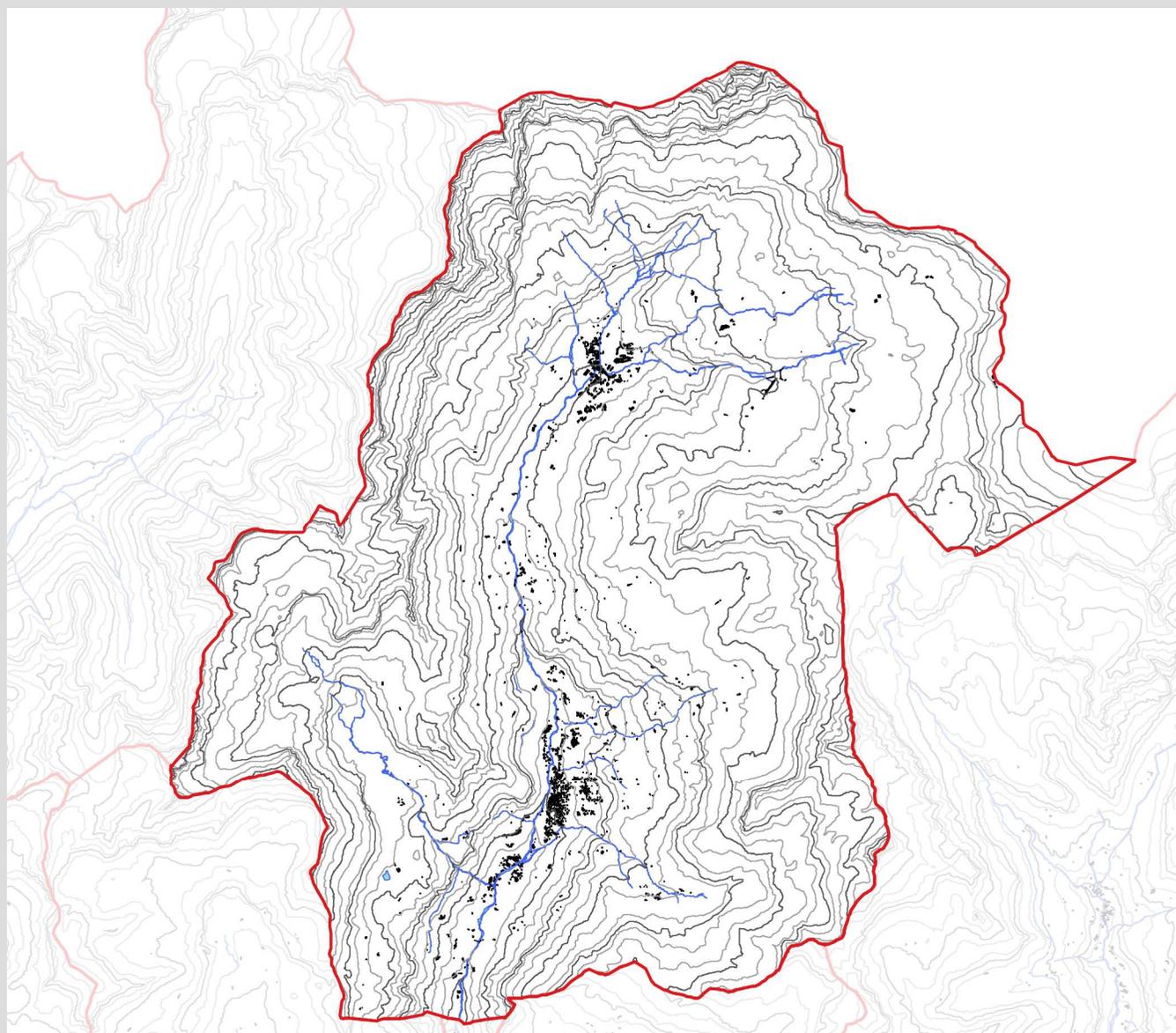


Figure 17 – Valtournenche – Map of settlements and isohypses – Scale 100000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.1.3. - Basic catalogue of the participating municipalities (LAU 2)

Name	Verrayes
Area (km²)	22
Inhabitants/km²	61,41
Population 2011	1344
0-19	247
20-29	113
30-59	586
60 or older	398
People in paid work	
Main economic sectors	
Number of SMEs of the construction sector	

Table 24 - Basic Data

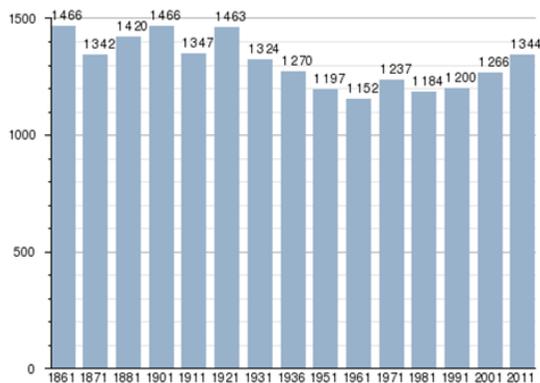


Table 25 - Chart of population development 1861-2011

Verrayes is situated on a moraine terrace above the Dora Baltea river (496 metres a.s.l.), it is split into numerous hamlets scattered along panoramic balconies and reaches the “Becca d’Aver”, at 2,469 metres a.s.l. The climate is particularly mild and it is in a very sunny position. Verrayes is connected to the Municipality of Torgnon by the Col St. Pantaléon, from where there is a panoramic view on the Valtournenche and the Matterhorn and the surrounding mountains..

The first settlements at Verrayes date back to prehistoric times, to 3,000 B.C. and some remains show that the municipality was also inhabited in the Roman period with the exploitation of the copper deposits, found not so far from the recently exploited green marble quarries.

The 20th century brought intense transformations in the agricultural and mountain reality of Verrayes. In effect, in this period paid work in factories and marble quarries began to take hold; from the 1970s the area saw a period of urbanisation and an increase in human activities which was among the most important of all the valley floor or in the lower hamlets: commercial activities, factories and artisan laboratories were set up and the younger generations also found occupation in the service sector. Only tourism is unable to evolve according to expectations, notwithstanding a landscape heritage of primary importance. .

With its ancient rural culture, this village is rich in “rus”, irrigation canals for agricultural land.

Today, the economy is essentially based on small enterprises from different sectors, that have set up in the lower, flatter area of the village, near the road layout of the valley. At 1,500 metres a.s.l there is a natural reserve around the pond of Lozon, which aims to protect an interesting wetland that has a vast assortment of water plant species.

A.2 Urbanistic & energetic analysis of the pilot areas

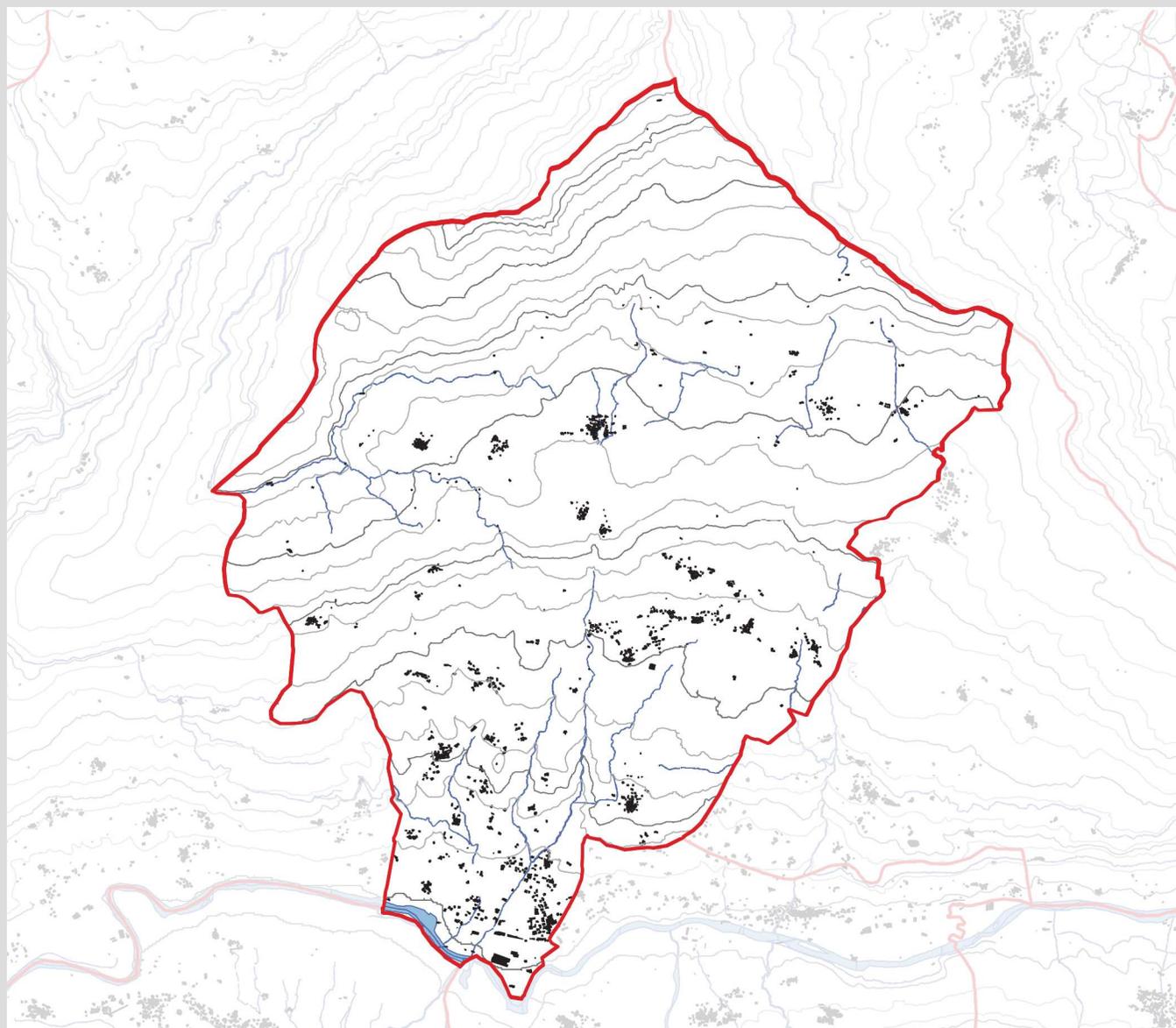


Figure 18 – Verrayes – Map of settlements and isohypses – Scale 50000

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.2. - Screening of legal and planning context

National legislation, with the DL 311/06, DL 115/08, DDR 59/09, defines the energy constraints for new constructions and renovations; at regional level further specific constraints are defined in order to conform the energy rules to the regional context, which is very specific and diversified.

For the aspects linked to the minimum requirements for extensive renovation the current point of reference is D.G.R. 488/2013.

In the Aosta valley there is a specific system of building energy certification, Beauclimat, (see regional law 26/2012).

The calculation method for energy certification of buildings located within the region is already subject of the D.G.R. n. 1606/2011.

As described in the regional law 26/2012 (Disposizioni in materia di pianificazione energetica, di promozione dell'efficienza energetica e di sviluppo delle fonti rinnovabili – Dispositions in matter of energy planning, promotion of energy efficiency and development of renewable energy sources), for buildings that are disciplined by the second part of the legislative decree of 22 January 2004, number 42 (Code for cultural property and landscape), for buildings constructed before 1945 that fall in the context of articles 136 and 142 of the same legislative decree and for buildings classified as worthy, documental and monumental by the municipal general regulatory plans reserves the obligation to draw up a Certificate of Energy Performance in the cases foreseen by law.

Following evaluation by the regional bodies responsible for the protection of cultural property and landscape, should the installation of energy saving measures foreseen by the above-mentioned regional law cause an alteration to the buildings such as to compromise the artistic, architectural, historical or landscape characteristics then the dispositions of the regional law 26/2012 may not be applied or they can be applied partially so as to be compatible with the protection requirements.

In the case of interventions on the building structure, for example, external insulation cannot be applied in the case of buildings in exposed stone, while, in the absence of particular points of merit (frescoes, particular wall structure) the installation of internal wall insulation is only allowed.

In the case of roof insulation, building techniques are advised (for example the use of false struts or insulation between struts) so as the insulation packets are non visible from the edge of the eaves.

Moreover, the regional law 26/2012 disciplines the procedures aimed at the approval of energy-environmental planning tools and promotes the implementation of special measures to diversify energy sources and to render the use of conventional sources more efficient and more rational.

The law defines a series of measures admissible for grants available to local administrations, companies and for private citizens in the residential building sector.

Following the implementation of the directives and legislation that render indispensable involvement and input from the bodies responsible for the environment, energy and territory, the interaction between urban planning and energy issues are evermore necessary. In regional legislation, an example of integration between the themes of urban planning and energy issues is represented by the Resolution of the Regional Council n.9 of 05/01/2011, that identifies the areas and locations across the region that are not suitable for the installation of wind turbines and photovoltaic systems and it adapts the regional legislation in the fields of energy and environment through the definition of criteria for the installation of these systems. One of the ways to integrate energy issues into urban planning could be the development of building regulations that take into consideration aspects connected to energy on the different levels of intervention.

Analysis for Energy Region – transalpine part

A.2 Urbanistic & energetic analysis of the pilot areas

A.2.1.2. - Screening of legal and planning context

A.2.1.1.2 - Spatial and energy planning background and approved tools

In the Valle d'Aosta, the tool for territorial planning used at regional level is the PTP, Piano Territoriale Paesistico (Territorial landscape plan); this tool constitutes a regional plan that directs the activities of the Region and the Municipal Councils in governing the territory. The PTP, adopted by the Cabinet of the Regional Council in November 1996, it is a reference framework for all public and private activities that affect the organisation and layout of the territory, the urban developments, the protection and enhancement of landscapes, the environment and heritage. The PTP holds an important role in the direction and coordination of planning in the Municipal Councils and the Mountain Communities, enhancing autonomy and the competences of the local administration bodies. The PTP offers a development strategy for the Valle d'Aosta that takes into consideration, not only the environmental and social risks that have developed in the recent past, but also the present potential, in proposing a strategy that regards the reinforcement of the transnational identity of the region, the choice of sustainable forms of development, above all in relation to tourism, the enhancement of natural and heritage and urban and territorial re-organisation.

Still at regional level, the regional law n. 11 of 6 April 1998, modified by the regional law n. 17 of 12 June 2012, constitutes the regional reference framework in urban and territorial planning.

At Municipal level, each Municipal Council has tools that allow planning and the implementation of specific choices in territorial planning, regulating the procedures for building and urban transformation through Regulatory plans generally municipal, building regulations and urban planning codes that are more detailed than the regional territorial plan.

A.3 Urbanistic & energetic analysis of the pilot areas

A.3.1.1. - Screening for the possible role of consultancy

A.3.1.1 - Possible thematic fields of intervention_A.3.1.2 - Possible points of intervention in planning and decision processes_A.3.1.3 - Expected improvement of planning and decision processes

In order to organise an effective screening of the fields to deepen through the consultancy activity, in the Aosta Valley have been created two different questionnaires:

- The first one, titled “*Which good practices in the energy field are present in your Municipality?*”, has been submitted to all the Municipalities (nr. 74) of the Aosta Valley. The questionnaire was elaborated in order to discover the current state of integration of energy aspects in municipal planning, the presence of innovative tools, particular areas of criticality or eventual needs to examine in depth specific issues.
- The second questionnaire has been submitted to all the professionals of the Aosta valley through the Professional Orders and Colleges; to each professional was asked an expression of interest on a list of issues related to the energy efficiency and the sustainable use of resources as: renovation of traditional buildings, energy audit of the buildings: methods and tools, energy optimisation of the building envelope, energy optimisation of the plant, solar thermal plants, biomass plants, windows. Moreover, to every professional has been given the opportunity to suggest new topics to deepen.

The spread of these questionnaires and the collection of the feedbacks is giving important hints to the organisation and to the set-up of the consultancy activity in the Aosta Valley. To know and understand the areas of strength and weakness in the Municipalities, and to investigate the needs of the local professionals allows to identify the potential for development in the energy field, through an efficient exchange of experiences.

Once the real situation has been investigated, COA intends to organize the consultancy activities through the system of the AlpHouse Center.

On the basis of the collected proposals COA intends to organize a series of **participated meetings**; each meeting will treat a specific topic and foresees the active involvement of professionals and local administrators in a training activity with some experts, with the presentation and the sharing of case-studies. At each meeting could be involved an AlpBC partner interested in the discussed topic, in order to promote the transnational exchange of experiences and know-how.

Moreover, COA, through the information desk “Info Energia Chez Nous”, on the basis of the experience collected during the AlpHouse project and after the publication of the “*Quaderno per il recupero energetico*” would like to provide advices to those who want explore the theme of energy renovation of traditional buildings.

A.4 Analysis for closed loop economies in the construction sector

A.4.1. - Transalpine part

A 4.1.1 Closed Loop Economy concept

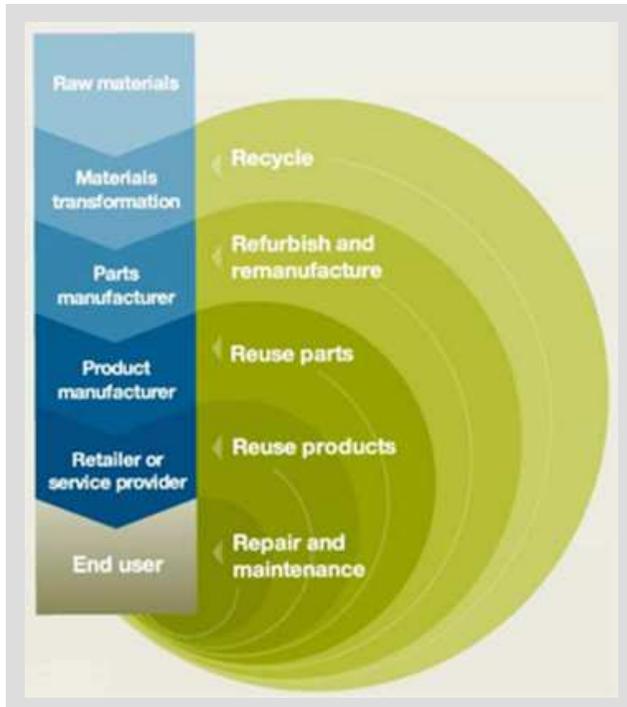


Figure 26 - Diagram of the Closed Loop Economy model

The **Linear Economy** on which the economic system has been based so far, is founded on the assumption that the goods that we use follow a linear life cycle consisting of different stages:

- extraction of raw materials;
- transformation of raw materials into semi-finished products;
- production of finished products to be used by consumers (intermediate and final);
- disposal and elimination of waste from the economic process and of the products themselves (when they become waste).

However, this kind of economy requires an unlimited number of resources to function, with high costs and with serious damage on the environmental system (pollution, loss of biodiversity and of whole ecosystems, problems for human health, etc.).

The alternative to this type of economy is given by the **Closed Loop Economy**, a system based on an efficient use of resources, that foresees making them live as long as possible in the economic cycle through their reuse and recycling. As indicated in the report titled *“Towards the circular economy”* (published by the Ellen Mac Arthur foundation) a switch to a closed loop economy – based on the concept *“from cradle to cradle”*, namely from the birth of a product to the birth of other products, through the use and the reuse of materials – would allow the EU to save 630 billion Euros per year (3,5% of European GDP), with advantages for enterprises, consumers and environment.

The change of the economic system means a rethink of the production process, including product design and the concept of regeneration and recovery of resources in their production, eliminating the idea of waste in product conception.

Thinking with a new approach to products leads, accordingly, to the adoption of a different form of enterprise management and to a new setting of consumers habits.

The closed loop economy considers the production of goods in relation to their duration:

- common consumer goods that may have a limited duration are produced trying to minimise the use of resources (with an efficient use of energy and of renewable energy sources) and using recyclable materials.
- goods that last longer could be linked to the provision of new services allowing the use of the same goods by different consumers, avoiding the endless reproduction of the "planned obsolescence" goods.

A.4 Analysis for closed loop economies in the construction sector

A.4.1. - Transalpine part

A 4.1.2 Possible examples of circular economy not necessarily related to the construction sector, in the manufacturing of products and energy provision and possible utilization of circular economy materials and products **in the construction sector**

Specific production in the Aosta Valley			
Product and raw materials	Building sector	Energy sector	Other sector
Wood	X	X	-
Stone	X	-	-
Sand/clay	X	-	-
Concrete	-	-	-
Cellulose	-	-	-
Glass	-	-	-
Straw	-	-	-
Cork	-	-	-
Hemp	-	-	-
Wool	X	-	-
Wooden doors/windows	X	-	-
Aluminium doors/windows	-	-	-
Vinyl doors/windows	X	-	-
Green energy from biomass	-	X	-
Green energy from biogas	-	X	-
Water	-	X	-
Steam surplus	-	-	-

Table 26 - Specific productions in the Aosta Valley

Replacing the traditional concept of a linear economy with that of a closed loop economy requires a complex process involving many actors.

In the Aosta Valley context, how could a mechanism of closed loop economy be activated?

A starting point could be to encourage the development and diffusion of local short supply chains.

Currently, in the Aosta Valley territory there are not many well organised short supply chains that fully adopt the principles connected to them. In addition, in this area there is a lack of awareness of this issue and a lack in support from the local authorities and administrators.

However, as detailed below, there are small examples that are trying to apply some of the important principles of short supply chains, raising some of the specific aspects of closed loop economy.

The characteristics of the regional territory, the availability of raw materials and of local resources (woods, rivers, brooks, stone, etc.) and the typology of the activity performed in the different sectors constitute a potential for the development of short local supply chains (although in many cases the potential decreases in relation to the conformation of the territory, which may not facilitate the use of the same resource).

Across the regional territory, the sectors in which, for example, short chains could be activated are many: agriculture, breeding, handicrafts, manufacturing activities and the construction sector.

Actually, there are some resources that supply the raw materials to local activities (see table 26):

- wood for manufacturing, local crafts, furniture, building construction, energy production;
- water to produce electricity using hydroelectric plants;
- quarries for the extraction of different kind of stone or of sand that supply the raw material to use locally as material for finishing (walls, floor covering etc.) and for the production of concrete mix in the construction sector.
- sheep's wool supplied by the sheep farms to the manufacturing activities that deal with spinning for the creation of wool products.

Moreover, there are some best practices that can be referred to as a closed loop economy model:

- use of slurry from livestock rearing to produce biogas for the energy sector;
- use of waste wood to produce biomass for the energy sector.

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.1 Potential of Loop Economies at a regional level in the construction sector

Potential field for the development of regional CLE related to building construction	
Product	Usage
Wood	Furniture
	Building finishing
	Building structure
	Biomass
Stone	Stoneblocks/tiles
	Waste for land filling
	Concrete aggregate
Sand/clay	Concrete aggregate
Biomass ashes	Dust for cement based materials
Wool	Building insulation
Waste from the supply chain of agricultural orchards and vineyards, waste from sawmills and/ or carpentry, waste by-products of industrial processes/craft, waste from wood packaging waste, wood waste, etc.	Biomass

Table 27 - Potential field for the development of regional CLE related to building construction

After an analysis of the resources that supply the raw materials to the local activities and the best practices that can be referred to as a closed loop economy model, it is necessary to identify the activities that could be developed in the Region with a high potential for the application of the principles of a closed loop economy associated to the idea of short chain:

- use of sheep’s wool supplied by the sheep farms for the production of insulation products for the construction sector;
- use of slurry from livestock rearing for the production of biogas (in thermal power plants that serve a district);
- use of wood biomass taken from wooded areas for energy production;
- use of waste derived from the supply chain of agricultural orchards and vineyards, waste from sawmills and/ or carpentry, waste by-products of industrial processes/crafts, waste from wood packaging waste, wood waste, etc.) for energy production.

Study of the wood-energy chain potentiality in the Aosta Valley in the Renerfor European project.

Among the activities listed above, for the use of wood biomass a specific study was conducted within the European project Renerfor.

Regarding the use of wood biomass, an analysis was conducted on the amount of wood available for energy use, distinguishing between:

- maximum **potential** which represents the maximum theoretically extractable from all wooded areas (even if not served by roads);
- minimum **potential** which represents the minimum quantity effectively extractable from wooded areas actually served by roads.

In order to provide all the necessary elements for the elaboration of development strategies of the wood short supply chain in the Aosta Valley, different scenarios were considered:

- the quantities extractable from the forests are related to what is available in **fifteen years of forest planning**;

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.1 Potential of Loop Economies at a regional level in the construction sector

- the basic assumption is that the wood potentially available for energy purposes such as wood chip is only the quantity that **cannot be used differently** and is not exploitable in a more economic way (wood for building, poles and firewood);
- wood management must be **sustainable over time** and must ensure multi-functionality.

When considering wood chip a distinction was made between A quality wood chip, mainly used in small and medium-sized plants, and B quality wood chip, used in larger plants such as, for example, district heating plants.

With regards to the maximum potential, the analysis revealed that more than 267.000 m³ per year of wood biomass (equivalent to about 241.500 t) can be derived from the forest top soil, of which 54% (about 131.000 t/year) could be destined to energy use in form of wood chip and firewood (see Table 28-29).

It is worth noting that the 63% of the wood biomass for energy uses is derived from private ownership forests.

When considering only the forest area actually served by roads (32.000 hectares, equivalent to about 39% of the total woods), a significantly lower availability of wood emerged, equal to about 93.300 t/year, of which about 54.400 t/year available for energy uses (see Table 30).



Table 28 – Forestry assortments takable from the Aosta Valley forests

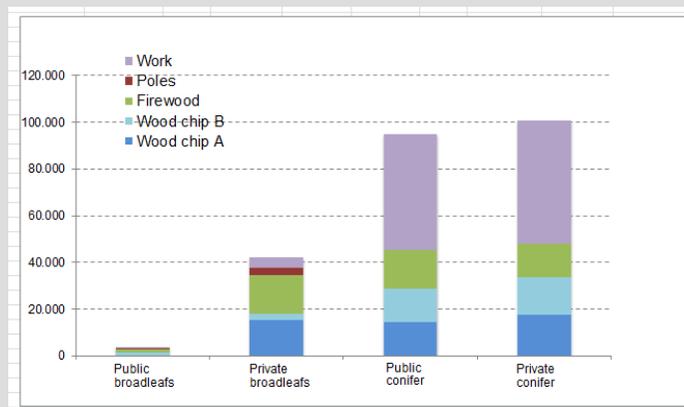


Table 29 – Wood biomass takable from the potential forests of the Aosta Valley expressed in t/year (M50)

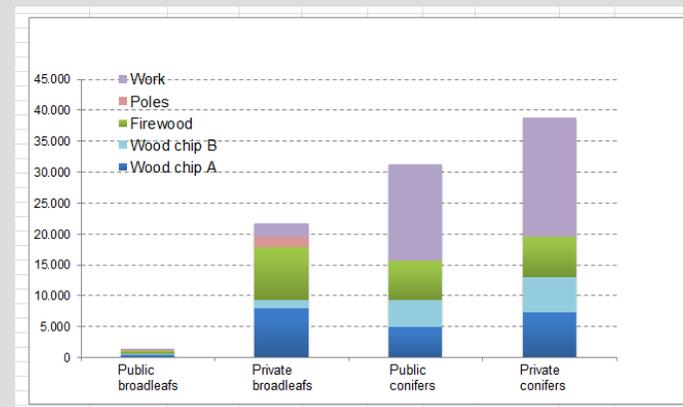


Table 30 – Wood biomass takable from the forests served by roads of the Aosta Valley expressed in t/year (M50)

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.1 Potential of Loop Economies at a regional level in the construction sector

The following maps present how the potential energy available from regional forests is spread over the territory.

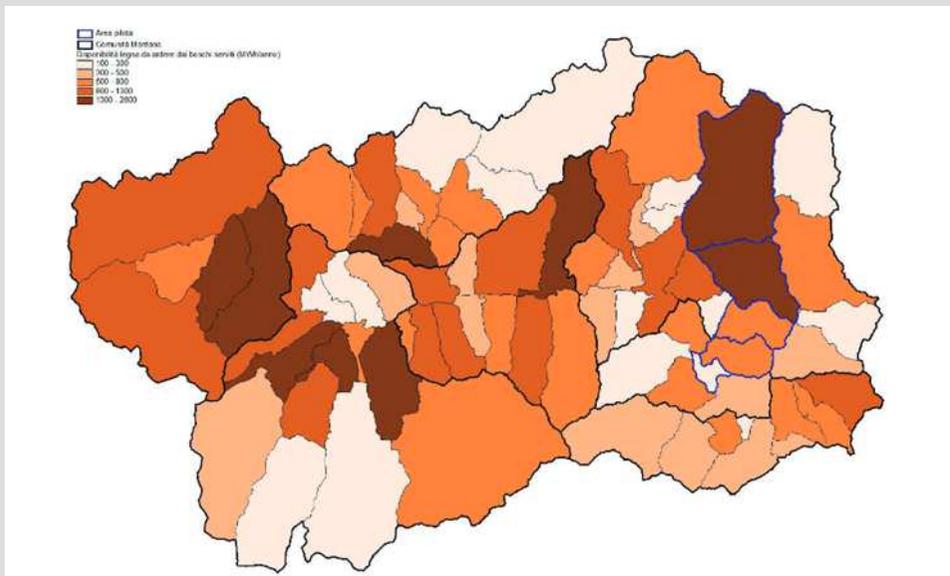


Table 31 – Distribution of the firewood energy potential from woods served by roads in MWh (M50)

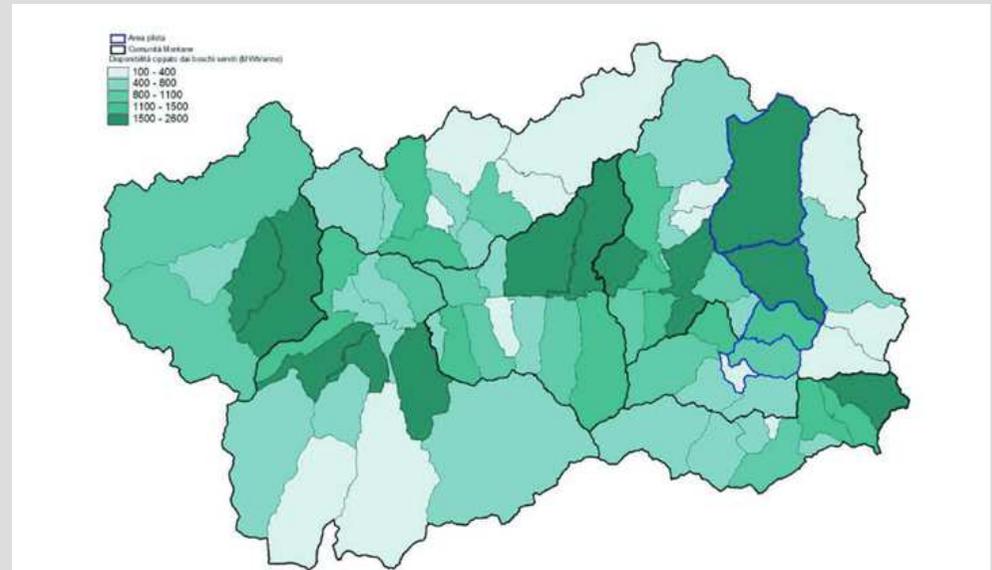


Table 32 – Distribution of the wood chips (A and B) energy potential from woods served by roads in MWh (M50)

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.1 Potential of Loop Economies at a regional level in the construction sector

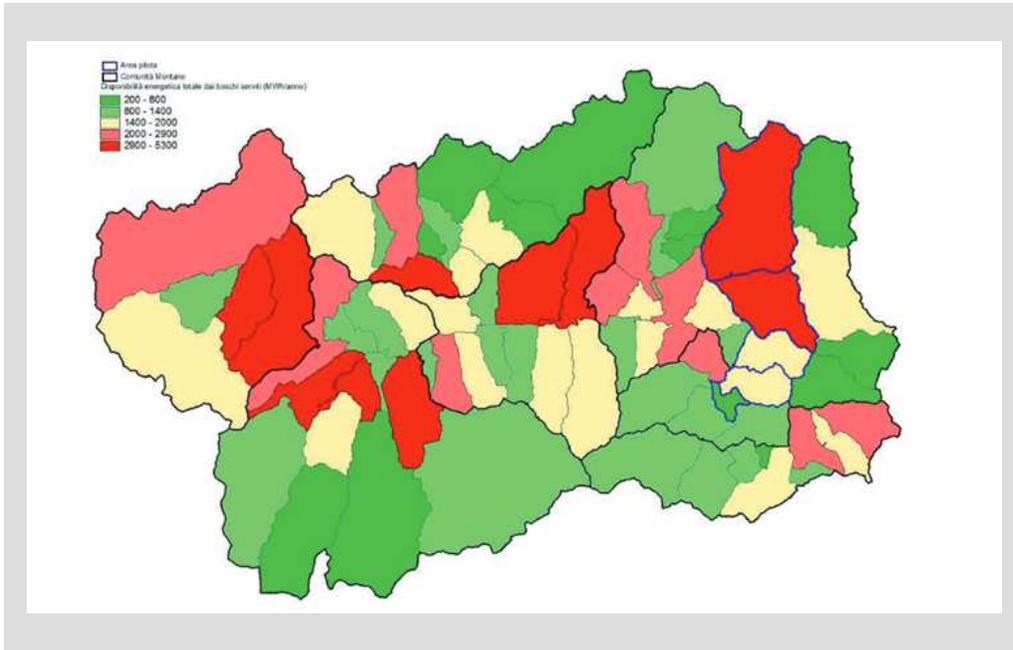


Table 33 – Distribution of the firewood (M50) and wood chips (A and B, M50) energy potential from woods served by roads in MWh/year

	t/year (M50)	MWh/year
Potential forest surface	131.000	300.000
Forest surface served by roads	54.400	128.500

Table 34 – Overall availability of wood for energy use

In the same way, in order to evaluate the opportunity for using wood waste produced across the regional territory for energy uses, an study was conducted to characterise the waste derived from the supply chain of agricultural orchards and vineyards, waste from sawmills and/ or carpentries, waste by-products of industrial processes/crafts, waste from wood packaging waste as well as wood waste, etc.

From the analysis, it emerged that the waste derived from the supply chain of agricultural orchards and vineyards was not relevant and these are used in several cases for compost production that is reused directly on site.

Regarding the sawmills and the carpentries, from the survey highlighted that the quantity of waste is not high and it is normally used for energy uses by the same enterprises that produced it.

In the case of wood waste, it emerged that the waste derived from the mowing and pruning of public green spaces is used for compost production, and the wood waste as packaging, furniture, pallets are actually sent to recovery. The analysis, therefore, shows that the wood supply chains "out of the woods" are not significant.

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.1 Potential of Loop Economies at a regional level in the construction sector

For a correct planning of the wood-energy chain, in parallel to the analysis of the available potential of wood biomass, the energy demand of biomass across the regional territory was analysed (see Table 35). In particular, consumption in the residential sector was estimated, as was that used in buildings of local public administrations, in hotels and huts and in manufacturing activities. Moreover, the consumption of wood chip related to the district heating plants located on the territory was also considered.

From the comparison between supply and demand, it emerged that compared to a consumption of 150.000 t/year there is a maximum potential of about 92.000 t/year, considering that both high quality wood chip and firewood logs are not used green, but after drying which reduces the water content to 20%.

With regards to pellets the survey shows that actually on the regional territory there is only a single production plant using non-regional biomass, therefore the offer was not considered.

This situation could change if economic conditions allow the use of part of the process waste or of wood chip in the pellet plants.

If the comparison is made with respect to the only served potential, considering therefore the current availability, the difference between supply and demand grows because the availability of biomass drops to 54.400 t/ year.

TOTAL CONSUMPTION OF WOOD BIOMASS (in the residential sector, local public administrations buildings, hotels/huts, manufacturing activities)				
WOOD BIOMASS	Total consumption	u.m.	Final energy [MWh]	Final energy [KToe]
Logs	86.207	t	343.104	29,5
Pellet	17.606	t	82.747	7,1
Wood chip A	1.922	t	7.650	0,7
TOTAL wood biomass excluded the district heating plants	105.735	t	433.501	37,3
Wood chip B for district heating plants	42.479	t	94.728	8
TOTAL wood biomass	148.214	t	528.229	45

COMPARISON BETWEEN SUPPLY AND DEMAND FOR ANNUAL POTENTIAL QUANTITIES OF BIOMASS								
	Firewood		Wood chip A (M20)		Wood chip B (M50)		Pellet (M10)	
	MWh/year	t/year	MWh/year	t/year	MWh/year	t/year	MWh/year	t/year
Demand	343.104	86.207	7.650	1.922	94.728	42.479	82.747	17.606
Offer	116.134	29.034	116.804	29.201	75.919	34.044	0	0
Difference between offer and demand	-226.970	-57.173	109.154	27.279	-18.809	-8.435	-82.747	-17.606

Table 35 – Total consumption of wood biomass in the residential sector, local public administrations buildings, hotels/huts, manufacturing activities

Table 36 – Comparison between demand and offer for annual potential quantities of biomass

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.1 Potential of Loop Economies at a regional level in the construction sector

The first considerations that emerge for the development of a wood-energy chain, thanks to the studies conducted during the Renerfor project are the following:

- wood is inherently multifunctional; for this reason its management cannot exclude the sustainability concept and it cannot be exclusively considered as a biomass culture for energy production;
- attention must focus on wood products such as wood for building, using at the end the waste for energy production;
- increasing the use of biomass as a replacement of traditional energy sources contributes to the achievement of European objectives and of the recent national obligations and to increase the use of renewable energy sources;
- the active and sustainable management of forest and wood resources can lead to the enhancement of local production, the qualification of forestry enterprises and a potential increase of jobs;
- in order to optimize the sustainable use of wood it is necessary to guide the development models that best represent the principle of diffused generation, minimising road transport and exploiting territorial potential. This aspect requires detailed analysis on the technical and economic feasibility of short chains at a smaller territorial level, as for example a mountain community;
- to reduce biomass demand and to limit the quantities being imported it is necessary to reduce consumption and, in particular, the energy needs of buildings through interventions of energy optimisation of the building-plant system;
- development of biomass plants must be assessed, taking into account the requirements for air quality protection;
- it is important to promote information activities on the quality of wood biomass in relation to the plant typologies and on correct plant management.

To consult the study on the potential of the wood-energy chain in the Aosta Valley conducted during the Renerfor European project in detail, visit the following web site:

http://www.regione.vda.it/energia/renerfor/default_i.asp

From the analysis conducted on the territory, it emerged that a potential for the implementation of a closed loop economy model in different economic sectors on the regional territory is present. It could be possible, for example, to establish a network of companies that use local resources for the production of quality products to sell on site, shortening the physical distance between the producer and the consumer, without the need of transport, wholesalers or markets which distribute the products. For example, in the agri-food business and in the livestock sector some systems could be developed that encourage the production of zero kilometre products to sell a few kilometres from the place of production or directly at the place of production, with direct sale between producers and consumers.

The closed loop economy in the Aosta Valley, applied to the construction sector, as to other sectors, could bring added value to the territory and an increase of jobs.

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.1 Potential of Loop Economies at a regional level in the construction sector

The short chain in the construction sector

With regards to the construction sector, COA energia carried out a survey to discover and understand the implications, the consequences and the impacts of setting up of a quality mark for enterprises that deal with construction, developing in parallel a short chain.

From the first analysis, it emerged that the creation of an enterprise network would bring together the enterprises operating on the various components of the building envelope and plant, in the different construction phases (from planning, to construction and finally to testing), it would also involve the planners and the new figures that have developed in recent years (e.g. energy assessors).

The creation of networks among enterprises and the drafting of a protocol would ensure the achievement of quality for the entire building process, with a level of innovation and respect for the local identity, trying to integrate the new requirements to local building techniques. The assignment of a quality label to enterprises should guarantee the quality of the construction in all its parts, with particular attention to the choice of technologies and products adopted (Life Cycle Analysis, use of certified, local, natural, sustainable and recyclable products, etc.) and to their own implementation in the construction site (innovative solutions, reduction of waste, etc.), with a look at the impact that the construction can have on the environment and the landscape.

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.2 Short description of path (*what has to be done to ease a CLE scenario*) resulting from the application of SWOT on the regional situation

Through the SWOT analysis it was possible to identify strengths and weaknesses currently existing in the implementation of a closed loop economy in the Aosta Valley; as a result, opportunities and threats in relation to a future scenario have been identified.

Strengths:

- Presence of productive local chains, or of activities with a high potential and that could structure their activity starting up a short local chain in the construction sector, or also in other sectors (agriculture, livestock-rearing, energy production, etc.).
- Use of local raw materials, among which wood, stone, sand and clay for use in the construction sector.
- Local skills and competences already present at local level that wish to develop and increase their knowledge over time in response to market developments.
- Citizens' good behaviour, sensitivity to re-use, recycling, use of local products and conscious use of the products by the consumer.
- Best practices in sustainable production at a national and transnational level.
- Availability of good examples from elsewhere.
- People involved in territorial management, for example, woods management.
- Efficient use of energy sources as, for example, water and wood.
- Use of renewable local sources.
- Presence of active Chambers and Professional Associations involving companies through which it is possible to sensitize members on these issues, with the possibility to have an effective support for the development of local networks.
- Presence of localised activities using the by-products of their activities or of other activities located in the neighbourhood.
- Support of local administrations.

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.2 Short description of path (*what has to be done to ease a CLE scenario*) resulting from the application of SWOT on the regional situation

Weaknesses:

- Structured and developed local chains of products not available and difficult to start up.
- Local materials not available in large quantities or difficult to find.
- Local skills and competences not widespread across the territory.
- No districts available.
- Lack of awareness with respect to the reduction of the costs of the linear economy approach.
- Difficult to apply an efficient differentiated collection of waste.
- Difficult to apply an efficient recycling procedure for waste.
- Difficult for local actors to change their traditional way-of-doing.
- Difficult for citizens to change their usual behaviour.
- Presence of strong economic agreement already assessed and difficult to change for political reasons.
- No availability of local materials and dependency from external supplies.
- Poor applications of energy saving cycles in production chain.
- No need for specific typology of production to reuse by-products.
- Difficult to involve private citizens such as owners, farmers, etc.
- Difficult to open to external mentoring (from a local system /bottom-up approach to a place-based approach).
- Critical conditions of local SMEs and difficulties in changing/ improving situation.
- Obsolete conditions of technological processes available.
- Long term results that discourage investment in this approach.
- Mistrust of local actors.
- Regulations not defined.

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.2 Short description of path (*what has to be done to ease a CLE scenario*) resulting from the application of SWOT on the regional situation

Opportunities:

- Possibility of improving local production.
- Production of high quality materials.
- Possibility of developing different sectors of production for a single raw material.
- Keeping local skills and competences on the territory, taking advantage of them.
- Increase of job opportunities.
- Reduction of raw material extraction.
- Reduction of waste production and cost management.
- Local sensibility (citizens, politicians, decision makers, etc.).
- Increasing sustainability of production and distribution.
- Reduction of transportation costs.
- Independence from external services and suppliers.
- Independence from external costs.
- Optimisation of rubbish collection.
- Specialisation of competences and sharing of resources (districts).
- Possibility of sharing with neighbouring regions by-products not used locally (over-local districts).
- Possibility of promoting the use of local resources.
- Possibility of creating satellite activities (training, supporting, cooperation with research&development sectors, etc.)
- Innovation in many sectors.
- Real local development (place-based approach).
- Decrease in social costs for workers and citizens.
- New dedicated regulations.

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.2 Short description of path (*what has to be done to ease a CLE scenario*) resulting from the application of SWOT on the regional situation

Threats:

- Not reasoned exploitation of local resources.
- Over-exploitation of territory.
- Predominance of large management companies/ lobbies (waste management or resource extraction).
- No advantages at the local level and consequently no satisfaction.
- Investments not worth the costs.
- Long period results.
- Market changed demands.
- Lack of interest from consumers.

Analysis for Energy Region – transalpine part

A.4 Analysis for closed loop economies in the construction sector

A.4.2. - Regional specific analysis

A 4.2.3 Describe how the possible 'scenario' of CLE fits the ideal definition of CLE concept given in first section of questionnaire

On the basis of the findings of the SWOT analysis, what are the first steps to take in order to enable the application of a closed loop economy on the territory of the Region?
How may the identified opportunities be applied in the territory and become real?

The process requires a long period of dialogue and consultation between different actors at various levels. To prepare the ground capillary action is necessary in order to raise awareness to the issue, highlighting opportunities, short and long term consequences that could lead to the new economic system, presenting good practices at national and international level.

The activation of this new mechanism would require then, on the part of decision makers and local authorities, to:

- set up an effective system of rules, with possible incentives;
- establish a fruitful relationship with other local actors, including, in particular the Chamber of Commerce, the Commerce Associations, the professional Orders and Colleges, the enterprises and the citizens;
- actively sensitise producers and consumers;
- draft recommendations to assess the potential of the regional closed loop economy.

The activation on the territory of a short chain should be supported by detailed feasibility studies which take into account the impact that this short chain will have, not only economic terms, but also social, environmental and landscape.

The definition of quality protocols could be a good way to ensure the quality of the product, both from the side of the producer or of the consumer.

The implementation in the region of a short chain as a good practice could be an example replicable on the territory, a driving force for the development of circular economy in the Aosta Valley.

1.4 Sources

Literature

- CERUTTI 1995** Augusta Vittoria Cerutti, *Le pays de la Doire et son peuple*, Musumeci editore, Quart (AO) 1995
- MERCALLI 2003** L. Mercalli, D. Cat Berro, S. Montuschi, C. Castellano, M. Ratti, G. Di Napoli, G. Mortara, N. Guindani, *Atlante climatico della Valle d'Aosta*, Graficat, Torino 2003

Websites

- Relazione Annuario Statistico Regionale Valle d'Aosta 2012:
<http://www.regione.vda.it/statistica/pubblicazioni/annuari/annuario2012/INDEX.HTM>
- Piano regionale per il risanamento, miglioramento e mantenimento della qualità dell'aria:
http://www.regione.vda.it/territorio/ambiente/aria/piano_aria_i/default_i.asp
- Piano Territoriale Paesistico_ Relazione illustrativa:
https://www.regione.vda.it/territorio/territorio/pianificazione_territoriale/ptr/default_i.asp
- Closed Loop Economy:
<http://www.qualenergia.it/articoli/20120202-economia-circolare-efficiente-che-fa-risparmiare-risorse-e-denaro>
<http://lucianomonti.wordpress.com/2013/07/10/dalleconomia-linerae-alleconomia-circolare-facile-a-dirsi/>
- Progetto europeo Renenerfor :
http://www.regione.vda.it/energia/renerfor/default_i.asp

1.4 Sources

Websites

- Other:
- http://www.regione.vda.it/energia/normativa/regionale/default_i.asp
- <http://www.naturaosta.it/valledaosta.htm>
- <http://rete.comuni-italiani.it/foto/2009/autore/stefano-venturini/page/15>
- http://www.lovevda.it/turismo/scopri/default_i.asp