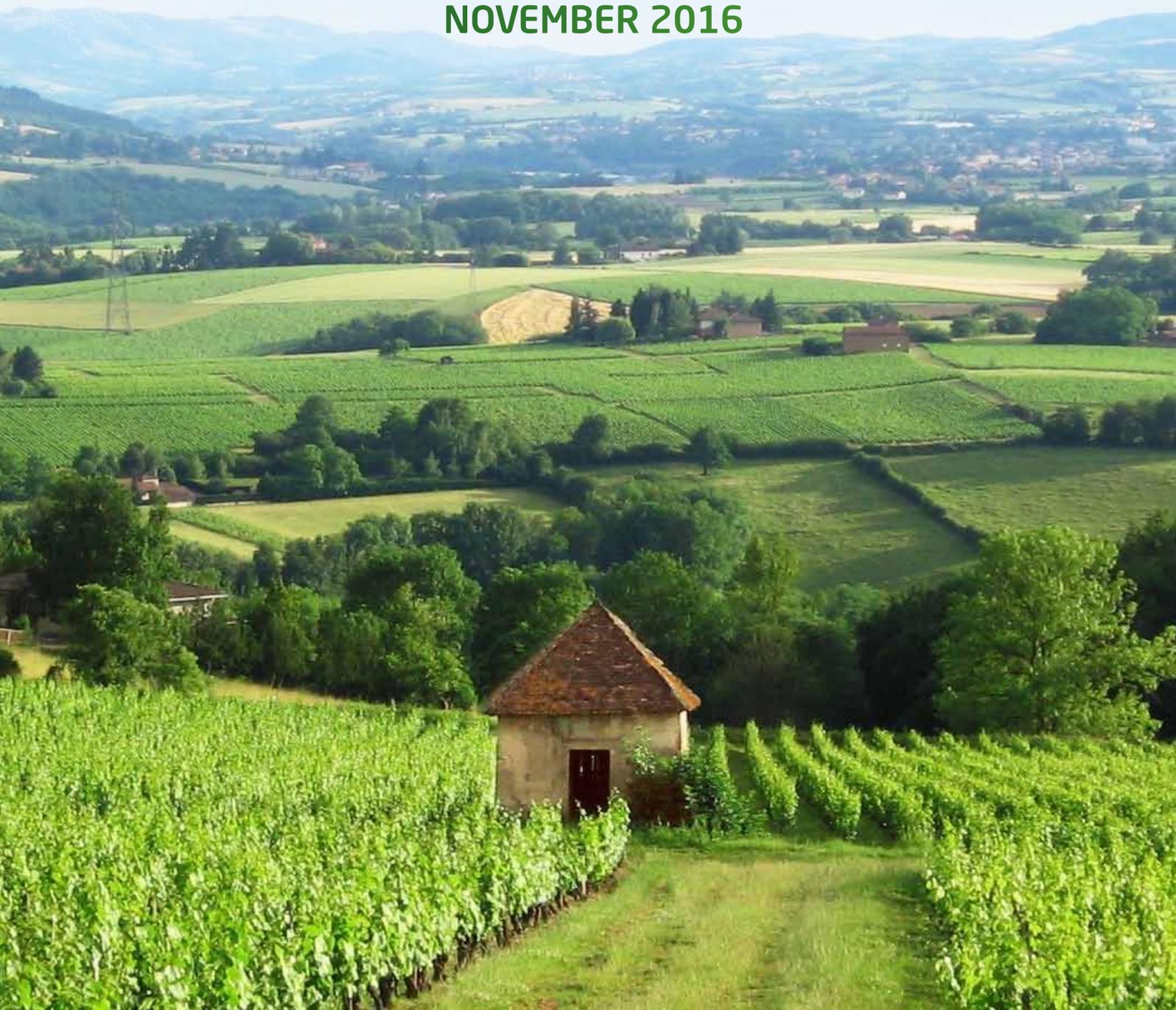


ASPIRING GEO PARK BEAUJOLAIS

APPLICATION DOSSIER FOR UNESCO GLOBAL GEO PARK
NOVEMBER 2016





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CREDITS

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A / Identity of the candidate territory

A.1. NAME & IDENTITY

The applicant territory is the Geopark Beaujolais, which, in the north of the Rhône department, forms a part of the buttress of the Massif Central. Looking at the extreme alpine domain, the Beaujolais is one of the most complex geological areas in France : the diversity of the landscapes, of the natural habitat and of the buildings is the result of a 500 million year-old geological history.

The Beaujolais region, of which is known around the world for its twelve protected vineyard appellations, also has a wider historic anchorage. In the XIIIth century, the Beaujolais became, thanks to its capital Beaujeu, one of the three baronies of the French kingdom. Geopark's territory is located near three sites included in the World Heritage UNESCO List : the historical site of Lyon, the cultural landscape of Burgundy and the La Tourette convent designed by LeCorbusier.



Geopark Beaujolais' logo



Location map of the aspiring Geopark Beaujolais, in Europe

A.2. GEOGRAPHIC LOCALIZATION

Geopark's territory is located in the Auvergne-Rhône-Alpes region and reaches to the north part of the new-Rhône department, north of the city of Lyon. It expands north for about fifty kilometers along the Saône river's axis to the Mâconnais and the Charolais areas, to the south up to the Lyonnais area, from the Saône valley to the east and up to the Roannais domain in the west.

The Geopark head office is located in Villefranche-sur-Saône. Its geographic coordinates in Lambert 93 are:

- ▶ 832624,04
- ▶ 6544313,8



Location map of the aspiring Geopark Beaujolais, in France

A.3. SURFACE, SOCIAL AND GEOGRAPHICAL FEATURES

The Geopark Beaujolais territory corresponds to the perimeter of the Syndicat mixte du Beaujolais (SMB) an administrative entity founded in 2009 which comprises 128 member municipalities. It covers a surface of 1550 km² and has a population of 225 000 inhabitants.

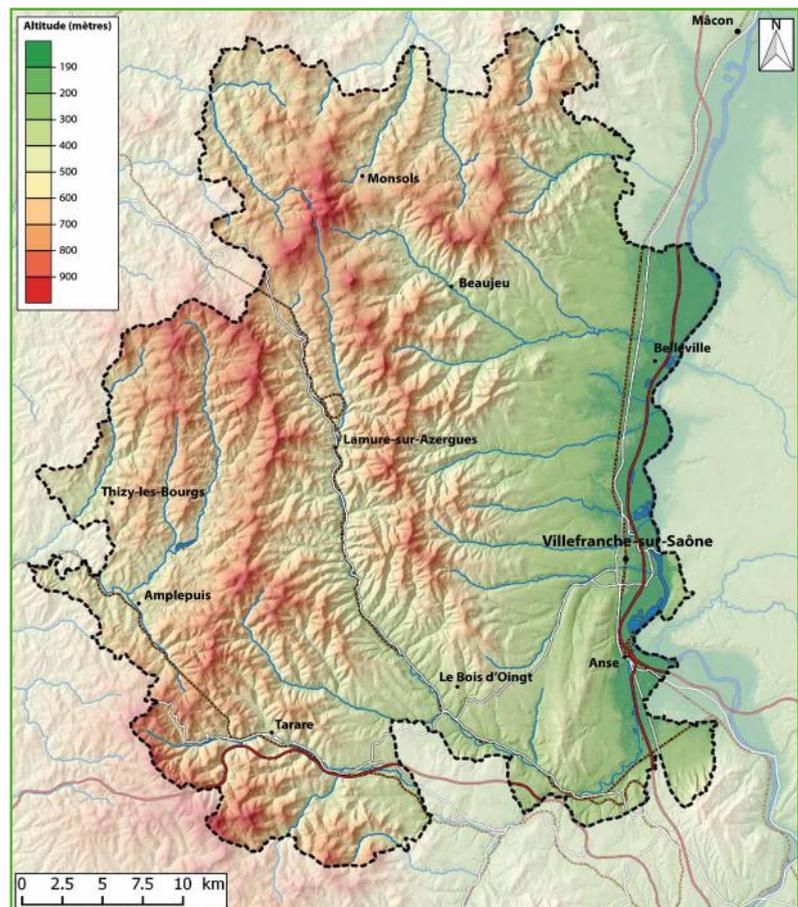
A.3.1.

Description of the territory

The organization of the relief seems quite desorganized in the entire Beaujolais region. Three areas can be distinguished and permit a description of the territory's geomorphology. The geological history of the territory, punctuated with great tectonic movements, is the source of the territory's landforms as we know them today, but also of the nature of the soil which varies depending on the areas and is part of the wealth of the natural environment, of agricultural lands and of the traditional dwellings.

The Beaujolais mountains

In the west of the territory, we find a medium mountain region, typical of the ancient mountain chains: these are the Beaujolais mountains. Crossed by many rivers, they spread for about fifty kilometers between the Mâconnais mountains to the north and the Lyonnais mountains to the south, and for twenty to twenty-five kilometers from east to west. The landforms rise between 800 and 900 meters high at the center, and to more than 1000 meters at the region's borders, dominating the plateau located around 600 meters.



Relief map



Map of the Beaujolais' intercommunalities (at the 01/01/2016)



Panorama from la roche d'Ajoux

The Beaujolais mountains are marked by a large proportion of original rock formations from the primary era, like grey, green or black volcanic rock, and granite with shades varying from pink to blue-grey. We can also find metamorphic rocks like gneiss (an ancient volcanic rock) and more schists (of sedimentary origin).

These rocks can be seen in the landscape thanks to many rocky outcrops, at the bottom of valleys or on ridges, as on the famous Ajoux rock, in Propières, where the black volcanic rock appears in large bare mounds at an altitude of 970 meters. Quarries and old mining pits are also the telltale signs of the extraction of these rocks for construction, road building as well as for the exploitation of lead, copper, zinc, sulphur, barite, fluorine, and coal deposits.

Granite has especially been used for construction. The church of Thizy shows the use of red microgranite. But other rocks have also been used in construction.

The deterioration of the rocks made the soil siliceous with an acidic tendency that favors the formation of heather and corncrake moors and fits the growing of Douglas fir, which also leads to soil acidification.

This geology is at the origin of a river water of great quality. The hardness and the nature of crystalline rocks results in the production of clear water, practically devoid of impurity and free of carbonate. The abundance of

this water and the slope of the land enabled the installation of many textile industries in the west part of the Beaujolais region from the XIXth century onwards.

The Beaujolais mountains boast many valleys, most of which are oriented north/south and more or less incised. The Azergues river takes its source at the base of the Saint-Rigaud mountain and flows first to the south. It constitutes the largest and deepest valley of the territory. It cuts through the landforms of the Beaujolais mountains, then through the Pierres Dorées hillside and ends up in the Chères plain while heading north towards Anse where the Saône river flows. In the north, the valley of the Grosnes and the Sornin are less incised and the landform slips towards the hilly and softer landscape of the Charolais. The crest line of the Beaujolais mountains running north-south divides the territory into two catchment areas : in the west the Loire basin that is irrigated by the Reins and the Trambouze rivers, and in the east the Saône basin where the Turdine and Azergues rivers flow.

The wine-growing hillsides and plateaus

The landform growing from the Cenves in the north towards the Soanan and Turdine valleys creates a virtually uninterrupted natural border (the crest line is only interrupted three times, by the Ardières, the Azergues and the So-

anan valleys) between the Beaujolais mountains and the Beaujolais vineyard. The latter occupies a fifty kilometers long and 10-15-kilometers wide space. In the east, the vineyard's limit is in contact with the alluvial deposits in the plain of the Saône, around 200-250 meters. From this riverbank, the landform rises to the west, creating a piedmont-like rolling landscape, slightly incised by various east-west shaped valleys. The wine-growing hillside rises to 500-550 meters high, where the vine slowly fades away and gives place to the wooded peaks of the Beaujolais mountains.

Some topographic features such as the Pommiers massif in Charnay, or the Brouilly mountain disturb the piedmont's uniformity and single out in the landscape.

The wine-growing piedmont shows to different geological situation. In the north, the land is noticeable by the presence of geological formations similar to the ones in the Beaujolais mountains, especially by granites such as the one in Odenas-Fleurie and by microgranites such as the one in Saint-Julien, whose decay produces silicious soils made of coarse sand, on which vine manages to prosper. Other rocks like the black volcanite of Rivolet or the dioritic base hornfel (called « Blue Stone) of the Brouilly mountain also form rocky but more clayey soils, notably in some high sectors of the vine-growing coteaux, between the Montmelas massif and the Juliénas hillside.



River transport on the Saône river

At the top of the wine-growing hillside, as well as in the most part of the High Beaujolais, granitic and volcanic outcrops form acid-loving lands, open environments in transition with softwood forests.

South of the vineyard, run-off erosion on Secondary terrains follow the geology of the layers, the fractures and faults of the Tertiary (North-South). In the lower part of the Beaujolais, the slopes are gentle in the east, and follow the inclination of limestone beds, steeper in the west because of softer sedimentary charcoal. In this area, the crests stand out in the landscape's monotony and create peaks. They are composed of crinoidal limestone and are supported by a network of normal faults from the Tertiary.

The diversity of the limestones is linked to different eras and sedimentation and is especially noticeable in the local architecture. The crinoidal limestone, or golden rock, which dominates on the hillsides is at the source of most of the villages' constructions, farms and hamlets in this area. Many small abandoned quarries, dug near villages for their edification, can be noticed in the south Beaujolais landscape. Today, the vast Belmont d'Azergues quarry

continues mining for golden rocks in order to make cement. Around the Pommiers massif, lighter limestones, such as the one in Lucenay, make the shades of the buildings vary. This limestone, called « White Rock », was the first to be mined in the Beaujolais. The Sinemurian grey limestone, recognizable thanks to the inlaying of many shells and oysters (gryphaea fossils), has been widely used to create paving stones, stairs, wash-houses and fencings in the vineyard. These limestones, and their associated marls, are the source of often rich and deep clay-limestone prevailing soils. They fostered polyculture in which the vine only prevailed since the second half the XXth century.

The Saône river's valley

The eastern fringe of the territory is characterized by a relatively flat space corresponding to the alluvial plain of the Saône river. Approximately 10 kilometers wide, north of Belleville, or at the level of the Chères plain, south-east of the territory, this plain forms several levels of alluvial terraces above the minor riverbed, located around 170 meters. Three principal levels can be noticed : the high level (from 250-260 meters), that we can also find at the

surface of the Dombes plateau, in the left riverbank of the Saône, the intermediate level (between 190 and 220 meters) including the low and high terraces of quaternary era, the low level (170-175 meters) made up of the most recent river alluvium.

The alluvial valley presents a very young geology. The alluvium form very fertile and neutral loamy-sand soils, bearing cereal crops, forestry and vegetable cultures, which prosper in the plain. South of the Beaujolais, the Saône valley forms meanders before going around the Mont d'Or by the east to flow through the Lyon agglomeration. It spreads to form the Chères plain, surrounded by the west fringe by the Azergues, which flows at the base of the Pommiers massif, in Charnay.

This topography and hydrology, closely linked because influencing one another, have shaped the occupation of the territory by man. The latter settled along rivers in search for energy and other resources to ensure a strategic role.

The erosion, especially by water, is one of the major processes that shaped the Beaujolais landforms. Active throughout the different geological eras after the elevation of the territory by the Alpines and Pyrenean orogenesis.

A.3.2.

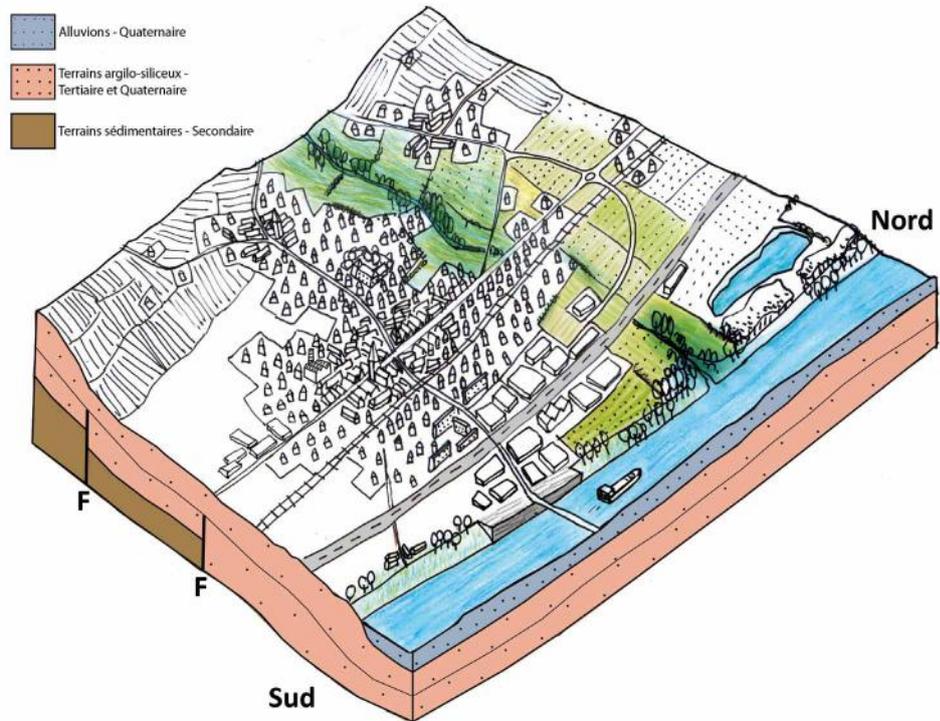
■ The major landscape features

► **The Saône Valley** : At the base of wine-growing hillsides and the Beaujolais mountain chain, the Saône has created a huge alluvial valley. Along the course of history it became a major axis of transportation and development between Lyon and the Bourgogne. The landscapes alternate between woodland, water meadows, riverside alluvial forest, arable zones of cereals and vegetables that grow in fertile sandy-loam soils.

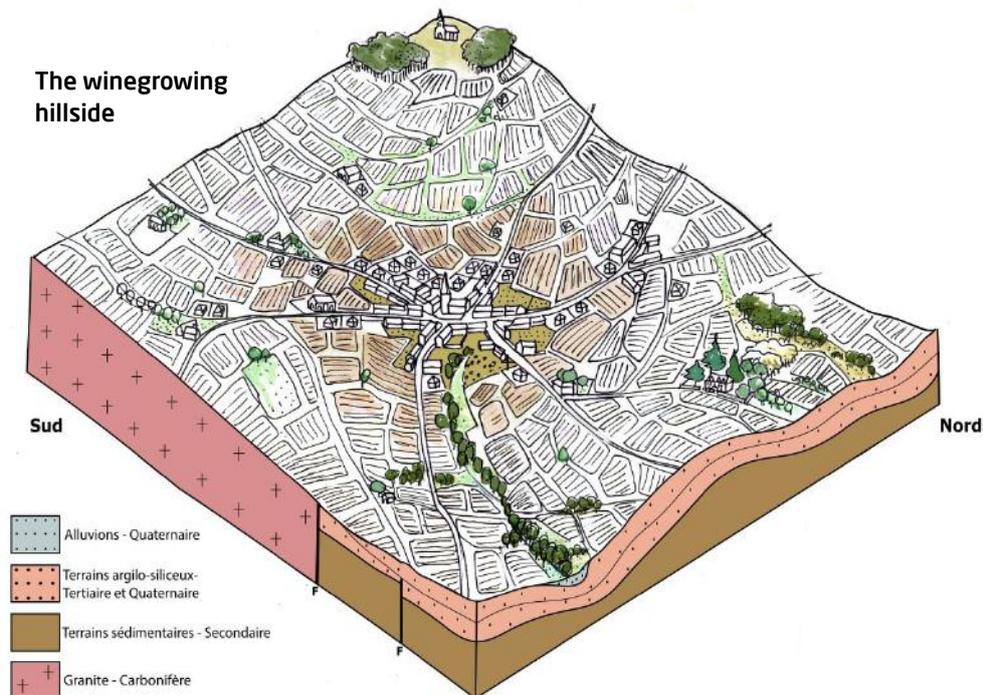
► **The winegrowing hillside** : the slope rises gently from the Saône Valley to the crests nearby the Beaujolais mountains. Since the XIXth century, winegrowing has spread up the hillside to around 500 meters' altitude and gets more dense in areas of controlled appellations of the Beaujolais crus.

The vast stretches of vineyard form a very open landscape in which vertical features, artificial or natural, take on significant visual importance. The villages, hamlets, castles and winegrowing domains are historically scattered. Many small valleys stand out in the landscape thanks to tree-covered corridors that underline their riverflow. A few large valleys show a more enclosed landscape of meadows and hedges. Vineyard monoculture offers a great ledibility of landscapes.

The Saône Valley

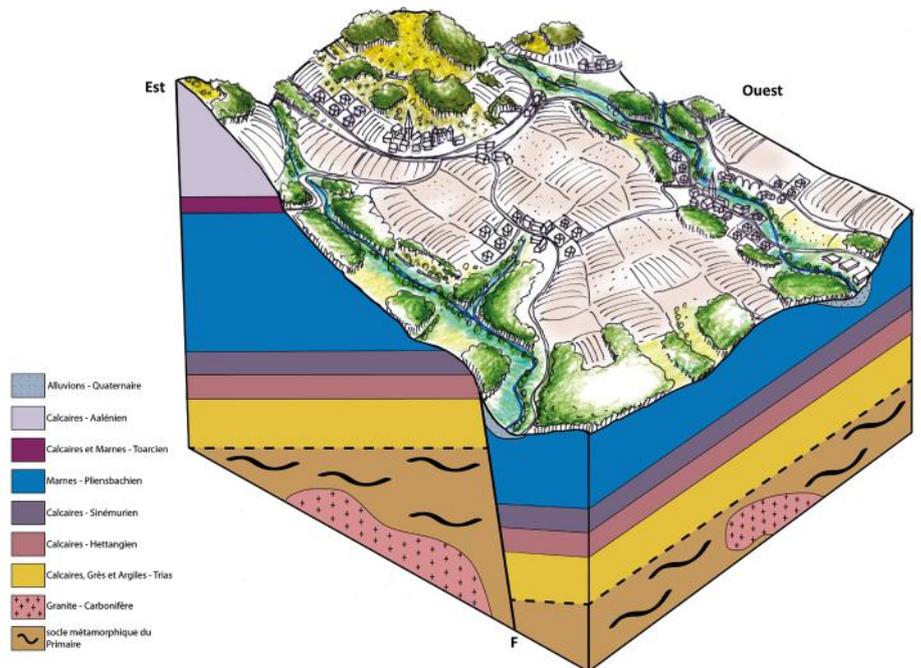


The winegrowing hillside



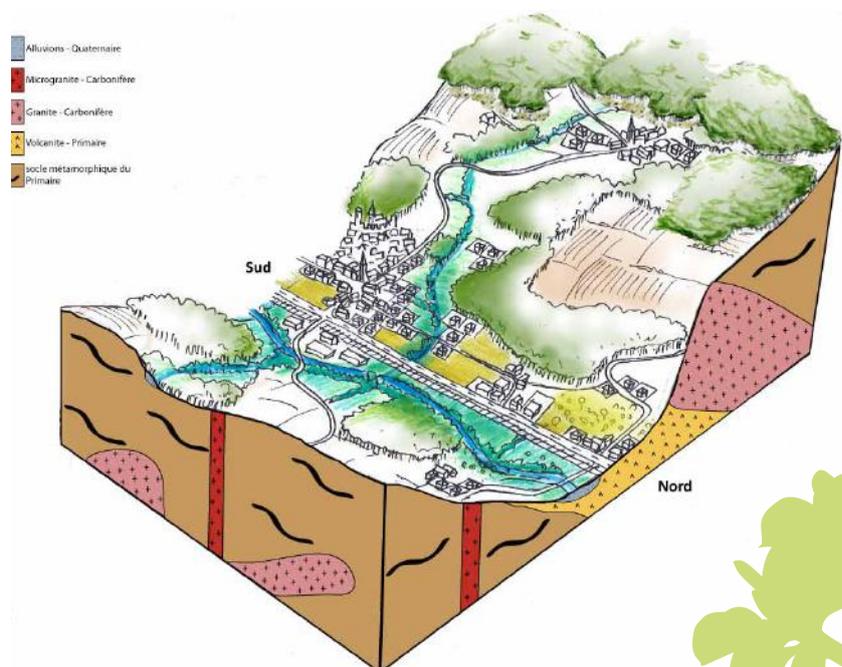
► **The golden rocks** : south of Villefranche-sur-Saône, the winegrowing hillside changes slowly to a hilly landscape composed of rolling plateaus and slopes that spread towards the Saône. This topography, founded on a limestone dominated geology, is generated by numerous valleys of various dimensions that flow either to the north-east to reach the Saône near Villefranche-sur-Saône or to the south to join the Azergues. The variety of limestones and marls have created calcareous-clay soils that allow a great diversity of agricultural crops, leading to polycultural landscape's with a wine-growing dominant. The name « golden rocks » comes from a yellow limestone (the crinoidal limestone) Ajouter : ("Pierres Dorées" in French) that exists in this area and constitutes most of the local traditional architecture.

The golden rocks region



► **The Beaujolais mountains** : over the crest line dominating the vineyard, the landscape changes. The vineyard gives way to a middle-mountain landscape, composed of vast forests and meadows dedicated to cattle breeding. These landforms, mostly from metamorphic origin, which spread towards the Loire then to the Massif central, are auspicious to forestry and especially to growing pines. The decline of agriculture during the second half of the XXth century led to the reforestation of these territories and in particular to the mono-specific plantation of Douglas fir, whose yield and quality of wood make it an interesting species for lumber.

The Beaujolais mountains





Douglas fir forest

Black woodpecker

Hoopoe

Forest wildcat

Monks hood

Barbastell

Elderberry orchid

Woodcock

A.3.3.

■ A mosaic of environments

The territory's fragmented forest is essentially under private management. Wood production, ecological management, landscape conservation and as a leisure destination for the general public are amongst the many activities that we have to reconcile to preserve the forest ecosystem.

The forest covers 33.5 % of the total surface of the applicant's territory. The prevalence of coniferous species puts the landscape at risk of becoming enclosed and uniform. A differentiation has to be made however, between natural regrowth and the increase in managed forests.

In the first case, regrowth is the consequence of the abandonment of agricultural land. This phenomenon is affecting the most inaccessible places, which are often sectors where agriculture has ceased and there is no urbanisation to compensate.

In the second case, it is the economic development of coniferous managed

forests, mostly the Douglas fir, which occupies a larger surface area. Its spread is assisted by a vigorous self-seeding.

The Douglas fir is grown and colonizes set-aside lands, and results in a uniform landscape. Up to 50 meters high and characterised by its fast growth, the Douglas pine (*Pseudotsuga menziesii*) is the most common timber in the managed forests of the Beaujolais.

Located in the High Azergues Valley and in the Trambouze Valley, the Douglas fir plantations give rise to a characteristic landscape : uniform, dark, giving an impression of large scale landscape, they are mostly located on ridges. This forest environment is home to specific wildlife:

the woodcock, the forest wildcat, the black woodpecker, forest bats in beech forests such as the barbastell and the greater mouse-eared bat, the common raven or the lynx.

The Beaujolais territory has always been auspicious to the development of forests. Man disturbed the natural organisation following the massive deforestation during the Middle Ages, in order to provide agricultural lands with construction wood, to such a point that,

during the XVIth century, there were no forests left in the Beaujolais region. They grew again from the XIXth century onwards when agricultural decline occurred, and the public authorities encouraged the plantation of pines and douglas fir. Today, forests occupy 50 000 hectares, which is one third of the territory.

Under this forest cap thrives a complex biodiversity. The blocks of old trees provide precious shelter for birds and bats who make the most of all the holes, when on the ground dead wood enables mushrooms and insects to develop.

Composed of small sized plots, the Beaujolais forests form a mosaic of trees of all ages and species. In addition to the silver fir and the douglas fir, we can find spruce, larch, black wood, sylvester pine and cedar... Further to the east, while descending from mountains, the forests change and are mostly composed of chestnut, oak and hornbeam wood.

The spreading of forests since the XXth century has allowed some mammals to regain their place. Today, around 8000 deer and 800 boar have been counted in the Beaujolais. Their population is regulated by management plans and

sustainable hunting. A small part is also ensured by reappearance of natural predators, such as the bobcat or the wild cat.

The environment's acid soils are appreciated by species such as the bracken fern or the foxglove. The High Beaujolais also welcomes the aconit tue-loup, only spotted in the Rhône department at the summit of the Saint-Rigaud mountain, the martagon lys and the sureau orchids.

Moorland and dry grasslands

Below the forests, as in Quincié-en-Beaujolais, some slopes appear dry, punctuated by shrubs, rocky outcrops and sandy areas. This moorland often alternates between « dry grassland » and natural environments with cropped vegetation.

Moorland and dry grassland can be found in the central part of the territory and contain characteristic and rare species. Dominated by Scotch broom in addition to hairy greenweed, arrowhead woadwaxen and heather, these places are home to the woodcock, the nightjar, the northern harrier or even the Eurasian eagle-owl. On the limestone hillsides, the dry grasslands shelter different varieties of orchids, the hoopoe, the red-backed shrike and an uncommon butterfly: the Piedmont ringlet.

Here, solar irradiance is strong, the substrate poor and the water rare, which limits the implantation of forest

species. Occupied by a specific fauna, these open spaces, once grazed by herds of sheep or goats, contributed to the balance of the environment. These special places are disappearing today. This is the reason why the actors of this territory are joining to maintain this environment, while encouraging the installation and the development of adapted agricultural production.

The open environment and vineyards

The small valleys and the plains of the Beaujolais are suitable for agricultural production. In the hillsides, cattle and sheep farming dominates and focuses on meat, milk and cheese production. Winegrowing is most prevalent to the east of the region.

The hedgerows are home to many species : from the end of summer and during fall, trees and bushes are covered with berries upon which blackcaps, linottes and sparrows feast. There are also foxes and deer.

On the eastern plains and hillsides of the mountains, vineyards thrive between the many affluents of the Saône. Implanted by monks and bishops during the Xth century, they are the result of a rich ancestral legacy, in which specific practices and craftsmanship are passed on from generation to generation.

In the middle of the vineyards, the smallest space left alone by human activity is a haven for biodiversity : low drystone walls, isolated trees, pre-

served hedges, flower or grass strips between plots. This is where secondary fauna regains its place : pollinators, predators and parasites also help cultures.

The Saône Valley

The Saône Valley ("Val de Saône" in french) is one of the most emblematic and fragile areas of the territory due to its multiple uses : water resource, agriculture, business parks, quarries, transport by waterway, water sports, etc.

The Saône Valley's landscapes have conserved their original aspect as lowland forest (Alder, Ash, Oak, Willow) which develops naturally along riverbanks. The shallow depth and the quality of the water (presence of molluscs and aquatic grass beds) give this place a role as a shelter and a breeding site for fish (Bream, Chub, Bleak, European Bitterling).

The flora is also characteristic: the Marsh Ragwort and the Summer Snowflake are some of the remarkable species we can find here.

During flooding, the waters of the River Saône spread over the water meadows : this phenomenon leads to the creation of new environments, which are conducive to the development of a particular ecosystem, whose emblematic flower is the Fritillary which blooms in March/April.

Some others with specific ecological requirements are less rare but none-



Eagle owl



Beaujolais' Moors



European Beaver



European Bee-eater

theless remarkable. The Unbranched Bur-reed, the Yellow Water-lily, the Holly-leaved Naiad and the Brittle-leaved Naiad are aquatic plants. One of them has their flowers and leaves at the surface of the water, the others are completely immersed. Among birds we can see the Eurasian curlew whose voice announces the Spring, and the Stone-curlew. One can admire the plumage of the Common Kingfisher and the European Bee-eater in addition to the Sandpipers, the Stilts and three species of Heron (Night Heron, Purple Heron, Grey Heron) that nest here. The European Beaver is also present, but not permanently installed. Pike is found in the spawning areas, and the Bitterling is present too.

The lônes, which are secondary beds of the Saône, totally or partially disconnected of the main riverbed, area real pools of biodiversity. The Saône River is the only river in the Beaujolais territory which is big enough for navigation. It is a strategic axis for transportation, and boats were, for a long time,

towed by men before horses took over this task. Today, river transport is still used for the transpor-

tation of goods (salt, wood, containers and oil) and for local transportation of sand and gravel.

Mines and quarries

The extraction of the Beaujolais underground resources began long ago : The Romans extracted lead from it. For centuries, mines and quarries sprung up all over the territory, so much so that each village and sometimes even each hamlet, still bear the marks of spaces dedicated to extraction long ago.

From the beginning of the mining operations, the mines and quarries were inhabited by many species. Birds such as the Eurasian eagle-owl, enjoy the quarries' rock walls in which they build their nests. The yellow-bellied toad is fond of the temporary pools often seen in quarries. With its heart-shaped pupil, its round nose and its yellow and black belly exposed in the face of danger, this little toad is easily recognizable.

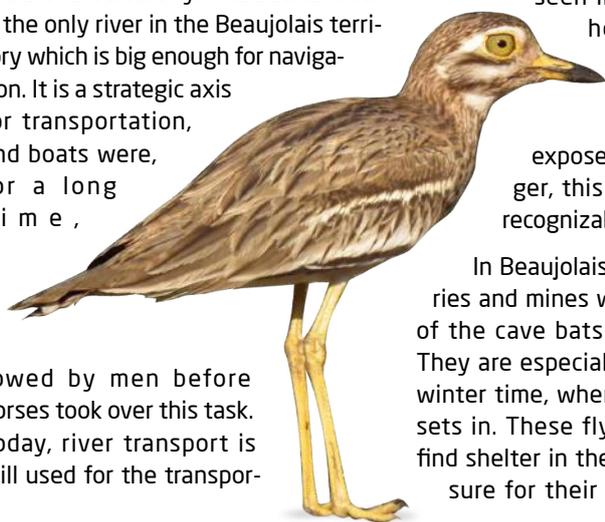
In Beaujolais, underground quarries and mines welcome almost half of the cave bats species in Europe. They are especially important during winter time, when seasonal lethargy sets in. These flying mammals then find shelter in the galleries they treasure for their calm, humidity and

constant temperatures. Their body temperature will then drop to 8°C until the first mild nights of spring. The Claveisolles mines are one of the main hibernation sites and host the most beautiful community of species in the department. The Glay quarries represent a matching and reproduction site for at least 4 species, including the Plecotus bats and the Daubenton murine bats. From the end of august, males meet, waiting for females to visit, creating a strange ballet that lasts a few weeks, until the beginning of october. Spawning will only take place during the summer months.

Since 2004, quarry industries have been offering operators a voluntary step towards environmental progress, regulated by a charta and ever more rigorous standards. The challenge is to push on towards a respectful operation that will be in concordance with the heritage of the surroundings. It's not unusual to discuss with business managers about natural vegetalization methods or about the emergence of uncommon species.

Rivers and wetlands

The wetlands and aquatic environments can be found throughout the entire territory, mostly at the heads of the catchment areas, as waterpoints and permanent streams, wet meadows, peatbogs, gravel pits, reed beds, river-



Oedicnème criard

bank woodlands, etc.). These places are remarkable for their biological diversity with rare plant and animal species.

Below the green Beaujolais summits, many springs ooze where the slope breaks and the groundwater crops out. The water is generally of excellent quality, although a bit acidic because of the rock composition. The locals have even grown into the habit of putting marble slabs at the water springs in order to balance the pH. Waters coming from limestone terrains are, on the contrary, more basic.

Coming from the same family as the cabbage and mustard, watercress boasts several species, some of which grow on drylands and others on wetlands. Among them, the watercress from fountain, eaten since Antiquity and grown since the XIXth century, exists in its natural state in the Beaujolais region.

You are however not advised to eat it in this form, since its renowned for hosting a dangerous parasite : the liver fluke. Also called goldencress, the « dorine à feuilles opposées » is also easily found in springs and cold waters. This plant has interesting healing properties : it prevents and treats gall-bladder troubles such as gallbladder and liver congestion or kidney stones.

The whitefeet crayfish can be seen in clear streams, upstream from the Reins, the Ardières and the Azergues. Its name comes from the white color

under its claws, but this criteria isn't always respected. This crayfish is today threatened with extinction because of pollution, the physical degradation of streams and rivers and the competition of other exotic crayfish, like the signal crayfish, that spread terrible diseases.

Among the many springs of the Beaujolais, the one in Saint-Rigaud is probably the most well-known and the most visited. According to an ancient belief, it is endowed with miraculous powers : it could cure rheumatism, sore-throats, fevers... and above all it could make women fertile again ! The story goes that an old healer monk, who was the last survivor of his religious community, was buried in the spring itself, thus giving it his powers.

Today, this belief lingers on, as the many crosses left by pilgrims decorating the site prove. They were made from the materials found around it, according to custom. Another belief says that the Saint-Rigaud spring comes from the Alps, thanks to a gigantic 100 kilometers drain. Don't be fooled, it's only a local tale ! In truth, the water comes from rainfall that seeps into the ground and then spouts out because of the overflow due to the waterproof loamy soil. This phenomenon also explains how we can find springs so close to the summit, which is pretty rare. Misunderstood, even overlooked, these wetlands have sparked legends and tales. Today, considering the stakes

they represent, they are gradually being recognized and preserved. Indeed, they have a part in managing the water supplies (in quantity and quality) and are useful to many species, for their reproduction and food supply.

Once omnipresent near springs, streams, at the bottom of small valleys and plains, most of the wetlands have vanished, having been drained or filled. Although declining, they keep on shaping the landscape. During the inventory conducted in 2012, at least 1300 wetlands were identified in the Beaujolais ! According to another study conducted in 2014, one out of five area of wetland is under threat, thus the necessity to act in order to preserve them.

If ponds and swamps are easily identified, water meadows and bogs are often more difficult to recognize. Several criteria help to identify wetlands. Firstly, the vegetation changes color and different species appear when the ground is wet - for example, there are a lot of rushes. Secondly, the color of the ground is changed because of the water (rust-coloured, blackish or greyish depending on the type of soil).

The wetlands are shelter for very specific species, adapted to water. Some of them, such as the golden cinquefoil and the sundew are vulnerable and delicate. Their presence shows how healthy the wetland is and how effective the methods used to preserve it are.



White-clawed crayfish

A.3.4.

Cultural and human landscape

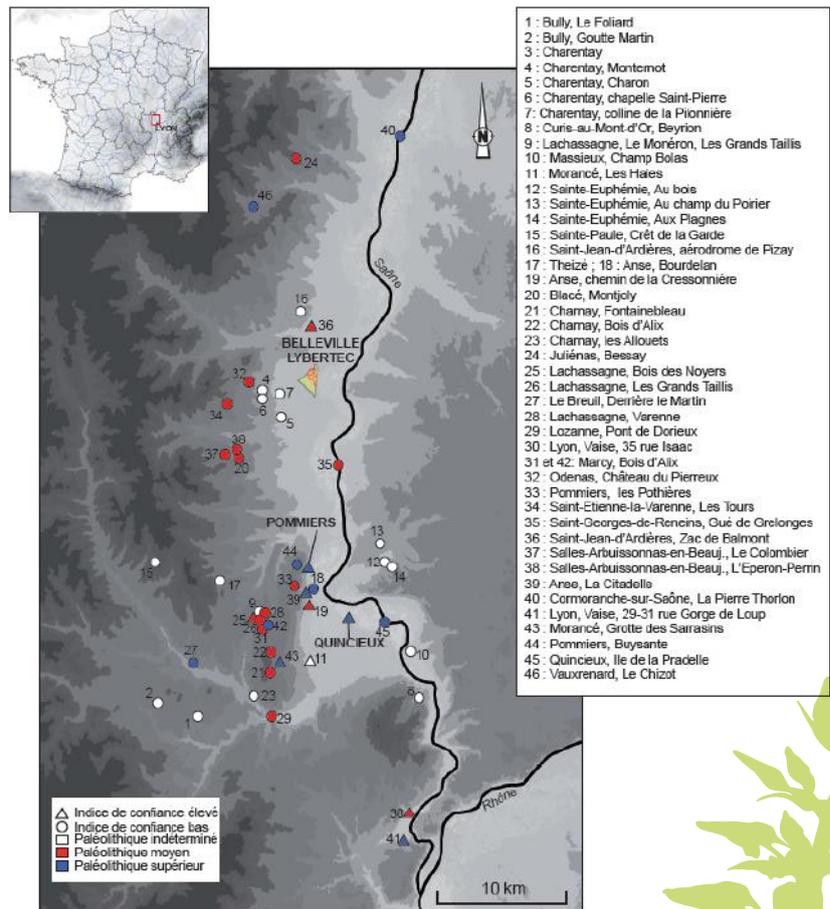
Located on or near two important communication and migration axes the Beaujolais soil was trodden by man and fauna from prehistoric times. The proof of their presence is manifest in the mountains, on the hillsides and to the far reaches of the plains.

Thus we can find traces of human occupation from the Lower Paleolithic (Acheuléen) up to protohistoric times. The famous deposit of Alix, covering a considerable surface of 400 hectares, contains an abundance of artefacts of the lithic industry of the Middle Palaeolithic (Mousterian), elements of which are found up to the high course of the Loire, Side of the Puy-en-Velay. From this site, and from other more concentrated sites (Anse, Belmont-Charnay, Nety-Milly à St-Etienne-des-Ouillières, Ludna à St-Georges-de-Reneins, Le Garret à Villefranche-sur- Saône, Les salles à Ronno, Amplepuis etc.) there are relics of diverse activities dated to the Upper Palaeolithic (Aurignacien-Gravettien), the Mesolithic and the Neolithic. However, no settlements have been identified in the Beaujolais.

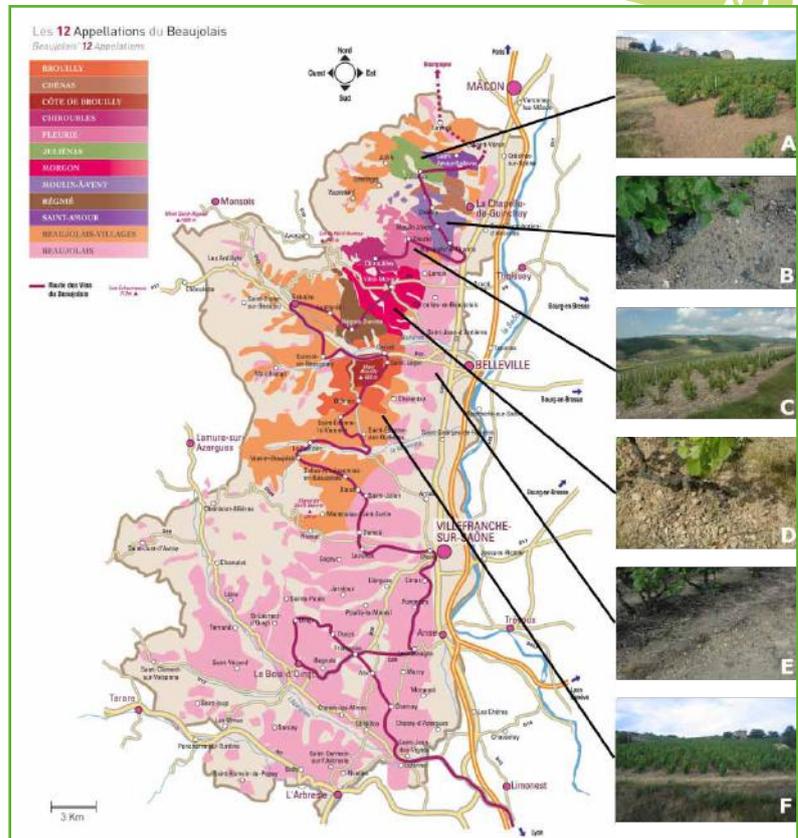
These activities of working, shaping and polishing various stones, produced at least two materials from the geology of the Beaujolais: Jurassic flint from Alix (essentially Bathonian in age) and the metabasalt from Brévenne (Devonian green amphibolite schist). An almost complete record of these activities has recently been assembled and presented to the public at the museum of the Espace Pierres Folles at St-Jean-des-Vignes.



Flint of Alix



Map of archaeological deposits



The main soil types of the Beaujolais vineyard

- A : Granitic soil of the crus area (Juliénas)
- B : Altered granitic soil (Chénas)
- C : Granitic soil (Fleurie)
- D : Schists and altered granitic soil (Morgon)
- E : Sandy-Clayey soil (Beaujolais)
- F : Clayey-calcareous soil (Beaujolais Villages)



Agricultural and silvicultural landscape of Green Beaujolais

When a diversified geology fully participates in the economy and heritage of the territory

The Beaujolais offers a great diversity of landscapes, resources as well as natural and human heritage. This is largely due to the complexity of its geology. Geology is clearly expressed throughout a remarkable multiplicity of landscapes born of the agricultural economic activity, and it is at the heart of an architectural heritage whose reputation is known outside the territory. The geological heritage of the Beaujolais is therefore everything that the geology of this area has created in the history and lives of its inhabitants, as crafted by them, in the past as in the present, a true geo-heritage.

The winemaking landscape of the Beaujolais, a direct link between geology, wine cultivation and wine production

Adjacent to the Haut Beaujolais Mountains, the oriental slopes, exposed to the east and gently sloping, are mainly oriented towards viticulture, where precisely where the geology of the territory displays its most beautiful diversity. Thus, most of the good wines, the celebrated Moulin-à-Vent, Fleurie,

Chénas or the Juliénas, are produced in soils covering different types of Carboniferous granite. Other good wines such as Côte-de-Brouilly or Morgon are primarily associated with more restricted, rare geological facies : the Devonian amphibolite honfels schist and microdiorite. Some good wines (Régnié, Brouilly, Saint-Amour) benefit from the fluvio-glacial clay rich sands of the Pleistocene. The Beaujolais-Villages are found essentially on polygenic silica rich lands of either Palaeozoic volcanic or metamorphic origin. The popular Beaujolais wines are produced in the area of Mesozoic clayey-limestones of the southern Beaujolais or, in the ancient Quaternary alluvium bordering the Saône River plain.

The forest and rural landscapes from the geology to forestry management and cattle rearing

Forestry activity occurs across a large part of the Beaujolais territory, mostly in the high ground to the west. This forest production shows a clear relationship with the geology. The distribution of the plantations with the commonly used species, the Fir, Douglas Fir and Spruce, correlate well with the distribution of the Carboniferous rhyolite and siliceous volcanic and hypovolcanic rocks of the Haut Beaujolais. These same terrains benefit sometimes from an enriching in lime that results in very

high quality pastures and fodder for the rearing of cattle, sheep and goats.

A remarkable architectural heritage, the strong mark of the geology in the construction and the traditional architectural heritage

If the geology of the Beaujolais is often covered by vines, forests, pastures or human habitation, it is no less visible through the architectural heritage of this territory. Rich in its stone varieties the traditional construction is a true "permanent exhibition" of the numerous types of Beaujolais geology. Tourists are above all struck by the beauty and special atmosphere of the "Pierres Dorées" area (Aalenain yellow crinoidal limestone). One of the villages Oingt has been listed amongst the "Most Beautiful Villages in France". Together, a group of villages have submitted an application to become a "Towns and Lands of Art and History". Certainly other villages display this yellow stone architecture which draws admiration and affinity of inhabitants and visitors, amongst which Theizé, Jarnioux ou Charnay are well known. Around these you will find a remarkable heritage of dry stone work, with an abundance of walls, low stone walls and traditional rural shelters "cadoles".



Jarnioux' Castle



Saint-Nizier's viaduct

There is equally another widespread heritage, both of major or minor importance, a true reflection of the "Civilisation of the Stone" that is so clear throughout the Beaujolais : churches, town halls, factories and simple rural homes made of Carboniferous grey-pink porphyroid granite or red micro-granite; viaducts, windmills and country houses built in Visean black and grey volcanic rocks; factories and bridges made of Cambrio-Ordovician green gneissic schist's; chapels and wells of Triassic sandstone; castles and churches of Bathonian white oolitic limestone; wash houses, steps, frames and walls made of Sinemurian grey shelly limestone etc.

– A.4. THE ORGANIZATION IN CHARGE AND THE STRUCTURES OF MANAGEMENT

A.4.1. ■ The Syndicat Mixte

The Geopark Beaujolais project is implemented by the Syndicat Mixte du Beaujolais which brings together several tools for implementing sustainable development.

The Syndicat mixte du Beaujolais is therefore in charge of carrying the development policies and bringing together municipalities at a supra-local level.

– **The territorial coherence program** is an urban planning document and a tool for strategic planning which permits municipalities and intercommunalities to establish coherent policies. This program regulates territorial evolution with land planning and development projects geared towards sustainability.

– **The Geopark in Beaujolais approach** : Since 2012, the Syndicat Mixte du Beaujolais has been in charge of the Beaujolais Geopark project. By bringing together local stakeholders around this project, but also by guiding and accompanying municipalities who manage geosites into planning

and valorization projects, by offering educational activities and by taking care of the communication and the scientific aspects of the project, the Syndicat Mixte du Beaujolais is the main player in the implementation of the application to the UNESCO Global Geopark label.

– **The territorial charter** is the core document concerning the sustainable development strategy for the territory in all domains : agriculture, economic development... A common base for all the policies and actions planned on the territory. The Syndicat Mixte du Beaujolais has been using this tool since 1999 and has revised it every ten years.

The territorial project is built around 4 strategic priorities:

- ▶ Putting natural riches and heritage at the heart of the Beaujolais;
- ▶ Developing the territory in a sustainable way through a reconsidered territorial organization;
- ▶ Welcoming firms and employment in the Beaujolais;
- ▶ Asserting a territorial governance in order to support projects and manage the future of the Beaujolais.



Bayère's Castle Icehouse



Charnay's Castle

These initiatives are organised into key issues and priority directions; the Geopark project is linked to many of them :

_ The forestry charter : Implemented by the forestry orientation law enacted in 2001, the territory forestry charter is a tool created in order to organize the planning and sustainable development project of the territories, allowing the inclusion forests in their cultural, social, ecological and economical environment.

_ The landscape charter : since 2008, the landscape charter has helped identify the landscape's features as part of a diagnosis in order to make local representatives and stakeholders aware of the necessity to preserve the quality of the Beaujolais landscape. This charter is meant to anticipate the specific dispositions necessary for the sustainability of the quality of the landscape in urban planning documents, and recommendations of territorial development.

_ Hosting policy : territorial marketing that aims at welcoming new active people in this rural environment in order to reinvigorate the economic structure, shops and local craft.

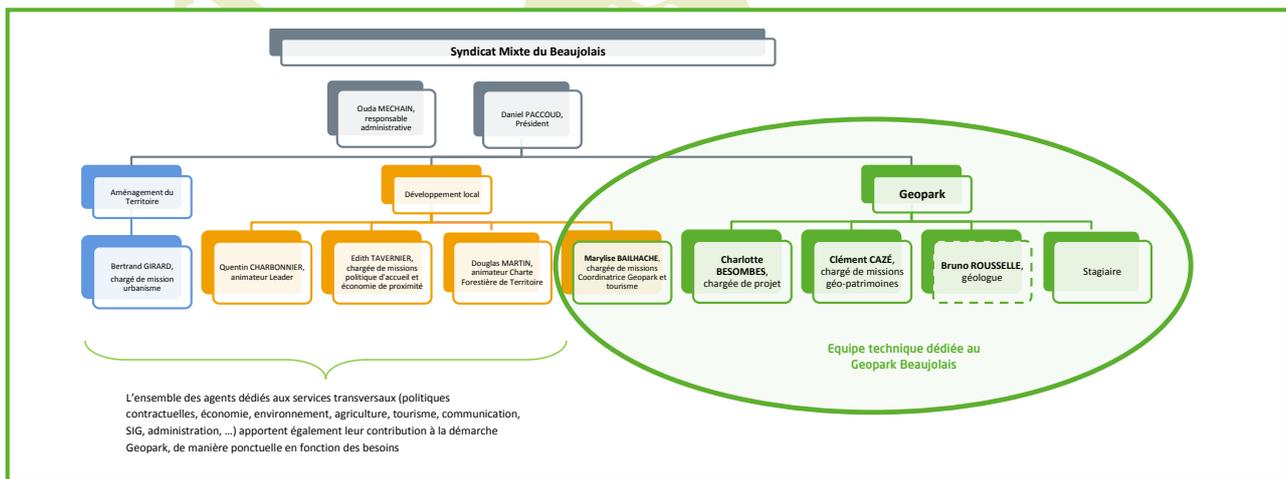
_ The leader program is a European program which supports innovative projects in rural areas. It encourages experimentation and innovation in selected applicant territories. Structured around a Local Action Group (GAL) it is a local democratic body that unites public and private stakeholders who work to develop the territorial strategy and decide which projects to support. Between 2009 and 2014 our territory, through this Leader program, has had the goal of becoming an eco-territory; assisting innovative projects to control energy and enhance local know-how in the wood-derived, textile and agricultural industries.

A.4.2.

■ How does the organization work ?

The Beaujolais Syndicat Mixte is a grouping of local authorities whose operation is governed by elected members representing the four inter-municipality associations.

The political body : The management comity has 49 regular members and 15 substitute members. The management committee meets once each quarter and takes the decisions about the specific competences of the SMB and votes the budget. The executive board (Bureau Syndical) is elected by the management committee from within its members. Its 16 members include a president, 4 vice-presidents and 11 delegates. This executive board meet once a month to follow the implementation of the territorial project and deal with day-to-day business.



Geopark and Syndicat Mixte du Beaujolais staff organization chart

A.5. TECHNICAL SUPPORT AND INTER-LOCUTORS IN CHARGE OF THE PROJECT

A.5.1.

■ The Geopark Beaujolais team

The Beaujolais geopark's technical support team is composed of three employees and one intern :

- ▶ **Marylise Bailhache,**
Officer for tourism and local development
- ▶ **Charlotte Besombes,**
Project geopark officer and CIFRE postgraduate (University of Grenoble).
- ▶ **Clément Cazé,**
Geoheritage officer
- ▶ **Alexandre Chignier,**
Geopark application intern

A.5.2.

■ Working groups

As the Beaujolais Geopark project is much more than an institutional project, there are many people involved in the process. Experts and qualified volunteers have completed the technical team. Thus Bruno Rousselles, geologist and curator of the Espace Pierres Folles Museum, is the expert in geology for the application and is the technical reference for the scientific working group. His skills are precious and essential to the project, so a convention has been signed between the SMB and the Espace Pierres Folles in order to establish partnership conditions.

– **The Scientific committee or scientific working group :** The scientific committee consists of experts from the applicant territory or who have worked on the applicant territory. Linked to the universities and their researchers, this group works on the methodology, the inventory and the documentation of the geosites, such as a general guide on the geology of the Beaujolais region.

Chantal Pegaz is an ardent ambassador of the territory and instigated the Geopark project. She is the referent for the « Communication, Partnerships and Lobbying » working group., which established an Ambassador for the Beaujo-

lais geopark in 2016.

– **The communication, partnerships and lobbying working group** focuses on three axes: the internal communication within the territory, raising the visibility of the Beaujolais Geopark project and being present at the main regional and territorial events and encouraging the development of geotourism.

Serge Gabardo is our referent for the working group « Educational action and public awareness-raising ». Former school director and Beaujolais elected representative, he is experienced and uses his skills to further the territorial project.

– **The « educational action » working group** aims at managing the educational aspects of the Geopark project. This working group is composed of local and regional educational stakeholders and is pursuing a triple objective : facilitating the creation of new educational offers or the reinforcement of associations who are in partnership with the project, geosites and the territory ; promoting cooperation between educational stakeholders and structures for public cultural actions and the development of innovative, good quality educational initiatives; to optimise the development of these educational actions through the implementation of a shared, capitalised and evaluated methodology.

Ginette Dufour is a former geography

teacher, local councillor and is passionate about mineralogy. This is why she has become the referent for the « Geosites » working group.

– **The « Geosites » working group** is composed of local stakeholders drawn from diverse backgrounds. In the building of the project, this group has produced a methodology for the inventory and prioritisation of identified sites in the database, creating detailed files on each site (cf. appendices). This group has been divided into territorial working groups in order to work on the management of geosites by municipality. They have also engaged key actors in the project. In the long term this group will establish management and valorisation plans for the sites together with the current managing bodies.

A.5.3.

■ The Geopark and its local network

Rich from the involvement of local stakeholders and inhabitants, the Geopark project also works with many partners throughout the territory. The preparation for application to the UNESCO Global Geopark Network has been achieved thanks to the participation of all the territorial stakeholders. Indeed, since the launch of the Geopark project, each initiative has sought to draw on the existing associations and to create momentum between them. Thus it helps ease the isolation of these initiatives in place within the applicant territory. The forum of the 28th of February 2013 was organized in that spirit: to allow the inhabitants to voice their opinions for they are the best ambassadors for their heritage riches, and are its finest connoisseurs. Since then, the project governance has been built with the same philosophy: working groups have brought together the elected representatives, technicians and civil society stakeholders who are the heart of the project. Particular tools were developed in order to allow the widest diversity of people to participate and be involved. In fact knowledge of the land cannot be only institutional.

It is by relying on the human resource from the territory itself that the Geopark project ensures a scientific and territorial coherence.

The idea of proposing the Beaujolais as the future French Geopark did not only win the support of the mayors and councillors, but it won immediate approval of the inhabitants of the whole region. In talking about the geology of a territory, its influence on people's lives as well as man's action to discover, understand and draw on the best part of the ground below our feet, everyone feels involved in such a story and wants to make their contribution towards it. Widespread mobilisation naturally takes place and is accompanied with enthusiasm from all the various stakeholders of the territory. For instance the wine growers through the work of characterisation of the "terroirs" completed in a very scientific manner by SIGALES, has deepened the understanding the origins and "raison d'être" of the different Beaujolais designations.

The association « Elles&Beaujolais » comprises women who are passionate about their region and wine culture, through their educational project for primary schools, to raise awareness amongst children about the geology of their region and teach them to respect their environment.

Landscapes, a natural but fragile resource have become a major concern for the Beaujolais. The entire territory has adopted the Charte de Fontevraud, an International Charter for Vineyard Landscapes following the membership of the "Pays des Brouilly" to this charter. These landscapes tell about the evolution of the territory, from the Palaeozoic to modern days, and everyone is proud to know how to read them.

Associations which have maintained these testimonies from the past have understood what development and communication they can build using the Geopark project.

The geomorphological processes that led to the setting up of "extraordinary" stones of Régnié and Lantignié have not even been identified. They had become the bane of winemakers, and they now take central stage in the press. Having been used to form pyra-

mids they have become the object of informative guided walks. The strong wish to create geosites in this territory, linked with water history, strengthens the Association IPP (the Association

Whether the Morguières of Theizé, the wetlands of the Haut-Beaujolais, the River Saône, the Douglas fir forests, the former quarries of Glay, the gravel pits, the agriculture or the farming, everyone can find a fitting place in the Geopark project to show the intelligence and the knowledge of our ancestors who have used the geology in the castles and villages, from the unassuming vernacular heritage and in agriculture. Therefore, all we have to do is to look at and admire this geological mosaic. Tourism stakeholders, such as the association « Atouts Beaujolais » or the SMB, promote the heritage interest in the geosites to generate curiosity in geowalks: the discovery of the geological resources linked to Beaujolais tourist attractions (landscapes, architecture, knowledge, local produce etc.). There is a lot of communication at meetings and wider general meetings in order to explain what a Geopark is, and enable everyone to participate in the project.

B.1.

GENERAL GEOLOGICAL DESCRIPTION OF THE TERRITORY

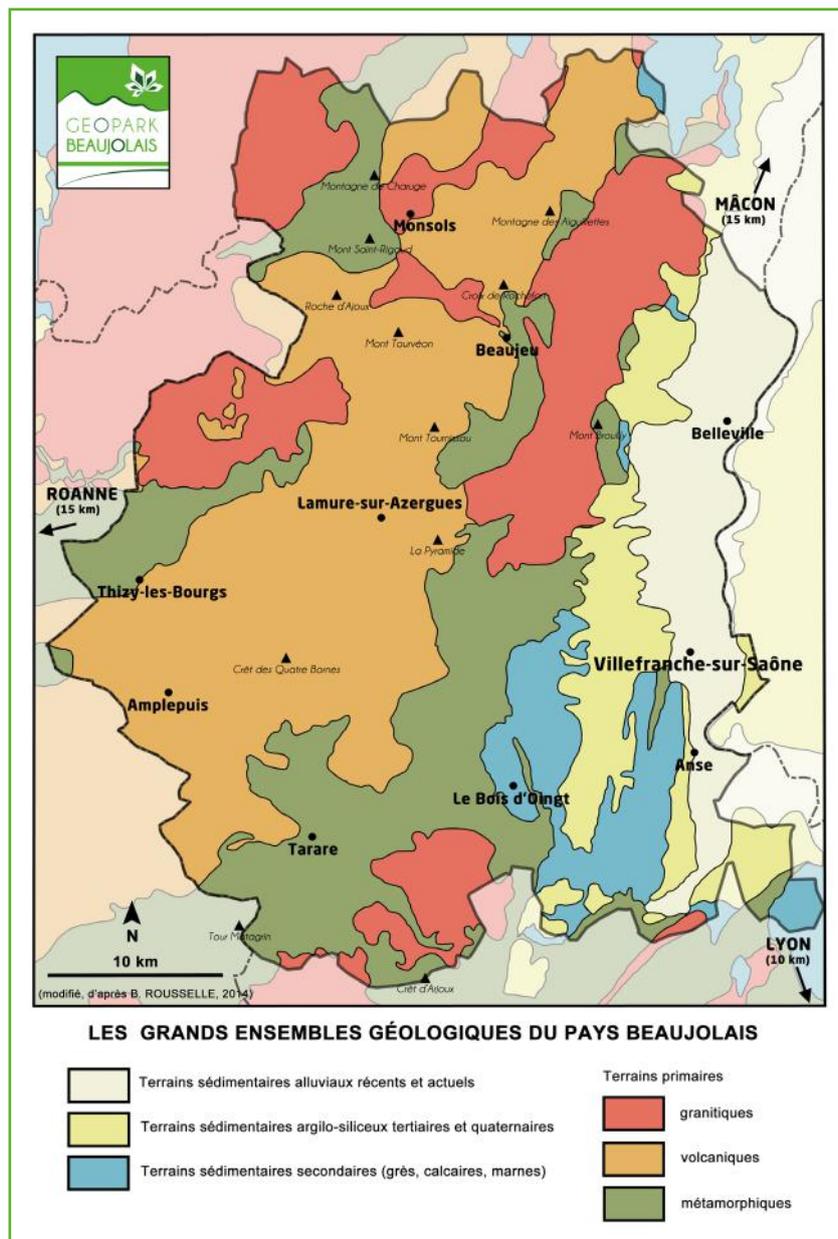
B.1.1.

■ Beaujolais' Geology and its Impact on the Natural and Human Landscape

Bordered by the vast Variscan French Massif Central domain to the west and the external periphery zone of the Alpine domain, the Beaujolais has one of the most complex geologies found within France and Europe. Its rocks are formed in nearly every type of internal and external geodynamic setting. There is a surprisingly high range of processes and span of geological ages represented there.

For more than two centuries numerous scientific studies have highlighted the importance of this region for understanding large parts of French and European geological history : the Devonian oceanic and intra continental ophiolitic Massif Central episode, the Variscan volcano-sedimentary and orogenic cycle in the Auvergne-Vosges zone, the general post-Variscan peneplanation, the Mesozoic epicontinental marine transgression in the North West Tethys domain, the Tertiary tectonics of the Alpine foreland basin, the peri-orogenic development of the large fluvio-glacial system of the Saône Basin and the pre-historic occupation and axis of migration of this basin and its periphery.

In this land where the geology is so generous, its influence on the landscape and human activities is particularly marked. Local construction benefits from an exceptional number of stone qualities such as the renowned "Pierre Dorée" of South West Beaujolais, "Granite Gris des Crus", the "Volcanite Noire" of the Haute Azergues or the



"Microgranite Rouge" of the Reins and Trambouze Valley's. This gives to the area a great wealth in architectural and rural heritage. Wine making, forestry, agriculture and raising cattle, as well as industry and tourism have benefitted, and continue today to benefit from this diversity of geological resources.

B.1.2.

■ The major geological units of the Beaujolais

The overall orientation of the principal geographic entities of the northern

Rhône department is north-south (mountains to the west, hills and plains of the Saône to the east). However the geological substratum of the Pays Beaujolais runs slightly oblique to this axis; the main geological units of this region form distinct bands of varying width that are aligned approximately NNE-SSW. These geological alignments broadly determine the position and organisation of the relief, the hydrographic network, human settlements and the economy. They are a major structural characteristic of this eastern segment of the Massif Central and constitute a direct legacy dating to the times of the Hercynian Orogeny.

At the heart of this structural organisation there is a vast collection of primary terrains composed of metamorphic

and magmatic formations. These rocks make up three quarters of the territory. In its westerly part these formations rise into a mountainous massif. The crystalline basement is generally subdivided into three parallel bands with a wide central volcanic band (extending from Amplepuis to Lamure and the Pays de la Grosne) separating two thinner granitic and metamorphic bands (from the Pays de Tarare to the vicinity of the Crus (Ardières-Mauvaise); and from the Pays de Thizy-Cours-la-Ville to Monsols). To the west and south-west of Villefranche the Mesozoic shale and limestone formations form low hills with gentle sides which about isolated higher mountains such as those in the south-east of the territory (north of the Lozanne or in the Mont d'Or). Finally, in the eastern margins of the Beaujolais there are superficial Tertiary and Quaternary formations running parallel to the River Saône. These large alluvial and fluvio-glacial deposits extend across the course of the river and its terraces.

B.1.3.

■ The Paleozoic metamorphic and igneous crystalline basement

It was during the Palaeozoic that the principal episode in the geological history of the Beaujolais took place; lasting almost 300 million years, it nearly spanned the entire Era. Located in the centre of France and to the west of Europe, this territory has recorded the geodynamic evolution of the Massif Central. For a long time this continental segment has been key to the general understanding of the pan-European geodynamics. To the north-east of this massif the diverse and complex Beaujolais basement is made up of most of the significant geological units of the Massif Central. It offers a comprehensive history of the initiation and evolution of the Hercynian orogenic cycle which resulted in the suture of the Gondwanan and Euramerican continents and the formation of Pan-

gea. The Palaeozoic of the Beaujolais holds a remarkable testament of the deep roots of the vast, high Variscan mountain chain whose importance is central to global paleogeographic history. The abundance and complexity of the Beaujolais Palaeozoic terrains contribute directly to the geological and heritage richness of the territory.

The Beaujolais Palaeozoic history can be divided into six principal phases, each of which is represented by primarily igneous, metamorphic or structurally distinct units:

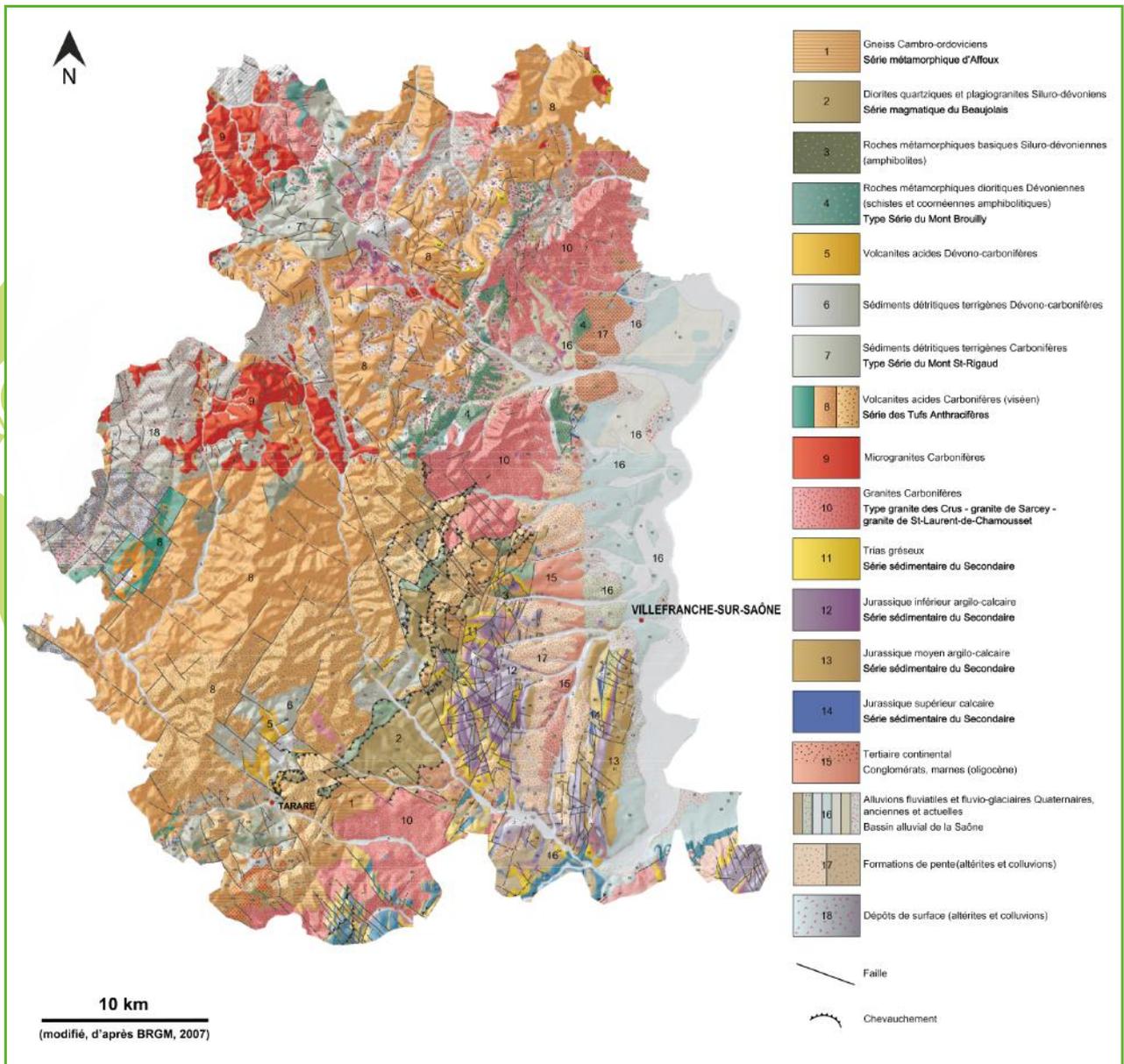
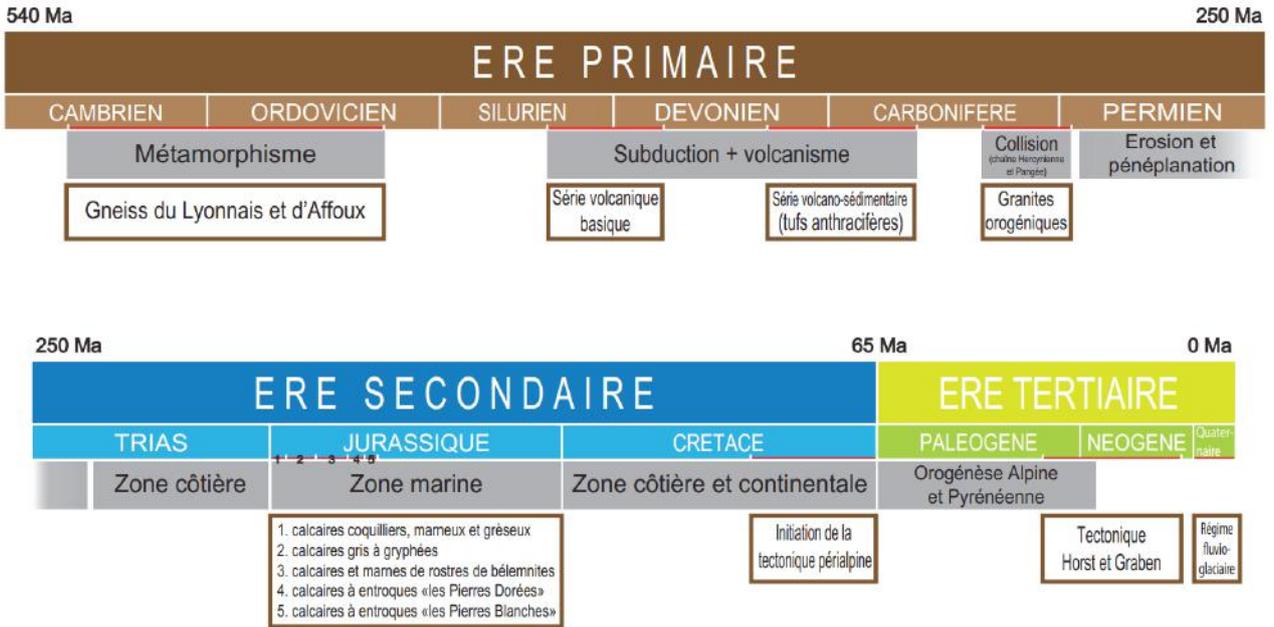
- **1.** A variable series of both ortho- and para- gneisses found in the Monts du Lyonnais (the extreme south-east of the Beaujolais region) and the sectors of Affoux, St-Loup-Dareizé or Montmelas-St-Sorlin. These either originate from essentially acid volcanic and plutonic rocks, with accessory basic and ultra-basic units, or they are formed from extensive detrital quartz rich sedimentation that occurred in diverse geodynamic contexts: epicontinental basin, volcanic island arc, intracrustal fault trough, upper continental crust

etc. These igneous and sedimentary processes are linked to the evolution of the active continental margin which existed and functioned on the edge of Gondwana between the Cambrian and the Ordovician, and maybe as far back as the late Precambrian.

- **2.** The Lower Palaeozoic volcano-sedimentary suite was transformed into gneiss from the end of the Ordovician. This occurred in a subduction setting due to the progressive closing of the Rheic Ocean between Gondwana and Euramerica. During the Silurian and a large part of the Devonian, the development of the Beaujolais gneiss took place in the Upper Gneiss Nappe of the internal zone of the Massif Central (the "Avergne-Voges" domain). The rocks were buried at depth and then transported to a higher level in the continental crust. During these intracrustal movements the rocks were extensively affected, but to differing degrees and at different times. They experienced mid to high pressure metamorphism, isostatic re-equilibrium and anatexis, compressional tectonics and thrusting,



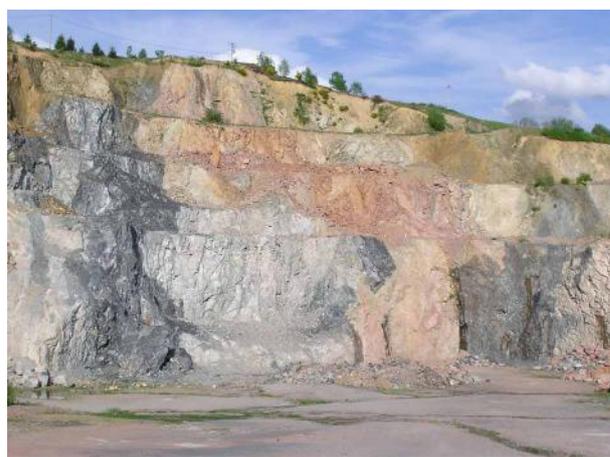
Gneiss



Beaujolais' detailed geological map



Anthraciferous tuffs in Saint Jean La Bussière



Volcano-sedimentary series of the former quarry in Cours



Metagabbro in Rivolet

as well as significant shortening.

3. Following the final phase of mid Palaeozoic tectonics which deformed the older metamorphic suite, an Upper Devonian to early Carboniferous (Dinantian to Lower Visean) series of volcano-sedimentary and volcano-plutonic rocks were developed. This happened either concurrently or successively, and the rocks are known as those of the Beaujolais and the Brévenne. The first, which is associated with the metasediments of Gresle to the west, is mainly characterised by detrital sediments (units from the Ternand-Cruizon and Valsonne). They contain peridotite olistoliths (Ponts-Tarrets unit), quartziferous and sodium volcano-plutonics (plagiogranites and quartz diorites of the St-Vérand unit / trachytic lavas of the Callet unit) and ophiolites (gabbros and dolerites of the Rivolet unit). The second suite of rocks in the Brévenne area primarily shows basic rocks (metabasalts and metagabbros) and ultrabasics. Associated with these are more silica rich volcanic rocks that formed in an intracrustal oceanic rift margin setting. The igneous and sedimentary

complex of the Beaujolais and the Brévenne characterise a new geodynamic environment; an active continental margin linked to a subduction zone, probably as part of the final closure of the Rheic Ocean. The volcanic part of the Beaujolais series contains stratiform metallogenic deposits which have once been mined (the deposits of Chesny-les-Mines).

The tectonic phase known as Brévenne took place at the transition from the Lower Visean to Middle Visean. It brought about the folding and metamorphism of the whole Devonian-Dinantien series. This episode had a south-east vergence. The overturning thrusts were directed towards, or onto the underlying Lyonnais metamorphic basement.

4. Prior to the drama of the intercontinental Variscan collision, two sedimentary and volcanic episodes left an important mark on the geological history of the Beaujolais at the end of the Lower Carboniferous (Middle to Upper Visean).

First, during the Middle Visean a detrital, limestone sedimentary series that was interbedded with rhyolite lava flows, was deposited in a peri-volcanic, shallow equatorial marine setting. These metasedimentary schists and grey limestone marbles covered large areas; today they notably found in the region of Thizy-les-Bourgs (the limestone and conglomerate series of Montagny, which until recently was quarried for lime), the massif of St-Rigaud and the area of Tarare-Valsonne

(metasiltstones and metaarenites).

In the Upper Visean after some epiorogenic movements (Voges phase), a final volcanic and hypovolcanic phase affected the whole of west Beaujolais. A vast rift valley formed between Feurs and Mâcon into which voluminous lava and pyroclastics from an intense calc-alkaline volcanism were deposited. These were interbedded with coal layers and together formed the Tufs Anthracifères. Rhyolitic ignimbrites which can show good prismatic jointing (the columnar lava of St-Victor-sur-Rhins), rhyodacitic lavas and microgranitic hypovolcanic units accumulated in great thicknesses, and today largely dominate the geology of the West and North-West Beaujolais. The anthracite veins gave rise to a number of mines (Ste-Paule, St-Vincent-de-Reins, St-Claude-Huissel...). The volcanic rocks were actively worked as a major source of aggregate for road building (St-Jean-la-Bussière, St-Vincent-de-Reins, St-Didier-sur-Beaujeu, St-Julien-en-Beaujolais, Rivolet).

The Sudetenland major tectonic phase folded and epimetamorphosed all the igneous and metasedimentary basement of the Beaujolais Upper Devonian and Lower Carboniferous. The Visean volcano-sedimentary formations and the Sudetenland phase tectonics can be easily observed in the remarkable quarry of Cours-la-Ville, a veritable "window" on the Beaujolais geology in Carboniferous times.

5. During the Upper Carboniferous (Namurian-Westphalien), in Beaujolais as in the rest of the Massif Central, a generalised episode of intracrustal

partial melting brought about the rise and emplacement of numerous monzo-granitic plutonic massifs (the granites of Sarcey and St-Laurent-de-Chamousset, Odenas-Fleurie, Monsols and St-Jacques-des-Arrêts). Most of these intrusions brought about important contact metamorphism with diverse hornfels facies, such as those seen on the west flank of Mont Brouilly at Odenas, or the Crêt du Py at Villié-Morgan. At the end of the Carboniferous extensional strike-slip tectonics which are well known in the nearby Stephanian age basins of St-Etienne, Autun and Creuzot, also affected the Beaujolais (La Chapelle-sous-Dun, St-Nizier-d'Azergues, Brévenne area etc.). Into these depressions detrital continental sediments were deposited mixed with coal beds, of which some were suitable for mining.

6. The Variscan system in the Massif Central came to a close during the end Carboniferous and Permian. Within a continuing extensional context, a dense network of microgranites developed and quartzose hydrothermal activity gave rise to abundant veins as well as more diffuse mineralised zones (E.g. The Thizy-les-Bourgs-St-Jean-la-Bussière alteration zone). These incorporated numerous minerals largely of Fe, Cu, Pb, Zn, As, Sb, barite, fluorite (the mines at Claveisolles, Chénelette, Propières, Beaujeu, Lantignié, Joux, etc...).

In the terminal stages of the Variscan orogeny at the close of the Carboniferous, intense erosion brought about peneplanation of the Beaujolais. Products of eroding reliefs invaded peripheral depressions (detrital Permo-Triassic sandstone formations). The major unconformity that separates the Palaeozoic crystalline basement from the sandy detrital sediments at the base of the Mesozoic is clearly visible at the side of road north of the Larfarge cement factory in Châtillon-d'Azergues.

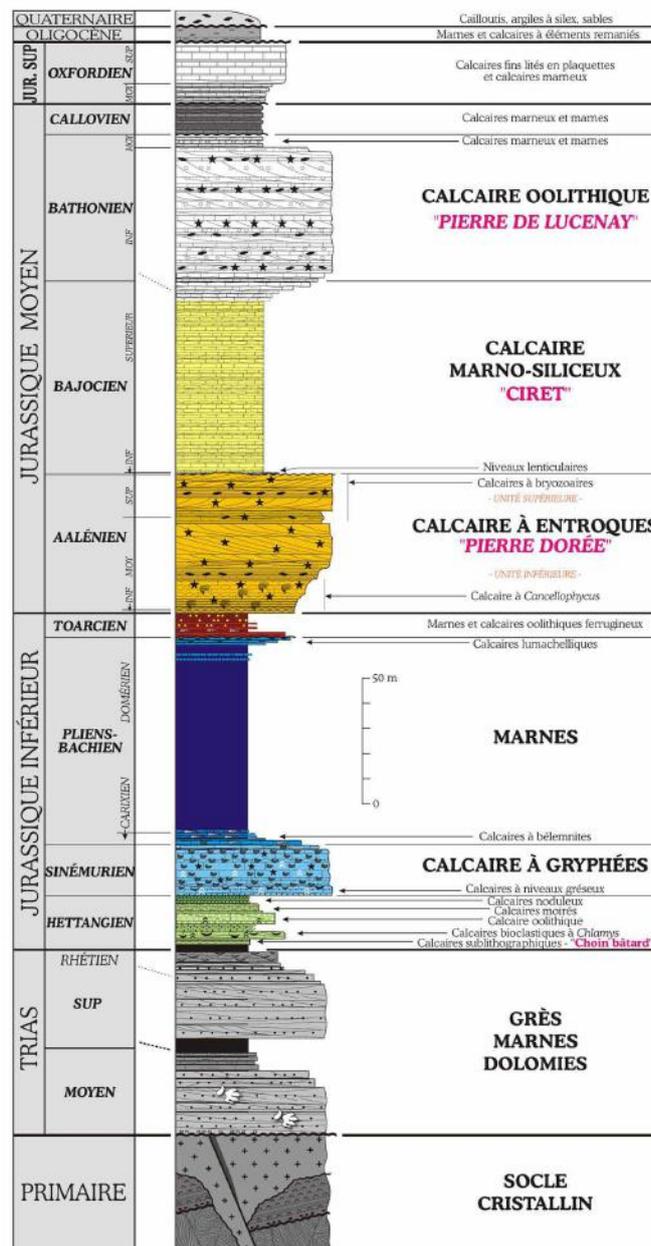
B.1.4.

The marine Mesozoic sedimentary cover

Above the erosional surface of the Permo-Triassic, the Mesozoic sea has left numerous strands of evidence in the Beaujolais, principally in the south-east (in the region of Villefranche and the massif of Mont d'Or). The sedimentary series preserved spans from the Middle Triassic to the Upper Jurassic, which is almost 80 million years. Cretaceous sediments cannot be found in the

Beaujolais, they have been removed by erosion.

For a long time, the Mesozoic sediments of Lyon and the Beaujolais have been the focus of numerous studies. This is due to their complexity, the number of sedimentary ensembles and because of their specific position at the eastern edge of the Massif Central. These studies have aimed to define the details of the Mesozoic oceanic transgression at the western limit of the South-Eastern French Basin. Geologists from many research units have worked in this area, however most have come from, and indeed still come from The University of Lyon and its affiliates (The Catholic University of Lyon, Bourgogne University, European Universities, Museum de Lyon, etc.).



Beaujolais' stratigraphy

The great abundance of lithology's and structures that can be observed in the sedimentary sequences of the Mesozoic in the Beaujolais were brought about due to the varied marine geological history of the territory. This history is marked by a great range of depositional environments. The paleoenvironmental diversity was a direct result of the specific paleogeographic position of the Beaujolais at the hinge between the "Terre Centrale" (Massif Central) and the epicontinental Alpine Basin; a long lasting setting that favoured the rapidly alternating and repeated oceanographic depositional conditions.

The Mesozoic transgression was initiated in the Triassic and was first represented by littoral and marginal-littoral environments with a continental influence. The essentially sandy sedimentation was brought about under a hot and dry inter-tropical climate with the active erosion of Terre Centrale. These thick sandy deposits indicated a stable littoral dynamic: stratified deposits formed by longshore drift or tides, channelized deltaic deposits, wave and current ripples, desiccation cracks and salt pseudomorphs etc. One must not forget the reptile footprints (Archosaurs or Lacertoids) which have made the formation very well known, notably in the Mont d'Or (St-Germain, Chasselay), the preferred study location for Lyonnais Ichthyology.

At the very beginning of the Jurassic, the first real carbonate environments appeared. In following the Pierres Folles geological footpath at St-Jeandes-Vignes the Hettangien beds show many mottled argilocalcareous sediments. These were deposited in a changeable shallow, tropical coastal domain alternating between open marine conditions (shelly and oolitic limestones), restricted lagoons (fine grained shale rich limestones and azoic shales) or mixed environments (bedded or sandy limestones, sublithographic limestones). Equivalent depositional environments, more rich in limestone and chalk, appear at the top of the Mesozoic stratigraphic sequence (Callovien and Oxfordien) in the region of Belleville (Charentay, Lancié).



Sinemurian limestone with gryphae

The rest of the stratigraphy is above all characterised by many open marine environments. These oscillate between shoreface, distal and deep offshore settings.

The celebrated Sinemurian grey, regular bedded, limestone with *Gryphaea* reveals a shallow marine environment dominated by tropical storm currents and marine swells. It has a reputation as a high quality building stone, and its many fossils of oysters and giant ammonites also add to its aesthetic appeal. Some quarries show this stone off magnificently, such as at St-Jeandes-Vignes, Limas, Theizé, etc.

Higher up the sequence the Lower Pliensbachian (Carixien) limestones and marls are literally steeped in belemnite rostra. Following on the Upper Pliensbachian (Domerian) sediments represent the shallowest epicontinental sea levels; in the distal offshore there are abundant remains of deep sea nektonic organisms (ammonites, belemnites

etc.). These marls are clearly visible in the tile quarry of Prony in the village of Oingt.

During the Toarcian at the end of the Lower Jurassic, similar offshore oceanographic conditions prevailed as seen during the Pliensbachian. It was however were marked by an important oceanic-climatic event known as the "TOAE", (Toarcian Oceanic Anoxic Event). There was an abrupt slowing in the argilocalcareous sedimentation leading to the heavy concentration of fossils, notably of cephalopods (Ammonites, Nautilus and Belemnites). In the Lafarge Cement Quarry at Belmont this event is well developed and clearly visible; there are also many vertebrate remains (ichthyosaurs, plesiosaurs, crocodiles and fish). A giant, 9m long, Ichthyosaur was exhumed in 1984 and a cast is on display in the Museum of the Espace Pierres Folles. The major part of the museums paeleontological collections come from this quarry.

Still within the Lafarge Quarry, as in many other southerly sites in the Beaujolais (Mont d'Or, Glay, Ville-sur-Jarnioux etc.), there are outcrops of yellow crinoidal limestone, or "Pierre Dorée". Dated to the beginning of the Middle Jurassic (Aalenian) it is equally well known for the strong mark it has made on the natural and architectural landscape in south Beaujolais. Here one can discover, at many sites, the traces of an ocean dynamic dominated by tidal currents and tropical storms that circulated in the shallow waters of the North-West Tethys Ocean.

The following Bajorcian "Ciret" facies is a series of rhythmically bedded marly li-



Ichthyosaurus discovered in Lafarge quarry

mestones laid down in a distal offshore setting. Finally, there is another formation, also well known in construction: the Bajorcian white oolitic limestone, or the "Pierre de Lucenay". This was formed in a depositional environment comparable to that of the yellow crinoidal limestone and is mostly seen in outcrop on the left bank of the lower stretch of the Azergues River.

The majority of the Mesozoic sedimentary rocks, calcareous sandstones and marls, were widely quarried and can be seen in the buildings (dressed stone, masonry rubble stone, paving slabs and ceramics etc.). Like the Palaeozoic rocks, those of the Mesozoic play an important role; they make a beautiful contribution to the wealth and renown of the architectural heritage of the Beaujolais.

B.1.5.

■ The alpine era and the tectonics structuration of today's Beaujolais

It was during the Tertiary that the Beaujolais territory progressively took on the face that we know today. This slow landscape transformation followed the long Mesozoic marine episode. It originated from the uplift of the Alpine mountain chain and the structural evolution of the external foreland (Dauphiné, Dombes, Bresse, Saône-Rhône). Since the first Alpine movements in the Upper Cretaceous, but above all since the Upper Eocene, the structural development of the Beaujolais region has followed the compressive and strike slip tectonic phases which have accompanied the genesis of the periphery of the great Alpine domain.

The beginning of the Pyrenean orogeny in the East Massif Central and at the edge of the Alpine domain is seen in the Upper Eocene by a series of north-south fractures that have been cut by others orientated NE-SW. This activity initiated the development of a number of subsiding extensional basins, such

as that of Bresse. It was here that the Beaujolais began its unique development, constrained to the west by this marked tectonic feature.

The strike slip activity accentuated in the Oligocene and provoked the intense fracturing of the basement and the Mesozoic sediment cover throughout the easterly part of the territory. It was due to this powerful brittle tectonic episode that the very dense fault network developed in the Mesozoic sequence, which is shown clearly on the local geological map. These movements accompanied the general shifting of the geological sequences to the east and south east. The stratigraphic sequences seen from the geological footpath of Pierres Folles at St-Jeandes-Vignes, or at the Lafarge Quarry in Belmont, spectacularly show the dip and fracture characteristics of the Mesozoic rocks. The large fault to the east of the Beaujolais that separates the Palaeozoic crystalline mountains from the Mesozoic, Tertiary depression and the Quaternary sediments of the River Saône is difficult to see from close up, but is clear in the landscape. It too was born of these tectonic events. The hydrothermal circulation of fluids along the length of this fault led to the deposition of extensive metal rich deposits during the Oligocene and Miocene; for example, the Romanèche-Thorins, the principal Manganese deposit in France.

It was finally during the course of this same Oligocene tectonic phase that the resistant linear relief seen in the south east of the territory was developed. Examples of these include the threshold of Limonest (Mont d'Or) and

the ridge of Lachassagne, south of Villefranche. The brittle tectonic activity continued a little in the Miocene but appears to have been much calmer in the Pliocene and Quaternary.

The western Beaujolais was uplifted to create mountains as a result of the formation of horsts (the Beaujolais mountains) and grabens (the Saône domain), as well as by the flexure of the basement linked both to extensional Oligo-Miocene tectonics and end Miocene Alpine compression. In the heights of the Beaujolais some clues of this period still remain: perched up high (at 850 to 900m), the bottom of the Mesozoic sediments (base Triassic) can be seen; these were uplifted at the end of the Tertiary. It was thus that the Beaujolais geography developed its contrasting nature between the eastern plain and the western mountains.

B.1.6.

■ The superficial Quaternary formations

Benefitting from the large depression that was gouged during the Tertiary between the Beaujolais Mountains and the Jura Mountains, the vast hydrographic peri-Alpine network was created and developed during the Quaternary. It progressively created the large alluvial and fluvio-glacial domain of the River Saône. In effect, the high and low alluvial terraces either side of the



Normal fault of the geological path of «Pierres Folles»

river would not have the height that can still be seen today, if this region that is peripheral to the Alpine domain had not been invaded by voluminous fluvio-moraine sediments. These were initially spread over the Dombes and the edge of the Jura during and after the advance of the great Alpine glaciers in the Middle Pleistocene. Before the development of the Saône Basin in the Upper Pleistocene, a considerable mass of material had been picked up by the river and its fluvio-glacial tributaries and dropped in its bed and on its banks forming thick horizons of clays, sands, gravels and pebbles. To this, all the sediments derived from the piedmont of the River Saône, which at times reach quite high levels also feature. Current studies (notably in the Ardières Valley) show that they are not only products of normal erosional processes, that of dejection and colluvial deposition.

At the end of the last glaciation (stadial 2 or the Würm in Alpine chronology), a general layer of loess covered the slopes and high terraces of the Dombes and Saône Rivers.

– B.2. LISTING AND DESCRIPTION OF GEOLOGICAL SITES WITHIN THE PROPOSED GEOPARK

B.2.1.

■ Inventory method and selection of geosites

A first inventory of geosites was launched at the start of the process of application in 2013. It aimed to engage widely inhabitants of the territory, so as to involve them from the outset in

the application process. The situation was: citizens of Beaujolais are those who probably know best their territory, as well as sites of natural and cultural interests. The geosites of the aspiring Geopark Beaujolais have been identified thanks to a participative inventory, which have permitted involving local stakeholders at the same time that it has engaged a thought on sites previously unrecognized or less valorized. There are nearly 150 sites that have been identified and then submitted to the validation of a scientific committee affiliated to the project.

Based on this extensive list, prioritization of geosites had to be performed to highlight the most interesting sites and representatives of local identity. Geosites can be divided into two groups: the geological sites and non-geological sites. Geological sites will be presented in this section, while non-geological sites will be presented in part B.4.

B.2.2.

■ Types of geological sites

The rich geological heritage of the area is observable on the field by the presence of many sites of varying size. They contain elements to understand (objects or phenomena) of the long geological history of Beaujolais. The

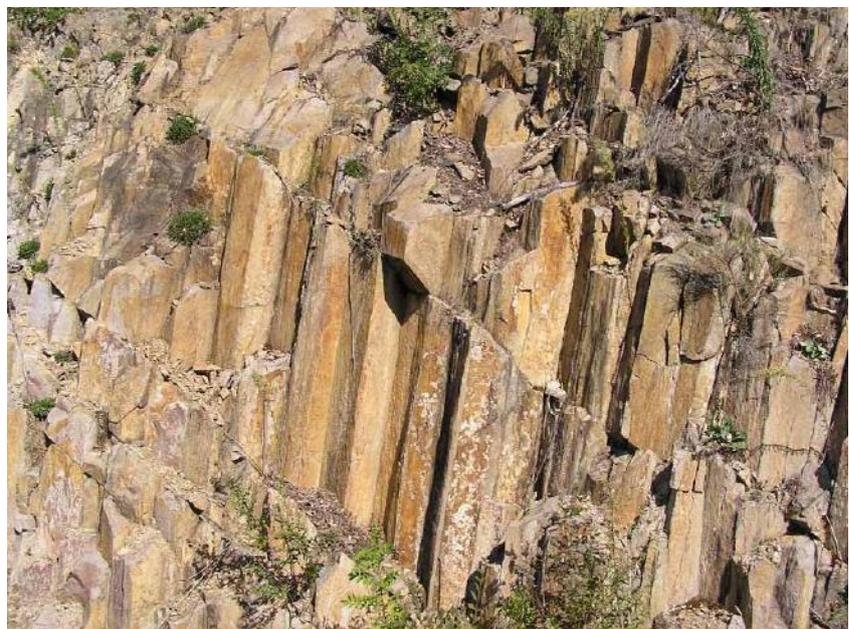
following table lists the 26 geological sites within this application. Other geological sites have been identified but it is necessary to deepen knowledge on these. It is possible to group them into six major types:

2 metamorphic sites

As an evidence of a complex geological activity, metamorphic processes have affected several areas in Beaujolais. The oldest examples are gneisses dated Cambro-Ordovician, located in southern territory. In the north, near the Mont Saint-Rigaud (SG_20), important Carboniferous shale deposits structure the massif. Corneal rock of Mont Brouilly (SG_19) has a very good contact metamorphism.

4 magmatic sites

The constitution of the geological basement of Beaujolais in the Primary was characterized by intense volcanic activity. Volcanic deposits are contemporaries of the subduction process before the inter-continental collision. Extensive spreading of volcanics and tuffs cover much of western territory. It is possible to observe especial volcanic facies in the quarries of Cours (SG_01), Creuzeval (SG_02) or with the columnar jointing of Saint-Victor-sur-Rhins (SG_23). Granitic plutons from the Hercynian orogeny are visible in some



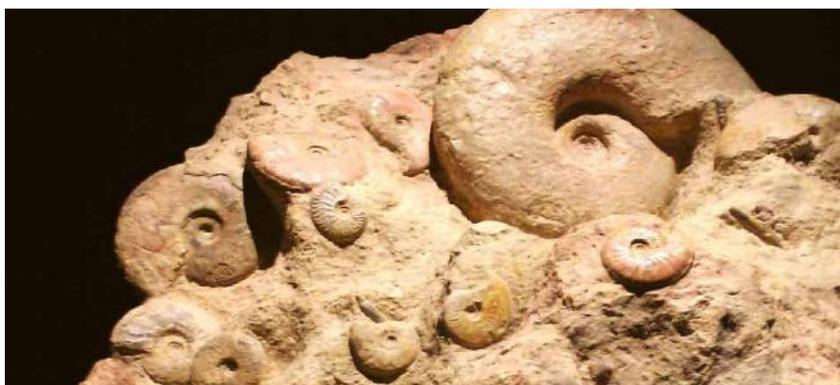
Picard Tuf in Saint Victor sur Rhins

List of the geological sites

Code	Nom du site	Commune(s)	Rareté/Valeur	Protection(s)	IPGRA	Intérêt géologique principal	Intérêt(s) géologique secondaires	Intérêt(s) pédagogique(s)	Intérêt(s) annexes	Accessibilité	Équipement
SG_01	Carrière de Cours	Cours	1		X	plutonisme	paléontologie - ressources naturelles	G/E	économie	R	N
SG_02	Carrière de Creuzeval	Saint-Ollier-sur-Beaune	4			volcanisme	ressources naturelles	G	économie	R	N
SG_03	Carrière de Glay	Saint-Germain-Muables	3	ENS	X	stratigraphie	sédimentologie - ressources naturelles	TP/S	faune - flore - paysage - histoire	L	O
SG_04	Carrière de Lucenay	Lucenay	3	PIU		stratigraphie	sédimentologie - ressources naturelles	TP	histoire	R	N[projé]
SG_05	Carrière de Prosyny	Oingt	4			sédimentologie	ressources naturelles - paléontologie	TP	économie	R	N
SG_06	Carrière de Rivolet	Rivolet	3			volcanisme	ressources naturelles	G	économie	R	N
SG_07	Carrière de Thizy	Thizy-lès-Bourgs	4		X	sédimentologie	ressources naturelles - paléontologie - tectonique	G	histoire	R	N
SG_08	Carrière Lafarge	Beaumont-d'Auvergne, Charnay	1		X	paléontologie	stratigraphie - ressources naturelles	TP/S	économie	R	O
SG_09	Complexe granitique de la Terrasse	Chiroubles	4	ENS		géomorphologie	plutonisme	TP	paysage - forêt - vigne	L	N[projé]
SG_10	Géosite des 3 Roches	Propières, Poule-les-Echarreaux	4	ENS		géomorphologie	volcanisme	TP	paysage - forêt	L	N[projé]
SG_11	Gisement fossilifère et gîte de Valtorte	Claveisoles	4		X	minéralogie	ressources naturelles	G	faune - histoire	R	N
SG_12	Gravière du Pré de Joux	Arnas	3	NA2000		sédimentologie	ressources naturelles - géomorphologie - hydrogéologie	TP/S	faune - hydrologie - économie	R	O
SG_13	Grotte des Sarrasins	Morancé	4			hydrogéologie	géomorphologie - stratigraphie	TP	hydrologie	L	N
SG_14	Lônes et îles du val de Saône	Taponas, Belleville	4	NA2000, SC, ENS		géomorphologie	sédimentologie	TP	hydrologie - faune - flore - paysage	L	N[projé]
SG_15	Mine de Lantignié	Lantignié	3			minéralogie	ressources naturelles	G	histoire - paysage	L	N
SG_16	Mine de Propières	Propières	3		X	minéralogie	volcanisme - ressources naturelles	TP	faune - histoire	L	N[projé]
SG_17	Mines de Chessy	Chessy	1	PIU		minéralogie	tectonique - ressources naturelles	TP	histoire - économie	L	O
SG_18	Mines de Romanèche-Thorins	Romanèche-Thorins	1			minéralogie	tectonique - ressources naturelles	TP	histoire - économie	L	N
SG_19	Mont Brouilly	Odenas, Saint-Lager	2	SI, ENS, Chartre de fonderaui	X	métamorphisme	plutonisme - géomorphologie - ressources naturelles	TP	histoire - paysage - vigne - flore	L	O
SG_20	Mont Saint-Rigaud	Monsols	3	SI, ENS		métamorphisme	géomorphologie - volcanisme - hydrogéologie	TP	faune - flore - paysage - histoire - forêt - hydrologie	L	N[projé]
SG_21	Mont Tourvénon	Saint-Ollier-sur-Beaune, Chénedette, Veray	4			géomorphologie	volcanisme	G/E	paysage - forêt	L	N
SG_22	Musée Espace Pierres Folles (et collections)	Saint-Jean-des-Vignes	2			paléontologie	stratigraphie - sédimentologie - ressources naturelles	TP/S	économie - flore - histoire	L	O
SG_23	Orgues rhyolitiques	Saint-Victor-sur-Rhins (42)	3			volcanisme	géomorphologie	G	paysage	L	N
SG_24	Sentier géologique des Pierres Folles	Saint-Jean-des-Vignes	2		X	tectonique	stratigraphie - paléontologie - tectonique	TP/S	paysage - flore - histoire - vigne	L	O
SG_25	Sentier géologique du Mont d'Or	Chasselay, Polymeux-au-Mont-d'Or	3	ENS		stratigraphie	stratigraphie - paléontologie - ressources naturelles - tectonique	TP/S	flore - paysage	L	O
SG_26	Tour Bourdon	Ragny-Durante	3	PIU		géomorphologie	sédimentologie	TP	paysage - vigne	L	N[projé]

Rareté / valeur : 1 (internationale) - 2 (nationale) - 3 (régionale) - 4 (locale) // **IPGRA :** site inscrit à l'Inventaire du Patrimoine Géologique Rhône-Alpes

Intérêt(s) pédagogique(s) : G (géologues) - E (étudiants) - TP (tous publics) - S (scolaires) // **Accessibilité :** L (libre) - R (réglementé) - I (interdit) // **Équipement (sur site) :** O (oui) ou N (non)



Block of ammonites at the «Espace Pierres Folles»

places, either as massive rock (at La Terrasse (SG_09) or in Rochefolle site) or in altered form (granitic sand locally named "gorrhe").

9 sedimentological sites

The aspiring Geopark Beaujolais has major sedimentary series remains in the southeast quarter ("Pierres Dorées"), mainly from deposits of Secondary marine environments which include many fossils (belemnites, crinoids, ammonites, ichthyosaurs). The famous Golden Stone is visible in many quarries (Glay (SG_03), Lafarge (SG_08)). The two geological trails of Pierres Folles (SG_24) and Mont d'Or (SG_25) initiate the understanding of the stratigraphy and tectonics. The oldest sediments (Carboniferous) are visible in the western and north-western territory (former quarry of Thizy-les-Bourgs (SG_07)).

6 geomorphological sites

The relief of Beaujolais comes from a combination of factors that participated in the set up of the current landscapes. The main reliefs appear relatively dull, testimony of the slow work of the widespread erosion throughout the territory. The most resistant rocks have been highlighted as a result of various

processes of erosion. Tectonics also played a big role in the organization of landscapes. Several sites have geomorphologic forms: the mont Tourvéon (SG_21) emerges in the landscape with a unique conical shape, the quartzite sandstones of la Tour Bourdon, the "lônes" (oxbow lakes) and islands of the Saône river.



Chessylite

5 mineralogical sites

The complex geological history in Beaujolais has led to an extraordinary diversity of minerals. More than 100 mineral species have been recorded on all territory. Mineralization essentially dates from the Paleozoic and Tertiary. Some minerals of the territory are emblematic and known worldwide: the chessylite (or azurite) from the small village of Chessy (SG_17) or the romanechite (manganese oxide) from Romanèche-Thorins (SG_18). Pyrite, barite, fluorite, galena, pyromorphite or wulfenite are other types of minerals present on the territory.

Hydrogeological sites

Water is abundant in the area, and it has a special relationship with geology. For example, the Saint-Rigaud massif plays the role of a real natural water tower giving birth to four major rivers: Ardières, Sornin, Grosne and Azergues.

Selected primarily for their naturalistic interests (see non-geological sites list), the Couty's bog and the Monneries' wetlands are filtering water and regulating flows. Calcareous sedimentary formations have modest karst area, but it is necessary to make mention. The Sarrasins' cave (SG_13) located in Morancé is probably the best known because it contains traces of human occupation.

B.3. DETAILS ON THE VALUE OF GEOLOGICAL SITES

B.3.1.

■ Beaujolais' geology and scientific activity

Benefiting from a plethora of formations and study subjects that are offered by the geology of the Beaujolais there have been many discoveries and scientific studies. Numerous thesis (PhD) and uncountable articles have been published on this area for more than 200 years. Much of this body of work was produced in the 20th century at the time of the revision or completion of the geological maps of France. All the major scientific subjects of both pure and applied geology have been addressed here in the Beaujolais: petrography and magmatism, tectonics and metamorphism, stratigraphy, sedimentology and paleogeography, palaeontology and paleoecology, geochemistry and paleoclimatology, engineering geology and geotechnics, pedology, prehistory, physical and human geography etc. Continuing today this territory still provides material for studies and interesting discoveries, notably in sedimentology and palaeontology (cf. Suan et al. 2013, Vincent et al. 2013). This is thanks to the Lafarge Cement competition and the vast wealth preserved in the Jurassic formations of its quarries.

Range	International	National	Regional	Local
Number of sites	4	2	11	9

International, national, regional or local sites' range

B.3.2.

■ International, national, regional or local importance of sites

Even if it is not spectacular only with landscape observation, Beaujolais' geology remains one of the most diverse geology in France. Some sites have international value, gained through scientific publications or natural rarity. The national inventory of the geological heritage (De Wever, 2009) has raised awareness of this natural richness of France. In the list of geological sites selected for the application, it is possible to distinguish: 4 sites of international value, 2 sites of national value, 11 sites of regional value and 9 sites of local value.

B.4.1.

■ Natural heritage sites

Geological diversity has greatly influenced the development of specific natural environments throughout the Beaujolais. Many sites are concerned: calcareous grasslands of Pierres Dorées (NSG_PN_03), moors developed on granitic terrains of the northern vineyard (SNG_PN_01), slope bogs of the volcanic Haut-Beaujolais (SNG_PN_06), wetlands of the Saône valley (SNG_PN_02). We can note that the interactions between the natural environments and the geological basement are large, and they are essential to the development of a wide variety of species.

B.4.2.

■ Historical and cultural heritage sites

The historical heritage is very rich in Beaujolais, and can be observed in various forms. The historical and religious heritage buildings has a important place, with the presence of numerous castles, churches, small villages with their remarkable architecture or materials used in their construction. They are often concerned with the use of local stones and are very beautiful



Thizy church in red microgranite from the high Beaujolais («Haut Beaujolais» in French)

evidence of the richness of Beaujolais' basement: Montmelas' castle (SNG_PH_01), Bagnols' village (SNG_PH_04), Thizy-les-Bourgs' church (SNG_PH_10). Other elements of the built heritage are remarkable because of the stone use in their construction. This is the case of the viaducts of upper Aزرgues valley (SNG_PH_07) built in local volcanite. The museum of the priory of Salles-Arbussonnas (SNG_PH_09) allows the visit of the last clunisian cloister of Rhône department, where the stone is remarkably enhance in the walls.

Another type of link between geology and human occupation of historic sites: the habitat. The positioning of some villages or prehistoric settlements is directly related to the local geology or geomorphology. Thus, the hilltop village of Ternand (SNG_PH_08) is settled on a marble vein highlighted by erosion. Some villages of Pierres Dorées area are often located in high position on rocky headlands (like Oingt, SNG_PH_06 ; and Charnay, SNG_PH_05)

– B.4.

Listing and description of non-geological sites with high geo-heritage interest

Strong links exist between geology and natural environment or human activities. Thus, many natural, cultural, historical, religious, industrial or landscape sites find themselves linked to the geological heritage of the territory.



Charnay's village in the golden stones area («Pierres Dorées in French)



View on the Saône Valley from Beaujolais' hills

with generally open quarries nearby. Montmelas' castle (SNG_PH_01) also benefits from a dominant position in the vineyard area. Otherwise, the archaeological sites of the territory are strongly linked to their particular environmental context (sites of Ludna, Alix or Anse).

B.4.3.

■ Economic and industrial heritage sites

Several sites show the industrial heritage of Beaujolais, which has greatly contributed to the economic development of the territory. The most beautiful remains of this industrial past, strongly focused on the textile sector, are located in the west where the specific nature of the geological substrate has strongly encouraged the use of river water. The main river valleys of the Beaujolais Vert still have the marks of this industrial history. In the upper Reins River valley, we can still see the remains of hydraulic works for rotating turbines of small factories or sawmills (SNG_PE_03). In Tarare, the development of the city along the Turdine River (SNG_PE_01) is closely related to the water quality of the river. The Quartier Déchelette (SNG_PE_02) in Amplepuis is a former industrial housing area built in local rock.



Espace Pierres Folles, Museum of geology and paleontology

B.4.4.

■ Landscape sites

Landscape sites offer views of the Beaujolais area and are very good gateways to understanding of the local geomorphology and landscape organization. They illustrate the diversity of landscape entities: the site of La Terrasse (SNG_SP_01) in the vineyard of the Crus, the Sapins lake (SNG_SP_02) in the Beaujolais Vert, the Echarmeaux' pass (SNG_SP_04) in the Haut Beaujolais, the Saint-Bonnet's pass (SNG_SP_06) above the vineyard and rivers, the site of tower Chappe (SNG_SP_05) in the Pierres Dorées area. The Tacot trail allows to walk 20 kilometers through the Pierres Dorées area,

B.4.5.

■ Visit sites and museum spaces

Several visit sites and museum spaces are present on the Beaujolais' territory. Both located in Romanèche-Thorins, the Hameau Duboeuf (SNG_SV_02) is a museum area on the vine and the wine which has a room dedicated to the explanation of links between the vines and soil, while Touroparc (SNG_SV_03) includes a small museum about the culture and local history, including a room on the Romanechite and exploitation of the mines in the village. The Ninkasi Brewery (SNG_SV_01), based in Tarare in old dry cleaners, conducts guided tours where the visitor can discover the hydrogeological context of the sector which allows a water of high quality for the production of craft beers.



List of the non-geological sites

Code	Nom du site	Commune(s)	Intérêt(s)	Description / Lien avec la géologie	Rareté/Valeur	Accessibilité	Site touristique	Equipement
PATRIMOINE NATUREL								
SNG_PN_01	Landes du Beaujolais	Le Perréon, Quincé-en-Beaujolais, Marchamp	paysage - flore	Espace naturel composé de landes acides développées sur des terrains granitiques. Les vues paysagères sont multiples.	3	L		N
SNG_PN_02	Marais de Boistray	Saint-Georges-de-Reneins	flore - hydrologie - histoire	Le marais de Boistray persiste sur l'emplacement d'un ancien bras de la Saône disparu vers 8000 avant J.C.	3	R		N
SNG_PN_03	Crêts de Remont	Theizé, Ville-sur-Jarniou	paysage - flore	Espace naturel présentant de belles pelouses calcaïques et des panoramas sur le pays des Pierres Dorées	3	L		N
SNG_PN_04	Balcon du Morgon	Gieizé	hydrologie - flore - économie - histoire	Sentier botanique le long du Morgon présentant des éléments remarquables de petit patrimoine de rivière.	4	L	X	O
SNG_PN_05	Vallon du Sormin	Propières	hydrologie - flore - histoire - paysage	Les gorges du Sormin présentent une flore intéressante et des vestiges d'ouvrages hydrauliques qui alimentent plusieurs scieries.	4	L		N
SNG_PN_06	Tourbière du Couty	Chénelette	hydrologie - flore - paysage	L'une des dernières tourbières du département du Rhône, avec des espèces rares et protégées. Panorama sur la haute vallée d'Azergues.	3	R		N
SNG_PN_07	Gîte à Chauve-Souris des mines de Valloisères	Claveisolles	faune	Le site minier de Valloisères, anciennement exploité pour la barytine, abrite de nombreuses espèces de chauves-souris. Plus important site d'hivernation du département du Rhône.	3	R		O
SNG_PN_08	Zone humide des Monneries	Poule-les-Echarmeaux	hydrologie - flore - paysage	Site d'interprétation sur les milieux humides, la faune et la flore associés dans le Haut-Beaujolais.	4	L	X	O
SNG_PN_09	Sentier découverte de l'Azergues	Châtillon-d'Azergues	hydrologie - faune - flore - paysage	Sentier découverte autour de la rivière Azergues (hydrologie, faune, flore, géologie...).	4	L	X	O
SNG_PN_10	Sentier d'interprétation de la forêt de Longeval	Saint-Juste-d'Avray	flore - hydrologie	Sentier d'interprétation du milieu forestier de Longeval.	4	L		N (projet)
SNG_PN_11	Sentier forestier de la Flachère	Légnay	flore	Sentier qui invite à la découverte du massif forestier de la Flachère.	4	R	X	N (projet)
PATRIMOINE HISTORIQUE ET CULTUREL								
SNG_PH_01	Château de Montmelas	Montmelas-Saint-Sorlin	architecture - matériaux - paysage - histoire	Le château de Montmelas est bâti en pierre locale (granite) et offre, par sa position sur un éperon rocheux, une vue imprenable sur la cote viticole et la plaine de la Saône.	3	R	X	N
SNG_PH_02	Vieille Anse et château des Tours	Anse	architecture - histoire - préhistoire	L'histoire de la ville d'Anse est en grande partie liée à sa position géographique. De nombreux sites archéologiques y ont été trouvés. Le château est classé.	3	L	X	N
SNG_PH_03	Maisons et Cours Renaissance	Villefranche-sur-Saône	architecture - matériaux - histoire	Le centre-ville historique de Villefranche-sur-Saône d'époque Renaissance montre de nombreuses traces d'utilisation de ressources minérales locales.	3	L	X	O
SNG_PH_04	Bagnols, la maison naît du sol	Bagnols	architecture - matériaux - paysage - histoire	Le village de Bagnols incarne parfaitement la relation qu'entretient le sol et le bâti traditionnel Beaujolais. On trouve sur la commune tous les éléments (calcaire à entroques, grès, sables...) favorables à la construction de maisons et monuments.	4	L	X	N (projet)
SNG_PH_05	Cœur de village de Charnay	Charnay	architecture - matériaux - paysage	Le village de Charnay, bâti presque entièrement en Pierre Dorée, est localisé sur la ligne de crête allant de Villefranche à Lozanne, lui offrant des panoramas exceptionnels tant sur les monts du Beaujolais que sur la plaine de Saône et les Dombes.	4	L	X	N
SNG_PH_06	Village d'Oingt	Oingt	architecture - matériaux - paysage	Le village d'Oingt est l'un des plus beaux villages de France, grâce à son bâti remarquable et sa localisation géographique. La carrière de marne de Prosyny est exploitée pour la fabrication de tuiles.	2	L	X	N
SNG_PH_07	Viaducs et circuit des viaducs de la Haute-Azergues	Claveisolles	architecture - paysage	Les viaducs de la Haute-Azergues définissent la topographie locale pour connecter Lyon au Morvan par une ligne de chemin de fer. Les nombreux viaducs en pierre locale constituent un véritable patrimoine architectural.	3	L		N
SNG_PH_08	Vieux village perché de Ternand	Ternand	architecture - histoire - paysage	Le vieux village de Ternand est bâti sur un promontoire de marbre, roche relativement rare à l'échelle du Beaujolais.	2	L	X	N (projet)
SNG_PH_09	Musée du prieuré	Salles-Arbussonnas	architecture - matériaux - histoire	Un des derniers cloître cisterciens du département du Rhône. On trouve dans ses murs une multitude de pierres de construction du Beaujolais. Lien fort avec le site archéologique de Grélonnes.	3	P	X	O
SNG_PH_10	Eglise Notre Dame de Thizy	Thizy-les-Bourgs	architecture - matériaux	Eglise construite essentiellement en microgranite rouge local. De nombreuses autres roches sont visibles.	4	L		N
SNG_PH_11	Site archéologique de Ludna	Saint-Georges-de-Reneins	préhistoire	Le site de Ludna a eu un rôle conséquent dans l'organisation des axes de communications dès le 2ème siècle avant J.C.	3	R		N
SNG_PH_12	Gisement archéologique d'Alix	Alix	préhistoire	Haut lieu de l'archéologie beaujolaise, le gisement archéologique d'Alix présente de nombreux ateliers.	3	R		N
PATRIMOINE ECONOMIQUE ET INDUSTRIEL								
SNG_PE_01	Tarare au fil de l'eau	Joux, Tarare	hydrologie - histoire - économie	Le développement industriel de la ville de Tarare est intimement lié à la qualité de l'eau de la Turdine.	4	L	X	N
SNG_PE_02	Quartier Déchelette	Amplepuis	hydrologie - matériaux - économie	Ancien quartier d'habitat industriel construit en roche locale, connecté à un parc paysager le long du Reins.	4	L	X	O
SNG_PE_03	Haute vallée du Reins	Saint-Vincent-de-Reins	hydrologie - paysage - économie	Cours d'eau présentant de nombreuses traces d'utilisation de la force motrice pour alimenter de petites usines ou scieries.	4	L		N
SNG_PE_04	Ecomusée du Haut Beaujolais	Thizy-les-Bourgs	histoire - économie	Ancienne manufacture devenue centre de découverte sur le passé industriel de l'ouest du Beaujolais.	4	L		O
SNG_PE_05	Circuit des Mines	Le Perréon, Claveisolles, Poule-les-Echarmeaux, Chénelette	histoire - économie - paysage	De nombreuses petites mines ont été exploitées depuis le Moyen-Âge dans la haute vallée d'Azergues.	3	L		N
SITES PAYSAGERS								
SNG_SP_01	Site de la Terrasse	Chiroubles	paysage - flore	Site paysager remarquable au dessus des crus du Beaujolais.	3	L	X	O
SNG_SP_02	Lac des Sapins	Cublize, Ronno	paysage - hydrologie - économie	Site paysager et touristique du Beaujolais Vert, dans la moyenne vallée du Reins. Plus grand site de baignade biologique d'Europe.	2	L	X	O
SNG_SP_03	Circuit du Tacot	Liergues, Pouilly-le-Monial, Jarniou, Ville-sur-Jarniou, Theizé, Moiré, Frontenas, Le Bois D'oingt, Légnay, Sarcey	paysage - histoire - flore - hydrologie - matériaux - architecture - économie	Ancienne voie de chemin de fer reconstruite en sentier pédestre, le circuit traverse de nombreux villages à travers le pays des Pierres Dorées et invite à la découverte des nombreux patrimoines et paysages.	3	L	X	N (projet)
SNG_SP_04	Col des Echarmeaux	Poule-les-Echarmeaux	paysage - hydrologie	Le col des Echarmeaux offre un beau panorama sur la vallée d'Azergues et le Beaujolais Vert. Il est situé sur la ligne de partage des eaux entre les bassins Loire-Atlantique et Rhône-Méditerranée.	4	L		N
SNG_SP_05	Tour Chappe	Marcy-sur-Anse	paysage - histoire	Situé sur l'arête calcaire allant de Limas à Saint-Jean-des-Vignes, le site de la Tour Chappe de l'ancien télégraphe offre une vue panoramique vers les Monts du Beaujolais et également vers la plaine de la Dombes.	3	L	X	N
SNG_SP_06	Signal de Saint-Bonnet	Montmelas-Saint-Sorlin	paysage - architecture - matériaux	Depuis le promontoire de Saint-Bonnet, la vue s'ouvre sur tout le vignoble du Beaujolais, le val de Saône et la plaine de la Dombes. Une chapelle du XIIème siècle est située sur le site.	4	L		N
SITES DE VISITE ET D'INTERPRETATION								
SNG_SV_01	Brasserie Ninkasi	Tarare	hydrologie - économie - histoire	Site de brassage de bière utilisant l'eau de la Turdine, installé dans un ancien bâtiment de teintureries.	3	P	X	O
SNG_SV_02	Hameau Duboeuf	Romanèche-Thorins (71)	pédologie - histoire - économie	Espace muséographique sur la vigne et le vin. Une salle est réservée à l'explication des liens qu'entretient la vigne et le sol.	2	P	X	O
SNG_SV_03	Touroparc	Romanèche-Thorins (71)	économie - histoire - minéraux	Parc zoologique comprenant un espace muséographique sur des éléments de la culture et l'histoire locale et un "hôtel des Mines" qui met à l'honneur la richesse du sous-sol dont la Romanèche.	3	P	X	O

Rareté / valeur : 1 (internationale) - 2 (nationale) - 3 (régionale) - 4 (locale)

Accessibilité : L (libre) - R (réglementé) - I (interdit) - P (payant) // Equipement (sur site) : O (oui) ou N (non)

– C.1.

CURRENT OR POTENTIAL PRESSURE ON THE PROPOSED GEOPARK

C.1.1.

■ Territorial dynamics of the Beaujolais

The aspiring Geopark Beaujolais is composed of diverse and fragile natural areas. One of the major issue for the territory and its natural environments is the preservation of the ecological functioning at the scale of the whole territory. Because of its proximity with the metropolitan area of Lyon in the south, the development of the territory is not uniform, and some areas are more impacted by the demographic growth. Thus, the South-East part of the territory is directly concerned by urbanization and land pressure issues. The proximity of Lyon can be considered as an asset for visibility and accessibility, but also can be a threat for natural environments. The South/North axe of the Saône river valley is strongly urbanized along the communication paths. The territorial coherence program (SCoT) of the Beaujolais ensures the conservation of ecological corridors at a good scale for wildlife movements. Widely dominated by the growing of vine, the vineyard area is presenting fragmented natural spaces, often disconnected one to another. In the western part of the territory, Lyon's influence is not so strong: rural and natural spaces are taking up more place.

C.1.2.

■ Different types of pressure

Two types of pressure can be identified on the applicant's territory. First, anthropic pressure is a consequence of



View of the vineyard in autumn

the current territorial dynamic. Urbanization and land pressure of the south is threatening some viewpoints and landscapes (geological path of Espace Pierres Folles for instance). Buildings close to geosites are a real threatening, as the creation of new roads or buildings which could lead to the destruction of certain sites of interest. Some other sites are concerned by plundering of minerals, fossils or archeological objects. Some sites are highly frequented by tourists: it is the case of the Mont Brouilly, which has been equipped recently and has to face problems with frequentation. Measures have been taken to address the problems that might interfere with the quality of the site (bins, ecological toilets). Intensive farming practices (wine growing in the east, forestry in the west) can have an impact on some geosites if operation works are not done well. Improvements are in reflexion, notably within the partnership with the Forestry Charter to reduce the impacts of forestry works. Natural pressures are also present, even if they are minors and do not represent the major issues. After all, pressures linked to the closing up of the environments exist, as a consequence of the abandon of some lands. Natural erosion collapses or landslides of some outcrops are real and many sites of importance are concerned by them.

– C.2.

CURRENT STATUS IN TERMS OF PROTECTION OF GEOLOGICAL SITES WITHIN THE PROPOSED GEOPARK

C.2.1.

■ Multiple methods of conservation

Natura 2000 sites

In the Beaujolais area, 2 sites are integrated into the Natura 2000 network: the Saône valley and the Vallossières mine. They were identified as geosites for the close relationship they have with local geology. The objective of Natura 2000 program is to maintain and restore natural habitats to achieve favourable conservation status. So geological heritage is also considered.

Political-administrative level	Protective tools regulatory	Protection tools for land
Europe	Natura 2000 (ex : gîte à chauves-souris des mines de Valloisiers)	
State	Sites classés (ex : val de Saône)	
	Sites inscrits (ex : Mont Brouilly)	
Region		Sites du Conservatoire régional d'Espaces Naturels (ex : tourbière du Couty)
Department	Arrêtés Préfectoraux de protection de biotope (ex : les landes du Beaujolais)	Espaces Naturels Sensibles des départements (ex : les carrières de Glay)
Municipalities and intercommunalities	Plans Locaux d'Urbanisme (ex : carrière de Lucenay)	Acquisition foncière de terrains par les collectivités locales ou par des associations de protection de la nature (ex : mines de Chessy)

Table of types of protection according to the international, national, regional or local scope of the sites

Classified and listed sites

As everywhere in France, Beaujolais has sites which are subject to specific legislation created in 1930 by the French State, in order to preserve natural monuments, landscapes and sites of outstanding interest (historical, legendary, artistic or scientific). There are 1 classified site (the Saône valley) and 14 listed sites, some of them are geological, natural or cultural sites integrated to the geosites list.

Conservatory of Natural Areas

In France, Conservatories of Natural Spaces are non-profit associations involved in the conservation of natural heritage. With 29 organizations on French territory, they became managers recognized for the relevance of their work built on conservation, and referents for their scientific and technical expertise. They intervene in land management and use. They rely on regulatory protections to preserve a wide variety of environments by themselves or in partnership with local stakeholders. The association of Rhône-Alpes region works on 8 sites in the Beaujolais area, with 5 sites which are directly concerned by geosites.

Prefectural orders of biotope protection

This type of protection is set up by the prefecture (local representant of the State) in order to protect a natural habitat or biotope with one or more animal and/or plant wild and protected species. This prefectural order enacts the prohibition of certain activities that may affect the ecological balance of the environment and/or the survival of protected species living there. One site is subject to this type of regulation in the territory: the moors of Beaujolais (Croix Rosier and Croix Saburin).

Sensible Natural Spaces (ENS) of Rhône department

The departmental policy of Sensible Natural Spaces is to preserve, manage and open to the public spaces whose natural character is threatened or vulnerable. There are 16 sites on the territory of aspiring Geopark.

Local Urban Plans

With the Geopark project, the Syndicat Mixte of Beaujolais wants to integrate more widely the urban planning sector. SMB is responsible for conducting the development plan for the whole

territory and validates the Local Urban Plans of the municipalities. Joint work is done on geosites, with their integration in the various planning documents, so as to preserve the integrity of the geological objects and immediate surroundings. Thus, 11 geosites are actually registered in the local urban plans of their municipalities and regulating urbanization and various buildings that might impact them.

C.2.2.

■ Inventories for future conservation

All geosites are not yet covered by the protective measures mentioned above. However, a large majority of them appear completely or partly, in inventories of geological or natural heritage. If this type of identification does not guarantee an advanced mode of protection of these sites, it make them appear on various regulatory documents and could help evolve the recognition of geological heritage in the future.

Geoheritage inventory

Launched in 2007 by the Ministry in charge of ecology at the national level, the inventory of geological heritage aims to identify the sites and objects of geological interest and bring them to knowledge. The Rhône-Alpes regional inventory was conducted in partnership with the DREAL (regional service in charge of the environment, territorial management and housing). In this inventory, several sites of Beaujolais have been identified and are incorporated in the list of major geological sites.

Since the end of 2015, a new legal tool for the protection of geological heritage was born in France: the prefectural geotope protection. According to the Grenelle II law (article L.411-1 of the Environment Code), it is now possible to protect a site for its geological interest: "it is forbidden to destroy, alter, degrade a geological interest site ; to remove, destroy, degrade fossils, minerals, concretions, when a particular scientific interest or the requirements

of preserving the natural heritage justify the conservation of the site”.

ZNIEFF 1 & 2

The ZNIEFF (or in english: Natural Areas of Ecological, Fauna and Flora Interests) of type 1 are generally small places of specific interest which are home to protected and identified plant and animal species. ZNIEFF of type 2 are larger geographical areas that sometimes include several ZNIEFF 1.

— C.3.

DATA ON THE MANAGEMENT AND MAINTENANCE OF ALL HERITAGE SITES

C.3.1.

■ Protection of sites

The Syndicat Mixte du Beaujolais has no real direct management capacity on identified geosites because the structure has no particular competence in this field. However, the SMB is committed since the launch of the Geopark project to working with various partner organizations (Conservatory of Natural Areas, public river-basin territorial agencies, nature protection associations, etc.). The Geopark Beaujolais team ensures to be present alongside these partners when developing management plans on certain sites and to include consideration of the geological heritage. Thus, work has already been initiated with the Conservatory of Natural Areas and the Frapna association to work together on a better management of sensitive sites. Several sites are concerned: Couty's bog, Boistray's swamp, valley of Sornin Stream, Propières' mine, Valtorte mineral deposit, moors of Beaujolais, oxbow lakes and islands of Saône River valley, mont Brouilly, mont Saint-Rigaud. These sites are mostly sensitive natural environments with high biodiversity issues

but also with high geological interest.

At the same time, several Sensitive Natural Areas contain one or more geosites. Working in collaboration with the Rhône department (which is in charge of this policy to protect natural areas) would be a good way to engage better management of these sites with strong interest.

A work of raising awareness towards the public authorities has been led by the SMB for elected officials and technicians of communities are more knowledgeable about the Geopark project and what it entails in terms of site management and maintenance. In this way, a paper was written for a better consideration of geosites in municipalities. The “Convention on the recognition and management of Geopark Beaujolais geosites” (see convention in Annexes) is moving along two main objectives. First, it is to formalize the recognition of a site as a geosite identified and selected as part of the Geopark project. Secondly, both parties' signatories agree on the methods of geological site management and equipment provided by the Geopark Beaujolais, in accordance with the Charter of Geoparks.

C.3.2.

■ Vulnerable and unsecured sites

The mineralogical sites have a special status because they are sites with various issues. Most of these sites are often inaccessible because mines galleries were closed after the end of the exploitation. However, they have not all been rehabilitated and some sites are dangerous or very poorly secured. The non-management of these sites has sometimes resulted in strong attendance of amateur mineralogists who regularly visit mines to find minerals. There were many small mines in the Beaujolais area which have not all been heavily exploited (except sites of Chessy and Romanèche-Thorins) but whose traces are still visible today. All these sites have become increasingly vulnerable over time and are highly degraded. These are exceptional sites of geological heritage because they are

evidence of an intense hydrothermal activity which was played in this sector. It has become difficult to highlight them because of their dangerousness. To carry out its missions of management and conservation of geosites, the Geopark Beaujolais must undertake to improve security around these mineralogical and mining sites, but also establish regulations regarding the attendance of these. It will also be important to respect the natural characteristics of those sites that have become protected bat shelters.

D.1.

ECONOMIC ACTIVITIES

The Beaujolais region is endowed with a privileged geographical position in one of the most dynamic region in France. Local resources have been involved in the development and traditional economic sectors such as viticulture, textile industry thanks to the quality of river water, forest exploitation, etc. This territory, which is so close to Lyon, also benefits from an endogenous economic development which allows a significant proportion of its workforce to work locally, albeit declining. The relatively virtuous economic model of Beaujolais has suffered from various crises. Beaujolais have not always been able to differentiate or locally capture sufficient added value. This observation, unfortunately banal, has motivated in Pays Beaujolais frank reactions of the socio-economic actors in favor of maintaining the local economy. As such, we should mention the Beaujolais Chamber of Commerce and Industry, already at the head of the "Made in Beaujolais" brand, which in 2015 committed itself to the creation of a "Very Beaujolais" territorial brand which strongly supports the values of the territory and its enterprises.

In this mobilization of the territory in favor of its economic fabric, the local authorities are not left behind and seize all the opportunities that are available to them to support the local economy. As such, the territory has benefited from various national calls for projects. Finally, a specific part of the territory must be honored, named "Beaujolais Vert", a dynamic and exemplary territory which has been involved in the European Leader procedure since several consecutive schemes and has been involved in actions of exemplary cooperation. Today, this territory claims its commitment as a "Territoire à Energie Positive" recognized and supported by the Auvergne-Rhône-Alpes region and the Ministry of Ecology and Sustainable Development, which should again allow local resources honor as a part of a sustainable economic development project.

D.1.1.

Vines and wine of the Pays Beaujolais: Geology and winegrowing soils, the alchemy

The vineyards of the Beaujolais are centrally located in the Beaujolais territory. With a large surface area (17 000 hectares), it is entirely located on the eastern border of the Massif Central, between the ridges of Haut-Beaujolais in the East and the Tarare Mountains further to the South. The vineyards largely dominate the hillsides which -slope eastwards to the River Saône.

These vineyards and the wines they produce have a particular feature: they are made from a single grape variety (except for the white Beaujolais): the white juice of the black Gamay grape. These vineyards produce red wine; the typical "Beaujolais" wine, as well as 12 protected generic designations (the 10 Beaujolais crus, the Beaujolais and the Beaujolais Village) which have a great diversity of characteristics. A wine is the fruit of the earth (soil and subsoil), of the climate, of a grape variety and of the know-how of the winemaker. Despite only having one grape variety and a similar climate for the entire area of the vineyards (even if many climate variations can be observed from the geographic location, topography and altitude), it is the geology and the pedology that gives this variety of terroirs.

Since the 19th century, many studies have been led in order to know how vines and wines have been influenced by the terrains they cover, which have different structures and natures.

Recently, the interprofession started a capital work about the winegrowing soils in the Beaujolais. Indeed, wine-makers have realized how important are the soils and the necessity to know the latter better. This study has been conducted by the consultancy group SIGALES, organized by geologists, soils scientists and agronomists, which specialises in mapmaking and the study of soils and terroirs.



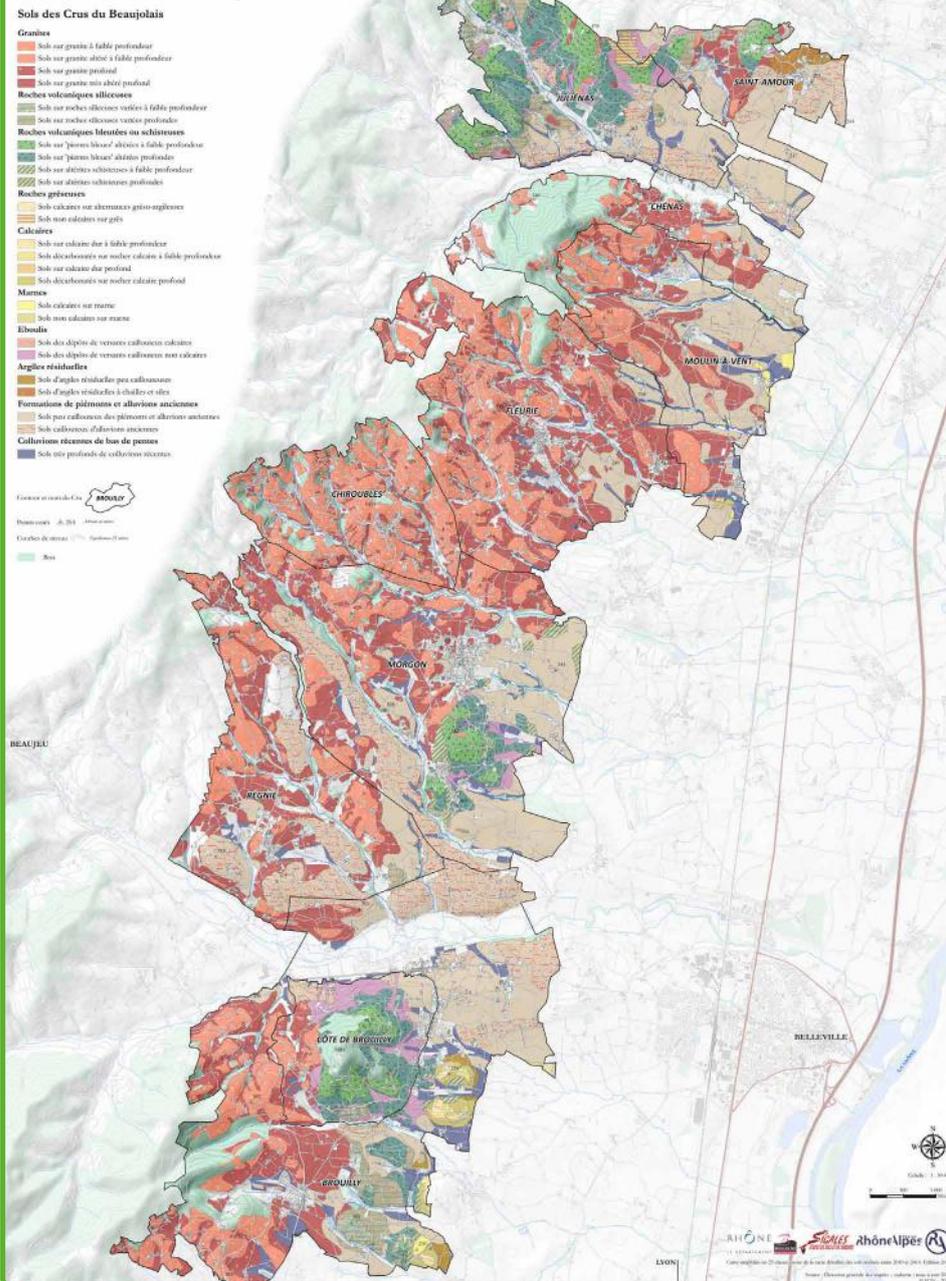
Visit of the EGN Experts in 2015, in a pit soil survey - SIGALES

Their objective is to get a sufficient knowledge of winegrowing soils, identify different types of soils and a map of them. If the latter were known already, their variations and their division weren't. Two environments can be easily distinguished: soils coming from crystalline rocks and soils coming from clay-limestone.

The SIGALES professionals, helped by the interprofession, have led a very meticulous and profound field work on the 13,000 hectares of the vineyard (auger holes, soil pits, profiles...). While waiting for the final study in 2017, the results concernin the soils of ten Beaujolais crus are available. We can identify 3 types :

- The most widespread soils develop from granite rocks; they occupy more than half of the surface area of the crus Chiroubles, Fleurie, Régnié and Moulin à Vent, and under half of the surface area for the 6 other crus. Soils develop from the alteration of granite into Saprolite, which is commonly referred to as "gore". It displays a wide variety of alteration and the modification into clays.
- Then in order of size of surface area, next are the soils derived from deposits and ancient alluvium of the piedmont which constitute glacis or gently inclined plateaus. These are well-developed gravel soils, with more or less significant clay levels. They were identified on all the cru soils except for Chiroubles.

CRUS DU BEAUJOLAIS



Map of Beaujolais' vineyard soil - SIGALES and Inter Beaujolais

— Soils developed from ancient volcano-sedimentary rocks that have been more or less transformed are commonly referred to as “blue rocks” they have display schistosity or other forms of metamorphism. These soils can be encountered in the area of 5 crus: Côte de Brouilly, Juliéna, Morgon, Brouilly and Saint-Amour.

Each cru has its own “pedological personality” that is made up of a combination of these different soil units and

nuanced with local variations. These soil covers extend over rounded relief and changing from one cru to another. The slope, orientation, energy received by the soil, aeration and shelter from prevailing winds differs from one cru to another, but also between local districts. All of this is a rich palette that permits the winegrowers to express themselves; their aspiration, know-how and specific character are expressed in the final wines, and no one can say that they feel they make the same products on these different soils...

Hereafter, there is the summary description of each of the Cru's soils.

— **Regnié** is one of the most granite rich Cru soils, followed by Chiroubles and Fleurie. The varied slopes of the area result in soils at different stages of development. Several hills are capped by evolving ancient superficial formations composed of gravels or big scattered sandstone blocks that complete the granite terroir area with their deeper soils that contain more clay at depth.

— **Fleurie** is the most typical cru developed over a granite soil. More than 90% of the soils are directly developed from pink granite with numerous, thin veins (dark lamprophyres, microgranite and quartz).

— **Morgon** has the second biggest vineyard after Brouilly which explains the diversity of its soils. The three main terroirs of the crus are well organized because the soils developed from the granite cover all the hillsides from the village of Villé-Morgon to Corcelette and Saint-Joseph, those of the “pierres bleues” group are concentrated at the top and on the eastern slope of the Côte du Py. They are progressively covered to the east by piedmont formations and reworked ancient alluvium. Then, a curious ribbon of clay with blocks covers the granite and snakes through the ledge between Morcille and Douby

— **Chiroubles** : the soils on which its vines grow are remarkably homogenous : the pink granite that is cut by little veins of dark lamprophyres and quartz, constitutes the only parent material for the soil. Backing up on the Beaujolais Mountains, this appellation is the highest altitude of the 10 crus. Wine growers, champions of anti-erosion techniques, are working on the thinnest, sandy soils

— **Saint-Amour** : Ancient alluvial clays, flinty clays, granite, schists, diorites, Triassic sandstones, and also some calcareous rocks combine to give an extraordinary diversity to the soils of this cru, which is the least spread.

— **Côte de Brouilly** : the « blue rocks » are a complex combination of resistant micro-diorites and more alterable shale. The hardest forms are the backbone and the summit of the Brouilly mountain. Approximately two thirds of the cru's vineyard is set on very steep slopes, covered in blue rocks of intermediate hardness. The alteration of dioritic rocks is more silty-clayey than it of the granites, which are more sandy-gravillonneuse and more present on the west slopes of the mountain.

— **Chénas** : In the municipality of Chenas to the west there are rough granite slopes, an extension of those of Moulin à Vent. Around the municipality of La Chapelle-de-Guinchay the land slopes less and is formed of a wide granitic outcrop which disappears to the East under ancient alluvium with small pebble horizons (SIGALES, 2014). Located between Chénas in the Rhône Department and La Chapelle-de-Guinchay in the Saône-et-Loire Department, Chénas is Beaujolais's rarest cru.

— **Juliéna**s : Some granite derived soils, but many soils coming from the « blue rocks » combination. They disappear to the east and are replaced by ancient alluvium and underlain by clayey subsoil. The resistant Triassic of the Mont de Besset is formed of Triassic sandstone and gives different soils.

— **Moulin à Vent** : This cru combines a good proportion of pink granite soils and a lenient topography, since altitudes and medium slopes are the most moderates of the ten crus. The granitic soils are high and evolved enough. The soils coming from the piedmont formations and ancient alluvial rebounds, quite complex to describe and manage, are very present in this east part, but less thick than anywhere else since granite has often been found there around one meter underground. As an example, it has been noted that some hectares of marls have been discovered to the extreme east of the appellation area, these are the most calcareous of the Beaujolais

— **Brouilly** : The most widespread and southernmost of the Beaujolais Crus gets its name from the hill Mont Brouilly. Its name doesn't come from a neighboring village, it comes from the six municipalities that surround the Brouilly, of Quincié, Odenas to Saint Etienne la Varenne. At the bottom of the slopes, clay screes of "pierres bleues", siliceous volcanic or schists form an irregular crown. The high Cercié and Saint Lager flats are rised on both sides of the Ardières, and are crowned by often rocky ancient alluvial deposits. Lastly, on Charentay appear four little limestone hills.

D.1.2.

■ Agriculture

The Applicant Geopark of the Beaujolais is a territory of contrasts, where the agriculture covers 44% of its entire surface. This activity is shapes the image and the lifestyle of the territory. The emblematic crop which made this region world renown is the wine growing. With more than one million of hectolitres of wine produced a year and the festivities of the Beaujolais Nouveau, the Beaujolais is known worldwide.

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But the territory is also produces many other goods that are distributed between the different areas of the territory:

— The Saône river plain the only zone of the territory dedicated to arable crops, orchards and vegetable production;

— The hills of the Beaujolais, essentially dedicated to wine growing and that consists of 12 appellations; a reflection of the terroirs' richness: Beaujolais, Beaujolais Villages, and the 10 crus: Brouilly, Chénas, Côte de Brouilly, Chiroubles, Fleurie, Juliéna, Morgon, Moulin à Vent, Régnié, Saint-Amour.

— The Beaujolais Mountains which culminate at the Saint-Rigaud Mount. Free from urban influences they reveal farming and forestry.

D.1.3.

■ Forests and logging

From a geographical point of view, the Beaujolais Mountains are the fringe of the North East Massif Central. The acidic and unclogged soils of the Beaujolais massif are ideal for the forests' development and to the production of good quality wood: rich and profound soils in low landforms. The climate is also beneficial to the forest.

The Beaujolais forests are young and were, for the most part, planted during the XXth century on ancient declining agricultural parcels and moors. In these days, the authorities promoted the plantation of resinous pines (silver and Douglas fir). The 30% of hardwood forest are found in the fringes of Beaujolais.

In the Beaujolais, 96% of the forests are owned by private landlords whose primary objective is to produce wood and sell it. Forests' fragmentation (the average surface of a parcel is 1.2 acres), the dominance of Douglas fir and local traditions have led to a certain type of forestry: high regular forests that are clear-cut at the end of each cycle (every 60 years).

The Beaujolais massif must today match the French vision of forestry: multipurpose forests. They must combine logging, receiving the public and protecting biodiversity. Housing density in the massif (74 people/km²), tourism (rising with the development of green tourism) and the growing preoccupation concerning the environment lead to numerous criticism that show an ignorance of local forests and forestry in general (ecology, forest management, logging..)

The high Beaujolais is known for the quality of its logging: pines and Douglas fir. Logging in the Beaujolais is strong since resinous trees are needed for construction work (backbone and framework), the massif is easily reached and fir trade is rising in Europe and abroad. Sawmills in the massif are not equipped to saw big volumes of wood and many of it is send to industrial sawmills, for example in the Alps where they don't produce Douglas fir.



Creuzeval quarry in Saint Didier sur Beaujeu

D.1.4. **Plenty of mines and quarries**

For many centuries the Beaujolais was able to draw on its geological diversity. From Roman times up to the present day there has been mining of numerous materials, minerals and useful substances.

The significant mining activity around Chessy-les-Mines produced Copper, Iron and Sulphur at the time of the industrial revolution. Tens of mines are spread out across the territory which worked Copper, Iron, Lead, Zinc, Arsenic, Tin, Antimony, Fluorite and Barite. It is known as the richest mining region in France, as highlighted by its royal decree awarded at the beginning of the 15th century. The Beaujolais has over one hundred types of minerals. The coal mines supplied the lime kilns in which the Carboniferous and Jurassic. The Golden Stone is used in the industrial manufacture of cement (site of Lafarge in Belmont-d'Azergues). The marls of the Lias and the quaternary clayey alluvium have been exploited, and still partially, for the production of ceramics (bricks, tiles, etc). Carboniferous volcanic and hypovolcanites are exploited as crushing and road materials (CBR SAS in Saint-Didier-sur-Beaujeu, Lafarge quarry in Rivolet, Eiffage-GMRT of Saint-Vincent-de-Reins and Saint-Jean-la-Bussière, STAL TP of Saint-Julien, Blacé). Finally, the quaternary alluviums of the Saône River are extracted and used in the manufacture of concrete (Vicat gravel pit in Arnas).

D.1.5. **Tourism and leisure**

The name « Beaujolais » is known worldwide for its wines. Despite this international reputation, the lands of the Beaujolais remain secret...

Between mounts and hillsides, the Pays Beaujolais displays a multitude of landscapes. It spreads from the

extreme South of the Saône and Loire Department to the gates of Lyon. This is a colourful territory: those of the golden stones villages, of the hillsides, of the Val de Saône the ruby coloured wines. This is why from a tourism point of view the Beaujolais is divided into 4 zones: Beaujolais winery, Beaujolais green nature, golden rocks Beaujolais and Heart of the City Beaujolais.

From this diversity emerged the Syndicat Mixte's strategic plans, that Destination Beaujolais and the Offices de Tourisme put in action, around the themes of wine tourism, agritourism, landscapes and heritage, outdoor leisure activities and fluvial tourism. The geopark approach is a cross touristic marketing and touristic development axis. The tourism development strategies are based on the professionalization of local actors, the development of ecotourism, of geotourism and nature tourism, of cultural and heritage sites and on transverse packages (children and family, tourism and disability, groups...).

D.2. **EXISTING AND PLANNED INFRASTRUCTURES**

D.2.1.

■ Existing facilities and infrastructures

■ D.2.1.1. **Touristic infrastructures**

6 Tourism Offices, 1 Information Center, 1 Maison de Pays work on the Beaujolais territory and manage 16 places of touristic visit and information (including 3 seasonal sites). In these places, stay advisors offer information about surrounding activities (animations, offers, housing, eating, museums...) as well as services (box office, reservations, equipment rental...). A study conducted by the Syndicat Mixte du

Around 20% of the wood cut in Beaujolais are sawed in the massif.

Douglas fir (or Oregon pine) was first discovered on the west coast of the United States of America and was introduced in the Beaujolais in 1872 by the Comte de Sablon, in Claveisolles. After noticing its rapid growth, the Douglas fir seemed promising and on the path to become the Beaujolais' lead essence. Some of the trees brought by the Comte de Sablon have survived all these years and storms in the bois de Corcelle, in Claveisolles.

Today, almost all plantations are Douglas fir. Its heartwood is resistant to mushrooms and insects when outside, when other resinous trees have to be chemically protected and treated. It's a local alternative to exotic woods. Next to agriculture, forestry is at the core of the region's local economy. On the massif, we count around 900 companies and 1800 jobs. Some people predict that wood will be the 21st century's lead material: it's eleven times more insulating than concrete, light, renewable, CO² neutral... The Beaujolais massif has the potential it needs to meet this challenge thanks to geology!

Beaujolais, who is at the head of the Geopark proceedings, is taking place in order to reorganize the existing infrastructures in one and only office of tourism, with a closer partnership with the Geopark Beaujolais and Only Lyon Tourisme.

Tourism in the Beaujolais region is rural and suburban at the same time, with a wide range of housing and eating options. The Geopark Beaujolais has a housing capacity of 37,000 units (10 500 commercial units and 26 500 private vacation units). Green tourism housing (country cottages and bed and breakfast) are represented on the territory.

The site and touristic activities panel is quite wide: natural sites where one can practice outdoor sports, leisure and family tourism, cultural and heritage sites, wine gastronomy, fluvial and geotourism.

– D.2.1.2. Geotouristic sites

Within the Geopark Beaujolais territory we can mention the infrastructure dedicated to scientific mediation and discovery of the Earth's history.

– **The Espace Pierres Folles** (Saint Jean-des-Vignes) : the Espace Pierres Folles is the showcase for the geology of the territory. Located at the heart of the golden stone countryside, near to the Lafarge quarry, the museum is open to the public from the 1st of March until the 30th November, and stay open to the groups by reservation during the whole year. This museum of paleontology, as well as core and applied geology offers a fairly complete discovery of the various facets of Earth's history (stratigraphy, paleontology, paleoecology, etc.) and of applied geology (mineral resources, use and transformation, oenology). The museum also highlights the essential resources of the territory for man, its habitat, its heritage and its economic development. The free-access geological path has been developed with interpretative equipment and invites you to discover the regional geological history through spectacu-



Espace Pierres Folles

lar objects. The botanic garden is located in the area of the former quarry and is also free-access. It includes about 530 species of regional flora whose diversity is the fruit of variety of soils and geology. This garden is sponsored by "Botanic Gardens of France and Francophone Countries".

– **The Glay quarries** has been developed as a pedestrian path and dotted with interpretation panels which explain the extraction and stonecutting and the human history of the site. This is a good example of rehabilitation of a former quarry. Classified as sensitive natural habitat (ENS) by the Rhône Department, the Glay Quarries are free access and animated by the association "Amis des Carrières de Glay".

– **The geological path of the Mont d'Or** : 9 kilometers long, this free-access path runs across the limestone mountain that overlooks the city of Lyon. Dotted with interpretative panels and panoramic tables, this path allows the discovery of landscapes and formation of rocks constituting this mountain.

– **The Mont Brouilly** is the viticultural mountain of Beaujolais and is an important tourist area within the territory. Facilities have been put in place during 2014 in the

Charte de Fontevraud framework provide visitors and walkers with a better idea of the landscapes and the various components of the territory.

– D.2.1.3 The touristic sites

– **The Pine Lake** (Lac des Sappins) is a lake dedicated to tourism. It has become a major site of the Rhône-Alpes Region with more than 300 000 visitors per year. The site includes both a lake of more than 38 hectares and a natural space for bathing. Since its creation, the Pine Lake provides many facilities for outdoor leisure activities.

– **The animal park Touroparc** in Romanèche-Thorins is mainly centred on today's living world, but a museum area covers the topics of local history, and the history of the manganese mines. (200 000 entries in 2015)

– **The Hameau Duboeuf** is located in Romanèche-Thorins and is a famous museum dedicated to wine, its promotion, production and history. Geological and educational themes are developed there which relate to Beaujolais local products, in order to highlight characteristic "terroirs" of the applicant territory (120 000 entries in 2013).



The geoscope belvedere of Mount Brouilly

– **The Maison du Terroir Beaujolais** is a touristic institution in a half-timbered house (with a Renaissance courtyard) located in the heart of the historic capital of the Beaujolais: Beaujeu. This site offers a visiting space, a terroir products shop, an exhibition room, animations, bike rental... (20 000 entries in 2015).

– D.2.1.4. Natural sites

The remarkable natural heritage of the Beaujolais is protected and enhanced in several ways: The Sensitive Natural Area of the Val de Saône and 15 other sites listed for their landscape qualities ; many Sensitive Departmental Natural Areas; 34 “flower” towns and villages, the Rhône Department also being recognised as a “flower” Department ; Nombre of remarkable parks and gardens ; The village of Fleurie has been designated as a holiday “Station Verte” ; 14 villages have committed to the Agenda 21 project of the national society “Notre Village” as approved by the MEEDAT ((Ministry of Ecology, Energy, Sustainable Development and Country Planning).

The Pays Beaujolais is very much a hiking territory and has more than 1600 kilometers of marked paths for many activities: hiking, horse riding, bike riding (with bike trails approved by the National Federation), self-stabilising scooter etc. Between mountains and valleys, across hillsides these little roads and winding paths are playgrounds for cyclists of all levels. The excursions are either self-guided or accompanied by an educational guide, a naturalist or trained personnel. Other

outdoor activities can be practiced, such as rowing, sailing, kayaking, climbing, speleology or rope paths, fishing activities, etc. Seen from the sky from an aircraft, the Beaujolais is a magical territory revealing its landscapes.

– D.2.1.5. Cultural and heritage sites

The applicant territory has 21 museums which have been born from the passion of great collectors, dedicated to inventors, and to traditions that have forged the Beaujolais. Among them we find the Paul Dini museum (23 800 visitors in 2015), Le Prieuré in Salles-Arbussonnas (5 000 visitors in 2015).

In addition to the museums there are many cultural and heritage sites as well as a remarkable and varied architectu-

ral heritage. So many elements that illustrate the richness of the Beaujolais subsoil which punctuates the characteristic villages at the heart of Beaujolais, encouraging you to journey through time. Within these sites, we can find: Oingt, the Most Beautiful Village in France ; the 2 Cluniac sites of Salles-Arbussonnas and Saint Mamert ; many protected buildings classified as historic monuments ; a hundred of castles from the 10th to the 20th century ; the territory of the Pierres Dorées awarded the label «Vignoble et Découvertes» by the national association Atout France; famous vineyards with its 12 renowned appellations, 6 « one star Michelin » restaurants and 1 « two stars » restaurant.

Above the structural equipments in the Beaujolais territory, we can notice tools that allow the territory’s valorization. The communauté de communes of Saône Beaujolais, for example, puts in action a local heritage support and rehabilitation program on the territory.

One of the Beaujolais singularities is its ever full agenda. The agenda of the Pays Beaujolais is rich in special activities and events which have an impact from the local level to the international level. Local products are often at the heart of the activity, such as during the Feast of the Crus or the Beaujolais nou-



Biological swimming at the Pines Lake («Lac des Sapins» in French)

veau, which takes place after the third Thursday of November and attracts more than 50 000 visitors.

In the same way, the two main cultural festivals ("Continents et Cultures" in Beaujolais and the festival of the watercolour artists of Bagnols) each attract between 10 000 and 12 000 visitors. Other unifying popular events based on traditional activities; such as the festivals of the Mousselines in Tarare, the Vague des conscrits in Villefranche or even the festival of mechanic music in Oingt.

There are also the sporting events of international and national notoriety that attract also many people (Pine Lake Triathlon, Beaujolais International Marathon, Raid Aventure Beaujolaise etc.) which reinforce the image of the Pays Beaujolais as a territory dedicated to outdoor leisure and sports.

D.2.2.

■ Planned infrastructures

■ D.2.2.1.

Signs and transverse equipments

Since 2015, the applicant Geopark Beaujolais is working towards the implementation of a common signing and transverse equipments, in order to construct and equip geosites in a homogenous and coherent manner. With this view, 4 projects are pending:

- Designing a **furniture line**, that is the variant of the Geopark's graphic charter for equipments and signs. A furniture catalogue is in finalization in order to be given to geosites managers to facilitate the harmonization of site equipments, as well as taking into consideration each site's characteristics.

- The implementation of **welcome totems**, financed by the SMB, which will allow visitors to identify geosites. On these totems will be information in French and English about the Geopark and the geosite in question, but also elements of geoscientific mediation. These totems will be put on operational



International Marathon of the Beaujolais Nouveau

geosites and be accessible to the public.

- The implementation of Geopark **display stands** in the main sites welcoming visitors, such as the Espace Pierres Folles or Tourism Offices. A study is pending and should end with the implementation in 2017.

- The conception of **ecological toilets** in sites that haven't got any lavatories. The Geopark Beaujolais assigned an architect to study, conceive and offer solutions adapted to geosites. With a view to respect sustainable development, this mission was conducted hand in hand with professionals of the wood sector, in order to promote the use of local materials (Douglas fir wood from the Beaujolais, well-known for its construction qualities). The first two prototypes were made by a local firm located in the Mount Brouilly. A collective purchase order should be finalized by the end of 2016, in order to install ecological toilets in 2017.

Notably, the Geopark team's role is of paramount importance since it monitors and supports proceedings of planning, interpretation, mediation, translation of each geosite in order to ensure the coherence between them.

■ D.2.2.2.

Planned equipments and arrangements

Within the framework of the Geopark project, many new projects are being developed. Among them, the projects that are equipping websites have been mentioned. On the Mount Brouilly for instance already benefited from different steps of the project (sustainable management, paths, geoscope...) and two new steps will come : the management of a small green quarry and the hosting of events promoting the site and finished arrangements (festival on the Mount and an opera in the quarry).

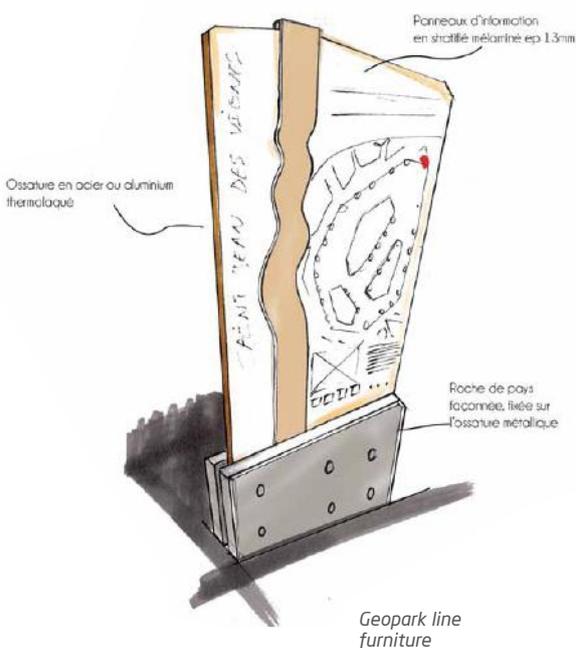
- **Chessey les Mines** is currently developing an interpretative path to help visitors discover the mining activity, minerals and the place's history, in partnership with the BRGM. One of its objectives is to connect this path to the other Golden rocks geosites.

- **Bagnols** has many heritage monuments (its famous castle, a quarry, a dovecote, some morguères...) The plan there is to organize a track (created at the beginning of the Geopark proceedings) to guide visitors on an itinerary through the village. Amongst the planned equipments, we can find a lookout area with an interpretation table, heritage mediation signs or the restoration of St Roch's chapel, which will become an exhibition room for the Geopark.

- **The White rocks quarry in Lucenay** is at the heart of a study before its installation. The Geopark team organized a « knowledge café » with a view to retrace the geosite's history with resource people, to enhance the contents of the interpretation materials. The municipality voted the budget it needs to plan a new interpretation space about stonework and quarries, as well as botany.

- **The Morgon balcony** : in Gleizé, is an interpretative path addressing fauna, flora, geology and vernacular heritage of the river. There are still some equipments to implement in order to ease the visitor's access to the site, including the creation of a parking lot.

- **The listed village of Ternand**, is located on a rocky promontory. In the Geopark's framework, the municipality wishes to promote the village and environment's geology. An interpretative path will be created in the forest of the Longeval castle, in order to enhance the visitor's understanding of biodiversity, landscapes and geology. The old Curs-la-Ville quarry is only open to visitors with a guide, a few times a year. That's why the city council voted the creation of an observation and geology interpretation point.



Other projects are also in study, in order to better understand the equipments and arrangements to implement, such as in:

– **The Saint-Rigaud mount**, which is undergoing a remodeling study in the framework of the geopark proceedings and its enlistment on the Saint Jacques de Compostelle path. The CAUE is working in a close partnership with the Geopark team on this project, which could lead to the installation of interpretation material and functional equipments.

– **The Chiroubles terrace** is a highly touristic place that benefits from an exceptional vantage point, a restaurant and a local product shop. A landscaper was appointed to study and define the equipments to be build, such as a path and a lookout with landscape reading elements and geological mediation.

– **A global approach of the Golden rocks path and geosites** is also in study in order to equip different sites : the jalopy path, the Golden rocks itinerant geosite... The Communauté de communes is currently pondering the creation of a path linking several municipalities and points of interest, in

partnership with association and local actors.

– **The Déchelette area and the Clos du Crêt park in Amplepuis** are at the center of a study led by the CAUE, about the reorganization of the park and the promotion of the Déchelette area. The phase of practical proposals should intervene soon.

– **An educational trail** is under study at the Creuzeval quarry of Saint Didier-sur-Beaujeu, in order to teach about geology, soils, environment, the quarry and its mining operations.

– **The Espace des Brouilly forecourt** must be rearranged in order to be at the junction of the selling of wines (Brouilly and Côte-de-Brouilly Crus) and the mount. The plan is to ease the explanations about the terroirs, by promoting experimentation and immersion: grape vines, rocks, entertaining explanations about the links between minerals and plants, an invitation to climb to the summit of the Mount...

Many projects are still under study, such as the securing and reorganizing of some mining sites and morguères. But some ideas have been matured enough to be operational, such as:

– **The educational room of the Hameau Duboeuf's** that will see its interpretation method changed in order to make it coherent with the geopark proceedings and the pedological studies led by SIGALES.

– **Touroparc's** mining museum enjoys a large collection of Romanechite but could do with a better promotion with a view to attract new visitors.

– **The mine's path project** would allow us to show visitors the mining assets of the Beaujolais region. The problematic securment of the mines that welcome visitors should be addressed by allowing the access to the path only under guidance of a guide at first.

– **The « Tarare au fil de l'eau » guided tour**, which shows the ci-

ty's history and industrial past (on the Turdine River) should give birth to a free-access interpretation trail that will promote hydrology.

– **An exhibition project** about the Geopark Beaujolais landscapes is in study, following the edition of the « cahier de territoire », by the CAUE.

– The creation of an **artistic trail** has been mentioned : it would allow to create a link between art and the sites, to have a new look on the territory and a new reflexion about the earth's history and heritage.

– D.3. GEOTOURISTIC POTENTIAL IN QUESTION

For a long time, the Pays Beaujolais has offered geotourism without knowing it, especially with all the aspects linked to the "terroir" and the heritage. The project for entry into the Geopark Network has been a real catalyst for ideas, desires and projects which identify and endorse the riches of the territory, especially its geological wealth.

D.3.1.

■ Types of visitors and attendance

In 2015, the total number of nights spent in the Pays Beaujolais is estimated at around one million. This ranks the Beaujolais as the second most popular tourist destination, just behind Lyon, which is listed in the UNESCO World Heritage. Tourist traffic is spread over a fairly long period of time, since the season runs from April to October. The Beaujolais region has two peak periods of frequentation: the first one is in July- August, and the second one in November at the time of the "New Beaujolais Feasts".



Model of the development project for the small quarry of Mount Brouilly

The Pays Beaujolais has a wide customer base, since it is close to Lyon, which attracts many foreign visitors, and seeks to diversify its offer by opening towards the Beaujolais. The clientele is made up mainly of French people (76%) coming from the Rhône-Alpes Region (30%) and from neighbouring Regions (20%). This explains the significant proportion of non-market accommodation in the territory. However, the reputation of the Beaujolais and its geographical location in the centre of Europe allows us to target foreign clients (24% of the visitors) who come from neighbouring countries (Belgium, the Netherlands, the United-Kingdom and Germany are the most represented). It is in November that the Beaujolais welcomes most international visitors, with almost 60 different nationalities.

D.3.2.

■ Visitors' and professionals' interest for geotourism

In a context of the current globalization of tourism, where supply is greater than demand, tourist destinations and professionals must adjust to the clients' desires, while searching to be different from other providers. Meanwhile, all recent studies led by Atout France (Ministry of Tourism) and the Regional tourism committee of Auvergne-Rhône-Alpes region, show that clients seek meaning, a fresh, back-to-the-roots experience. The ecotouristic and geotouristic approach of the Beaujolais region unleashes its full potential since it answers the clients' desires but also the local stakeholders and representatives' wish to preserve the environment and quality of life. This development strategy and the actions undertaken

to this day have confirmed this position with local tourism professionals. We found a growing enthusiasm for geotourism and geosites. Moreover, we have had positive reviews after fairs, solicitations and educational tours for tourism professionals from abroad (the UK, Canada, Belgium...).

D.3.3.

■ An analysis of geotourism potential

The geotourism themes in Pays Beaujolais have already been established: the discovery of "terroirs" and heritage. These are the two aspects that expand on the geology of the territory by means of human activities.

Exceptional terroirs thanks to the riches of the Beaujolais : The study characterising the "terroirs" which underline the clear link between pedology and local produce, and the raising of education and awareness which will be put in place at the end of the study, serve to illustrate this objective.

An abundant heritage, a reflection of the subsoil diversity. Building heritage is the expression of geological diversity that can be seen in many geosites. The Geopark project allows coordination and gives a common goal to many initiatives, with more clarity and visibility. We can highlight the will to create a shared calendar of guided tours, exhibitions and other events around Geopark, in order to implement a network of geosites and places to visit.

– D.4.

SUSTAINABLE DEVELOPMENT POLICIES OVERVIEW

The Geopark Beaujolais action is set in the Pays Beaujolais' Sustainable Development Charter. Its guidelines have been translated into working actions, set in the transversal plan of action established by the SMB in order to support the spread and the implementation of the Geopark Beaujolais' strategy. The latter has five axes:

– Conservation and planning:

this axis concerns the protection of geosites, sustainable development policies, and the equipment of territories. The implementation of this axis is organized by the Geopark Beaujolais team, who also funds the transversal equipment (guiding, signs...). But the funding of the accommodation goes to the geosites managers. It's interesting to notice that many investments (organization of geosites, signs, totems, ecological toilets...) were made in 2016 and the preceding years. Annual budget 260 000 euros + human resources.

– Geoeducation and teaching:

in this axis, the applicant Geopark wishes to link all local stakeholders of the Geopark's educational aspect, to develop a specific teaching method and to make of the territory a terrain for research. Annual budget 12 5000 + human resources.

– **Economic development** (including touristic development) ; this axis seeks to cooperate with local tourism stakeholders in order to develop the geotourism and promote economic activities hand in hand with geological heritage. Annual budget 2000 euros + human resources

In 2016, this action plan and its budget were extended until 2022 in



Geopark presentation for foreign tour operators

order to ensure continuity, in a spirit of consolidation and optimization of what already exists. It could be annually revised, completed or adjusted. The development of new co-funding, partnerships and synergies with other stakeholders and actions has also been mentioned.

D.4.1.

■ Geotourism and economy

Beyond what has already been presented previously, the Geopark Beaujolais' action plan also schedules an axis on local economic development, which would include geotourism and promoting economical activities in partnership with geological heritage. In terms of **geotourism and economy**, the Geopark Beaujolais is working on 4 action plans:

– Develop tourism products:

this is one of the first actions led by the Geopark, hand in hand with tourism provider « Atouts Beaujolais », by developing the « geocurious » concept. It consists in one-day trip suggestions including a geosite, a touristic offer and a meal (in a restaurant or a geo picnic). This idea is growing fast since Tourist Centers will widen the offer by developing their own geocurious products.

– The « Grain of sand Odyssey »

is at the crossroads between economy and tourism, since it consists in visiting a gravel quarry (partnership with Vicat Granulats and marketed by the Villefranche Beaujolais tourist office). Visitors are invited to embark on the Nicéphore and discover the Pré de Joux gravel quarry, in Arnas : its geology, its mining operations, its flora and fauna, the rehabilitation of the quarry... bargemen, captains, dredgers and sailors all share their

experiences with visitors.

– Improve knowledge of stakeholders about geo-heritage.

In order to do that, the Geopark's team often conducts information and training sessions about the Geopark and geo-heritage (guides, speakers, tourist office staff, tourism providers, guides de pays...). Sometimes the Geopark organizes educational tours and sites' visits in order to sensitize, inform and train local stakeholders about geosite management.

– Bring together a network of stakeholders and geo-events.

All year long, activities and events, such as conferences, meetings and visits around geology are organized, some of them by the Espace Pierres Folles association. As an example, we can mention the Marche des Cailloux ("Walk of the Stones"), organized by the « Itinéraires, paysages et patrimoine » association that receives great interest each year, or the Stone festival organized by the association « Amis des Carrières de Glay ». The SMB is also working with site managers and tourist offices in the territory in order to implement the summer visit schedule. These actions are to be developed in the years to come, in order to become a geotouristic animation.

– Promote the development of activities and products linked to geo-heritage

by organizing a geo-initiative competition. Many local stakeholders and firms of the cru wish to invest in the Geopark. That's how the idea of a competition, taking place in 2017, came to life : a competition so that farmers, craftsmen, winemakers and municipalities can become stakeholders in their own way in the Geopark Beaujolais. This call for tender will be designed by the communication workgroup and should use theme sections such as: geo-events, geo-

products of the terroirs (wine...) and other products (bakeries, crafts...), urban equipments (roundabouts, flower bushes...).

D.4.2.

■ Geological heritage

In terms of geological heritage conservation and protection, the applicant Geopark commits to respecting the principles listed in the transverse action plan. Some axes have already been brought forward:

– Guarantee the geosite's protection and conservation.

The geological sites must be protected from any damage, especially those that are fragile and need special attention.

– Strengthen the existing protection measures

in order to ensure a better implementation of the geological heritage's management plan. The creation of new protection perimeters is to be considered in the future, especially for the geosites which are currently outside protected zones. A special partnership with the scientific committee of the Geopark Beaujolais is of paramount importance for an effective protection.

– Always include geosites' perimeter in urban planning on the territory.

A collaboration with the SCOT Beaujolais team is already in place. Likewise, an agreement concerning the acknowledgment and management of the Geopark Beaujolais has already been written.

In addition to those planned actions, the applicant Geopark considers accompanying geosites' managers in order to sensitize them to respecting the Geopark's charter. As a supporting structure, the SMB must check that the Geopark's values are respected in-situ but also in communication around the Geopark's discovery and interpretation spaces. For more information of the geological heritage's protection and preservation actions on the territory, please refer to the C part (about geo-conservation) of the application file.

– D.5. ENCOURAGING RESPONSIBILITY AND EMPOWER- MENT OF COMMUNITIES

The Geopark Beaujolais seeks to involve residents and local communities in its construction and management. The goal of this involvement is the geological heritage's appropriation by as many people as possible, but also to evaluate and enhance the residents' interest in this project, and hence make the human resources and long-term interest around this project grow.

Thus, the Geopark Beaujolais has implemented many tools, but also meeting and speaking places where anybody can express him or herself about the uses of the territory and allow a concerted management of the geosites. The Geopark Beaujolais procedure is a strong participative approach. Bottom-up from its management with the residents participating in the implementation and decision making in working groups, the local stakeholders were also involved in the geosites' pre-inventory in 2013.

An annual forum (4th edition in 2016) allows stakeholders who are involved or interested in the proceedings to come together to get information and discuss. In February 2013 it was organized around participative workshops in order to make the inventory of places of interest in the geosites. Moreover, in the events that have taken place in the territory, other French Geoparks have been invited. Indeed, during the 1st Geopark Beaujolais forum, the Bauges Geopark was invited to speak about its experience. In the same way, during the second Geopark Beaujolais forum, the Natural Regional Park of Monts d'Ardèche, a Geopark applicant came to present its application and talk about the work it had carried out. Thus the project of the Beaujolais is not only a local project, but it is a participative

	ATOUTS	HANDICAPS
› INTERNE	Forces : <ul style="list-style-type: none"> ▶ Diversité des ressources géologiques et patrimoniales ▶ Appropriation et engouement des acteurs locaux pour la démarche Geopark en Beaujolais ▶ Développement d'une offre familiale de découverte du territoire de manière ludique ▶ Un territoire facile d'accès sur l'axe Nord-Sud européen et à proximité immédiate d'une grande métropole européenne : Lyon ▶ Une notoriété internationale liée aux produits du terroir : les vins ▶ Un tourisme à la saisonnalité peu marquée ... 	Faiblesses : <ul style="list-style-type: none"> ▶ Des ressources géologiques abondantes et variées mais moins visibles qu'en zone de montagne (à révéler) ▶ Une gestion encore peu institutionnalisée des sites d'intérêt géologiques ...
› EXTERNE	Opportunités : <ul style="list-style-type: none"> ▶ Vivier de touristes de courte durée à proximité ▶ De nombreux partenaires et acteurs locaux s'emparent du géo-tourisme ▶ Visiteurs en recherche de sens, de bien-être, de découverte intelligente et ludique à la fois ... 	Menaces : <ul style="list-style-type: none"> ▶ Pression foncière liée à la proximité de la métropole lyonnaise et à la qualité du cadre de vie ...

SWAT analysis table of the geo-touristic potential of Beaujolais

approach to create and formalize a sustainable network of exchanges with other territories.

In 2016, the forum was focused on questions of geosciences: speakers from universities and the geopark network in France debated these questions. Dr. Margarete Patzak, of UNESCO was also there to present the new UNESCO Global Geopark label. Every year the forum draws around 150 participants: representatives, local stakeholders from associations of civil society. It's a milestone for the Geopark Beaujolais.

Lastly, a network of Geopark ambassadors has been built up from 2015. In order to relay the action of institutional stakeholders involved in the territory and committed to defending the Geopark Beaujolais' values and its development, a voluntary ambassador's network was created. The Geopark Beaujolais ambassadors are committed to making the Geopark better known and to promote its interest to visitors and local residents, as a living heritage that must be passed on to future generations. The title « ambassador » is given after consultation of an ad'hoc commission of the SMB, to whoever asks for it and corresponds to certain criteria and is committed to the implementation and promotion of the Geopark Beaujolais (see charter). In September 2016, 6 organisations have already received the title of « Ambassador » (Atouts Beaujolais, Amis Guides en Terre Beaujolaise, Tourist Office Beaujolais vignoble, Espace des Brouilly, Destination Beaujolais, Tourist Office Beaujolais Pierres Dorées).

– D.6. AWARENESS- RAISING POLICIES

Education is a priority in the Geopark proceedings. The Geopark Beaujolais is connected with resource stakeholders around this theme. They are gathered in the « educational action » work group. An action plan was voted in 2015 in connection with the Geopark's activities. This action plan's objectives are:

- ▶ Networking and cooperation between the territory's stakeholders.
- ▶ The creation of education tools and documents by the Geopark.
- ▶ Collaboration and co-production with institutional stakeholders in education.
- ▶ Cooperation with universities and laboratories.

The educational theme is directed towards various types of public:

- ▶ Students and pupils.
- ▶ Visitors of the Geopark.
- ▶ Sensitization and knowledge-enhancement actions for professionals.

D.6.1.

■ Educational actions for pupils

Since the beginning of the proceedings, institutional partnerships were established with institutional education stakeholders, the Lyon academy, from the Ministry of Education. The Inspection Académique and the DAAC (academical delegation for arts and culture), gave support and became partners of the project. These partnerships have allowed the Geopark Beaujolais to become a part of the education system and ease communication with teachers. For example, in 2015: the DAAC launched a call for applicants amongst teachers for the Geopark Beaujolais. The Geopark Beaujolais was introduced during the award ceremony of the Geosciences Olympics of the Lyon academy. The Ministry of Education supports and advises the Geopark Beaujolais in organizing its action plans. Teachers met three times in 2016 in order to discuss and move forward on the different educational projects linked to the Geopark.

The Geopark Beaujolais is also working hand-in-hand with the CAUE 69 (Conseil d'Architecture, d'Urbanisme et d'Environnement du Rhône) on supporting and producing educational projects. Thus, for 2016/2017 school year, a technical class of the secondary agricultural school Bel Air is working on a project called « What landscape for tomorrow ? Reading and understanding the landscape to act on wine-growing territories ». This project is transversal. Thanks to meetings with environment and development professionals, students can observe, analyze and acquire knowledge about the wine-growing landscapes of the Geopark Beaujolais. The idea is also to analyze the environment's evolution and the impact of human activities on landscapes in order to act as responsible professionals and citizens in the future. The final production of this project (in 2017) will be a photographic and artistic exhibition with a view to showing the landscape's evolution over the last fifty years and imagining what it will look like in the future.

D.6.2.

■ Visitor awareness and information

The Natural Heritage Guide was edited in 2015 by the Natural environment Conservatoire and the SMB, supported by the Rhône-Alpes region, the Agence de l'Eau (Water supply Agency) and the Plattard and Vicat groups. After a year of work with around fifty local stakeholders and professionals, this guide promotes the richness of the territory's resources: its natural environment, its geology and vineyards that made it famous. This Guide, included in the region's natural environment guides, was sent to schools and sold to visitors.

The Geosites' Discovery Map : this tool was suggested by the Education actions workgroup. Conceived and written hand-in-hand with education stakeholders, it was printed in 2015 in 10 000 copies.

The geological book: currently, the Beaujolais has no book about its geology. In 2016, the scientific workgroup started the creation a book about the territory's geological history. This book bought together many local stakeholders and is a capital tool to know more about the Beaujolais' complex geology, landscapes, environment and biodiversity.

D.6.3.

■ Professionals and stakeholders' awareness and information

Beyond the actions directed towards pupils and visitors, the Geopark Beaujolais works with and organizes training sessions or visits for professionals



Geopark Beaujolais' discovery map

and partners. In 2015, two educational tours were organized, as well as visits of the geosites, and offered first to the Atouts Beaujolais association (touristic providers' association) in April 2015. Another educational tour for representatives and local development technicians was organized in October 2015, hand in hand with the CAUE, called "Geotour in Beaujolais, working towards a high quality landscape"). Many site visits were also organized, such as the one around the Mount Brouilly, in May 2015, for Beaujolais vineyard Office of tourism. In 2016, the Geopark was introduced and a visit was organized for the association of the Rhône-Alpes region's guides, in February 2016. This training workshop allowed professional guides to be able to talk about the Geopark in their future visits. In the same way, the Geopark Beaujolais was introduced during a Rotary club general meeting, in Villefranche-sur-Saône, in April 2016. Professional training workshops were set up about the knowledge of vineyards in Beaujolais; hand in hand with the SIGALES study group and the Chambre d'Agriculture. Visits of pits and pedological information, as well as conferences were planned.

Eductour (field trip) with the association of touristic operators



Endorsement of the Geopark Beaujolais ambassadors' charter



■ The Geopark Beaujolais is a long considered project that has been shared with all local stakeholders who, for more than twenty years, have committed to protecting and promoting its heritage.

– E.1. DEVELOPING A STRATEGY AND A PROJECT FOR THE TERRITORY

The Geopark label will bring the territory a qualitative recognition, in addition to a real opportunity to develop and reinforce the territories' geotourism. Moreover, the identification, preservation and communication of the geological sites through educational and mediation policies are an important point. Beyond these objectives and the geological theme, the Geopark project in Beaujolais has enabled a new local socio-economic strategy, based on a network of stakeholders and partners. The Beaujolais, in targeting these territorial policies is seeking to become and remain an innovative territory, thanks to its sustainable development ambitions and the involvement of as many people as possible. The Geopark application is transversal and became, in 2012, central to the territory's overall project.

– E.2. BEING INCLUDED IN A NETWORK

The integration of the Beaujolais in the UNESCO Geoparks' network will allow it to exchange with other Geoparks about good practices and during events. It will expand the cooperation and reinforce the Geopark network of geological heritage preservation and communication on a global scale. Since the project was launched, in 2012, the applicant territory of the Geopark Beaujolais has taken part in European and Global conferences in the Geoparks'

network and exchanged about the project and the Beaujolais' geo-heritage. Its participation in the International Intensive Course in the Lesvos Petrified Forest Geopark in June 2016 was an opportunity to spread this network. Its integration in the French Geoparks' network has been a priority since the start of the proceedings: by participating in the French geological society meetings (Geoles meetings, Geo-Inventory conference in Toulouse in 2015...) but also by inviting to the region other French Geoparks speakers to hear them talk about their experience. The Luberon Geopark took part in the Stone festival in Beaujolais in 2015. Further cooperation is evolving. Thus, it is not only a local project, but indeed a collaborative approach meaning to create and officialize a stable network with other territories.

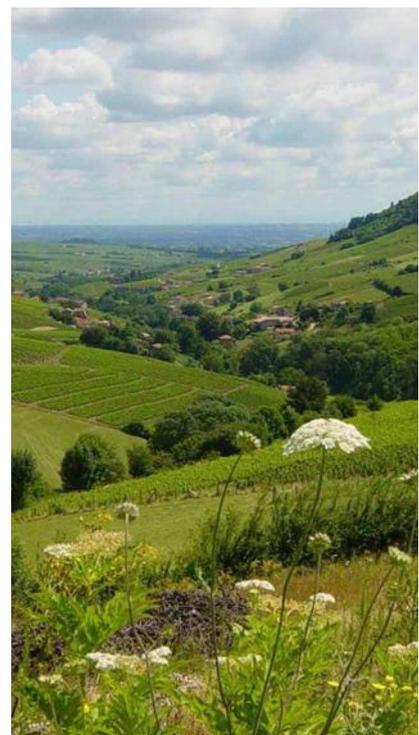
– E.3. REASONS FOR JOINING THE UNESCO GLOBAL GEOPARKS NETWORK

Promotion actions have already been implemented on certain sites and geosites on the territory, as well as the action plan, with local stakeholders' help, and the territory intends to invest in order to implement actions for the territory's development. The UNESCO Global Geopark labeling would confirm the merit of these promotion and protection actions of the Beaujolais' geological heritage and would strengthen local stakeholders' determination to invest in the Geopark's development. Given the enthusiasm that welcomed this project in the territory, a network has already been created: stakeholders took part in the project one way or another some supported the proceedings

and many wanted to know more about the territory's profound identity.

This desire to act as partners will allow, beyond the local community's support, to come up with new projects, on a larger scale. The territory is also involved in a research program thanks to the CIFRE. This thesis, done by Charlotte Besombes under the direction of Romain Lajarge for the PACTE-Territoires laboratory of the Grenoble University, and which will be presented in 2017, deals with the Geopark proceedings, in liaison with the French Geoparks network and with other European Geoparks. Its temporary title is: « From geological heritage to territorial resources in action ».

Lastly, the Beaujolais' singular identity, thanks to its geological diversity and the riches of the territory's history and life would be an interesting asset. Indeed, it is different from many other Geoparks, especially from the French ones, thanks to the use and appropriation of the geological richness by the residents, which can express their interest in their internationally famous vineyards. This specificity gives our territory its wealth and singularity, and will give it, we hope, a place in the list of prestigious sites that are included in the UNESCO Global Geoparks list.





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