GEOPARQUE CAMINHOS DOS CÂNIONS DO SUL

APPLICATION DOSSIER
FOR UNESCO GLOBAL GEOPARKS

BRAZIL . **2019** . **NOVEMBER**

CONTENTS

A. GENERAL INFORMATION

A.1 NAME OF THE PROPOSED AUGGP

Portuguese name: Geoparque Caminhos dos Cânions do Sul

English name: Caminhos dos Cânions do Sul Geopark

Caminhos dos Cânions do Sul Geopark is the name given to the area that is candidate to become an UNESCO Global Geopark. Its majestic scenery includes the escarpments of the Serra Geral Formation, composed of volcanic rocks sculpted by fluvial channels through millions of years, which also formed its famous Canyons that run towards the coastal plains of the Santa Catarina and Rio Grande do Sul states. The canyons make this Southern region of Brazil the national reference when it comes to these beautiful natural structures. The area of the Caminhos dos Cânions do Sul Aspiring Geopark (CCSAG) also displays numerous natural costal features, created by the winds and sea level variations throughout the last thousand years. These include the aeolian dunes of the Itapeva State Park, lagoons such as the Violão Lagoon, and the beautiful beaches of the Torres county that awe their visitors through the interaction between their great rock walls and sea waves.

GEOPARQUE
CAMINHOS DOS
CÂNIONS DO SUL

Figure 01 - CCSAG Logotype

A.2 LOCATION

The area of the Caminhos dos Cânions do Sul Aspiring Geopark (CCSAG) is located in the southern region of Brazil, in the northeastern portion of the Rio Grande do Sul state and the southeastern border of the Santa Catarina state. It is composed of seven counties, with 4 belonging to Santa Catarina and 3 to Rio Grande do Sul *(fig. 02)*.

Geographical coordinates:

29º 11' 51.85" S ;

49º 57' 08.03" W

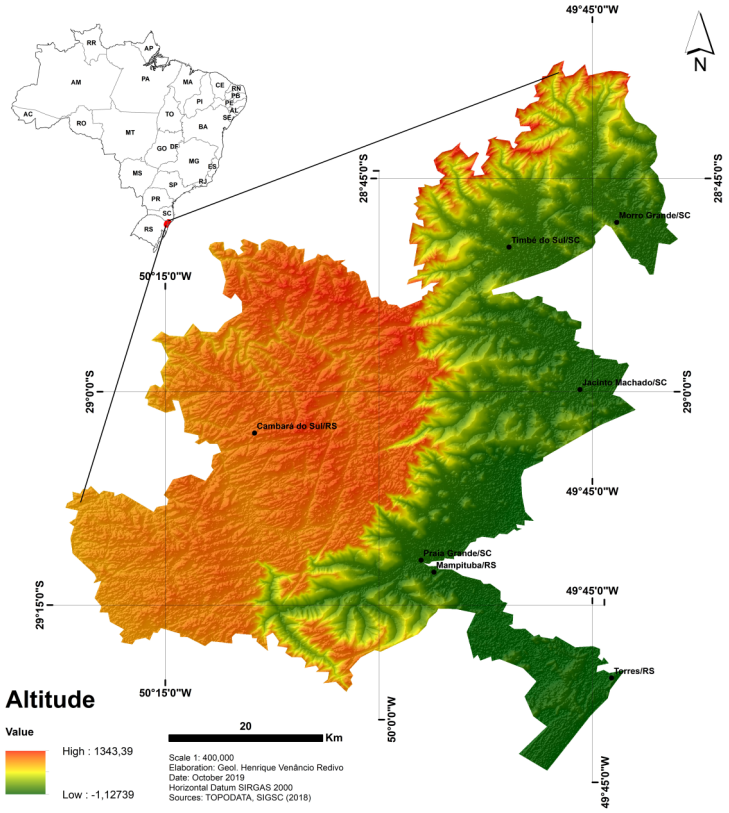


Figure 02 - Altimetric map of the geoparks area

A.3 SURFACE AREA (km^2)

The total area of the territory is 2.830,9 km^2. It is delimited by the political / geographical limits of the counties *(table 01)*.

CITY / STATE	AREA / HECTARES
MORRO GRANDE / SC	260,315
TIMBÉ DO SUL / SC	328,509
JACINTO MACHADO / SC	430,704
PRAIA GRANDE / SC	284,360
CAMBARÁ DO SUL / RS	1.207,916
MAMPITUBA / RS	157,848
TORRES / RS	161,182
TOTAL (ha)	2.830,834

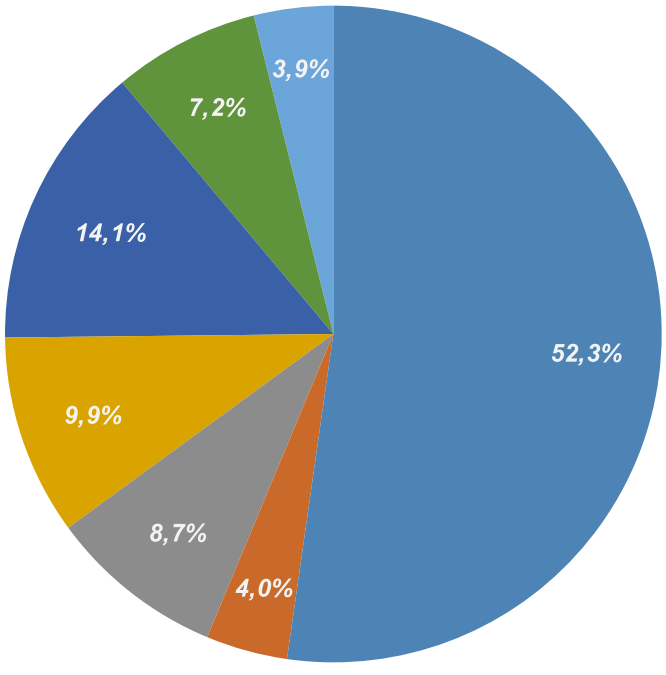
Table 1 - Areas of the municipalities of the Territory (Instituto Brasileiro de Geografia e Estatística - IBGE)

A.4 SHORT PHYSICAL AND HUMAN GEOGRAPHY CHARACTERISTICS

The Caminhos dos Cânions do Sul Aspiring Geopark is situated between seven counties of the Santa Catarina and Rio Grande do Sul states. According to statistics from IBGE, the estimated population of this region in 2019 is of 74.120 inhabitant, which accounts for 0.40% of the entire population of the two states.

From this total, less than 70% of the population is located in urban areas, with the rest living in the rural portion of the territory. This proportion is likely related to the fact that Torres, which contains 52.26% of the entire population of the region, has around 96% of its inhabitants living in its urban area.

Population composition of the territtory



COUNTY	POPULATION (IBGE, 2019)	% OF TERRITORY
TORRES	38.732	52,26
MAMPITUBA	2981	4,02
CAMBARÁ DO SUL	6.431	8,68
PRAIA GRANDE	7.319	9,87
JACINTO MACHADO	10.416	14,05
TIMBÉ DO SUL	5.348	7,22
MORRO GRANDE	2.893	3,90
Total	**74.120**	**100,00**

Table 2 - Population composition of the territory

A.5 ORGANIZATION IN CHARGE AND MANAGEMENT STRUCTURE

The organization responsible for the management of the Caminhos dos Cânions do Sul aspiring Geopark is the "Consórcio Intermunicipal Caminhos dos Cânions do Sul" (Intercounty Consortium Caminhos dos Cânions do Sul), created in 2017, which encompasses seven counties from two states of the federation, with the aim of strengthening the territorial management of the area, and promoting mutual collaboration between public and private institutions and regional, national and international agencies in order to achieve a common goal. The Consortium is an institution designated as a non-profit public Corporation in the form of a public association.

A.6 CONTACT PERSON

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A.7 WEBSITE

www.canionsdosul.org

A.8 SOCIAL MEDIA

Facebook: https://www.facebook.com/CanionsdoSul

Instagram: https://www.instagram.com/geoparquecanionsdosul/

Youtube: https://www.youtube.com/GeoparqueCânionsdoSul

B. DOCUMENTS CHECK LIST

• **Expression of interest (sent ahead of the application by 1 July)**	✓
• **Application dossier**	✓
• **Self-evaluation form**	✓
→ **Annex 1:** Self-evaluation document	✓
→ **Annex 2:** An additional and separate copy of section E 1.1	✓
→ **Annex 3:** An explicit endorsement of any relevant local and regional authorities and a letter of support from the National Commission for UNESCO or the government body in charge of relations with UNESCO	✓
→ **Annex 4:** A large-scale map of the aUGGp	✓
→ **Annex 5:** One-page geological and geographic summary	✓
→ **Annex 6:** Complete bibliography of the area in Earth Sciences highlighting international publications	✓
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C. LOCATION OF THE AREA

The area of the Caminhos dos Cânions do Sul Aspiring Geopark (CCSAG) is located in the southern region of Brazil, in the northeastern portion of the Rio Grande do Sul state and the southeastern border of the Santa Catarina state. It is composed of seven counties, with 4 belonging to Santa Catarina and 3 to Rio Grande do Sul *(fig. 03)*.

The estimated distance between the Geopark (CCSAG) and Florianópolis, which is the capital of Santa Catarina, is 210 km, and between it and Porto Alegre, the capital of Rio Grande do Sul, is 184 km. The main road accesses are through the BR-101 highway coming from both capitals, moving southward through Santa Catarina's coast and northward through Rio Grande do Sul's coast. For those coming from western areas, access is through the BR-285 highway, coming from the Vacaria/RS county, which is approximately 105 km from São José dos Ausentes/RS. It is important to note that, currently, the BR-285 highway is closed while the government paves the Serra da Rocinha, an area that connects the São José dos Ausentes and Timbé do Sul counties. A possible alternative for those coming from the west is the RS-486, also called the Sun Route, which comes from the Caxias do Sul county, from which one can take the RS-020 highway to the Cambará do Sul county. Those coming from the southern regions of the Rio Grande do Sul state can take the RS-389, also called the Sea Highway, which connects Torres to the other cities of the northern coast of Rio Grande do Sul, making it an important access point for them, as during summer, they receive a large amount of tourists not only from all over the state, but also from Uruguay and Argentina.

Shape files data attached

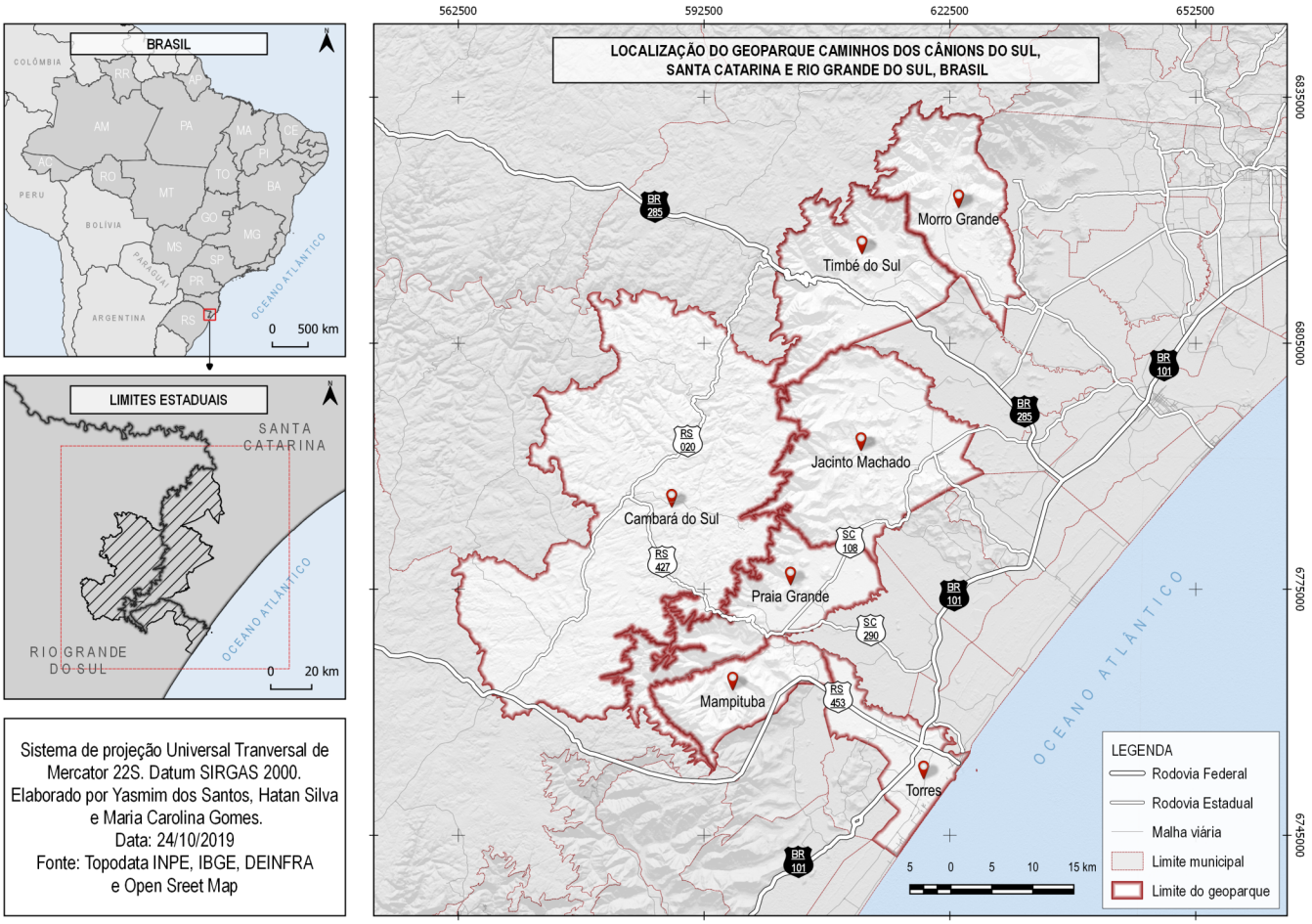

Figure 03 - CCSAG Location

D. MAIN GEOLOGICAL HIGHLIGHT AND OTHER ELEMENTS

The Serra Geral Formation escarpments, already famous for its several appearances in movies and TV shows, with their imposing volcanic rocks and their alluvial fan systems carved by intertwined river channels have, during millions of years, formed the Canyons, considered the largest in South America, as well as the entire dune field and coastal deposits, lagoons, everglades, swamps, the Atlantic Rainforest, rocky shores and a small island used by fur seals and other marine animals to rest. All these grouped elements make the territory of the Aspiring Geopark a unique and unforgettable place.

This same territory has ten Conservation Units legally established in the territory, which is inserted in the Atlantic Forest Biosphere Reserve, a condition which favors the preservation and conservation of the rich heritage of local biodiversity, conditioned by the unique geodiversity of the region. Another highlight of the territory is the large amount of paleoburrows, biostructures that have impressive dimensions and conservation.

All these conditions, the sea and the mountain range, have ensured the territory's vocation for tourism, in the segments of: ecotourism, nature tourism, experience tourism and adventure tourism and, more recently, geotourism, introduced by the Aspirant Geopark, a segment relatively unknown in Brazil; the region is now developing this over time. It has good infrastructure, with paved access roads, served by an extensive network of lodgings, restaurants, tourism agencies, tour guides and local drivers, in order to properly receive the visitors. The proposal to be a UNESCO Global Geopark has had a very positive and significant impact in recent years. It is creating interest inside and outside the community, and actions related to the Aspiring Geopark are gaining impressive prominence in regional and even national media, generating much visibility for the territory.

E. VERIFICATION OF UNESCO GLOBAL GEOPARK CRITERIA

E.1 TERRITORY

E.1.1 Geological heritage and conservation

E.1.1.1 General geological description of the aUGGp

The first geological surveys in the area of the territory with the aim of recognizing and classifying it as an UNESCO Geopark were conducted by the Brazilian Geological Service (CPRM), between the years of 2010 and 2011. Thus, much of the scientific knowledge about the region comes from their reports.

The territory of the Caminhos dos Cânions do Sul Aspiring Geopark (CCSAG) is located in the southeastern margin of the South-American Platform, in the southeastern portion of the Geological Province known as the Paraná Sedimentary Basin (Almeida et al., 1977), which covers an area of approximately 1.6 million km2 distributed between Paraguay, Argentina, Uruguay and Brazil, extending in the latter through the states of Minas Gerais, Mato Grosso, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul.

The Paraná Basin is an intracontinental cratonic Paleozoic basin, whose sedimentary and volcanic record is around 7,000 meters thick. This Basin corresponds to the southamerican portion of a great geological unit that covered the Gondwana Supercontinent, known as the Paraná-Etendeka Basin.

This volcano-sedimentary record is comprised by rocks with ages that range from the Ordovician to the Cretaceous, and can be divided into six Supersequences (Milani, 1997): (i) Rio Ivaí (Neo-Ordovician to Eo-Silurian); (ii) Paraná (Devonian) ; (iii) Gondwana I (Neo-Carboniferous to Eo-Triassic); (iv) Gondwana II (Meso-Triassic to Neo-Jurassic); (v) Gondwana III (Neo-Jurassic to Eo-Cretaceous); (vi) Bauru (Eo-Cretaceous to Neo-Cretaceous) *(fig. 04)*. These Supersequences represent the stratigraphic evolution of the basin, and the first three contain records of transgressive-regressive cycles related to sea level oscillations. In turn, the latter three supersequences mark the continentalization of the basin, with associated sediments and volcanic rocks. The strata that compose these supersequences represent intervals that lasted a few dozen million years.

The area of the CCSAG contains the final filling episodes of these basins, which are related to the break-up of the Gondwana Supercontinent (Widner et al., 2009), locally represented by the Rio do Rasto, Botucatu and Serra Geral formations (CPRM).

In Southern Brazil, the Paraná Basin contains a record of the transition between the Permian and Triassic periods. The sedimentation associated with this passage is related to the deposition of progradational successions that represented the final stages of the highstand system tract from Supersequence Gondwana I (Milani, 1997). The Rio do Rasto Formation is characterized by a general tendency towards the continentalization of its depositional systems (Lavina, 1991). The succession of coastal sediments gradually turns into lacustrine, fluvial-deltaic and eolian deposits.

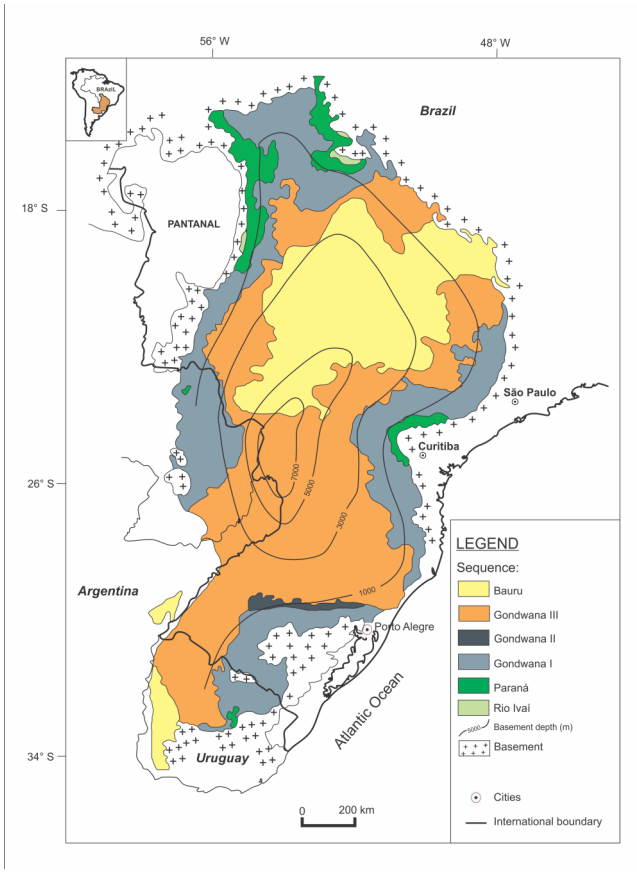

Figura 04 - Geological map of Paraná Basin showing its Supersequences and basement depth in Brazil, Uruguay, Argentina and Paraguay (modified from Milani, 2004).

From the Jurassic onwards, a large desert developed in the middle of the Gondwana Supercontinent, in which extensive dune fields were accumulated through wind action. This desert is today represented by the thick sandstone packages of the Botucatu Formation, which holds an important subterranean water reservoir, denominated the Guarani Aquifer (CPRM, 2011).

In the beginning of the Cretaceous, approximately 135 million years ago, the break-up of the Gondwana Supercontinent started in earnest with the beginning of the evolution of the South Atlantic Ocean. The crust was subjected to a colossal rifting process, associated to powerful magmatic events. Basaltic lava packages up to 2,000 meters thick were generated, which today make up the Serra Geral Formation.

The basement structures of the Paraná Basin were reactivated due to the fragmentation process of the Gondwana Supercontinent, and acted as conduits for igneous injections that cut through the Paleozoic units of the basin, creating diques, sills, and, wherever they hit the surface, large magmatic spills (Milani et al., 2007). In addition, the tectonic reactivation of pre-existing structures also results in the creation of arcs and flexures, with the most prominent structures being located in the eastern and southeastern borders of the Paraná Basin among them the "Arco de Ponta Grossa" (Ponta Grossa Arc), the "Sinclinal de Torres" (Torres' Synclinal), and the "Arco de Rio Grande" (Rio Grande Arc) (Almeida, 1983; Zalán, 1990; Machado et al, 2012). The Serra Geral Formation represents the magmatic event that originated one of the largest flood basalt provinces of the planet, the Paraná-Etendeka Igneous Province. The predominantly basic magmatism is comprised by a succession of flows and intrusive bodies around 1,700 meters thick. Over 90% of its area is made of basic rocks, followed by intermediate, andesitic rocks (7%) and acidic rocks such as rhyolites and riodacites (3%) which can be seen in the foothills of Serra Geral, particularly next to the Aparados da Serra area (Wildner et al., 2009). The different composition of the magmatic deposits of the territory strongly controlled the erosion that later took place and formed the canyons of the region.

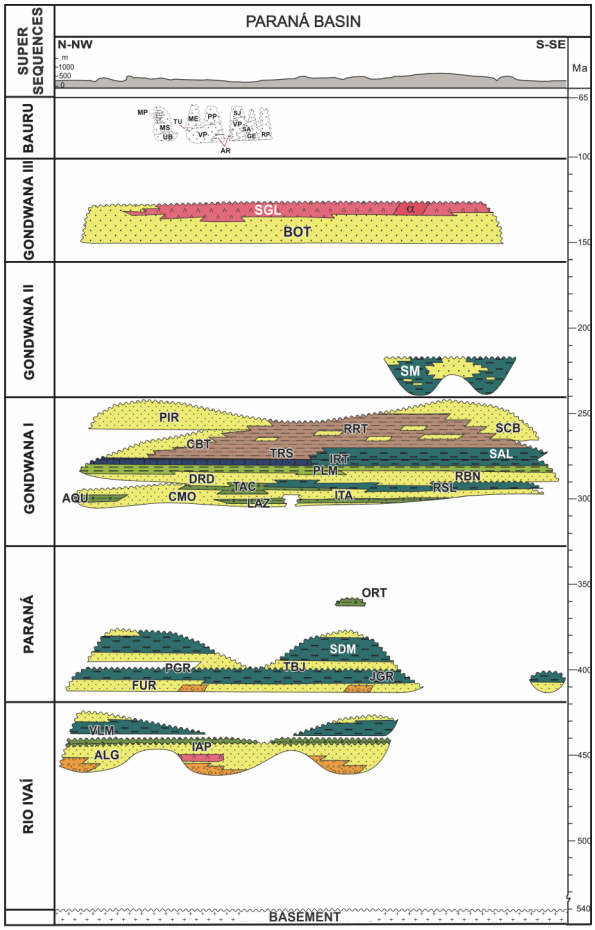

Figure 05 - Stratigraphic Column of Paraná Basin

The geodiversity of the territory can be observed in the geological map of the CCSAG *(fig. 06)*. Below are described the main geological units identified in the territory, organized according to their age, from oldest to newest. The sedimentary units are displayed in the stratigraphic column.

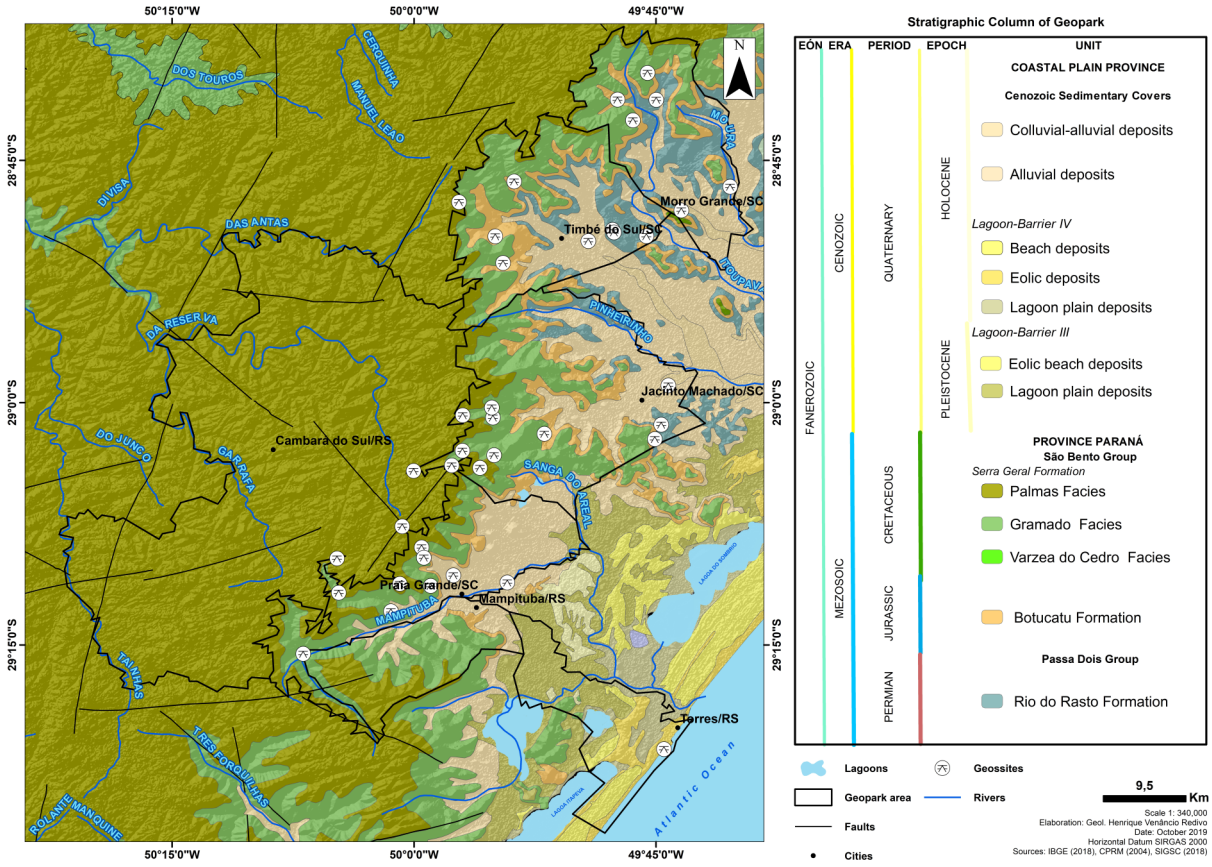

Figure 06 - Geological map of the Southern Canyons Geopark region including identification of geosites

Rio do Rastro Formation

The Rio do Rastro Formation belongs to the Gondwana I Supersequence, of Permian–Triassic age. Its sediments were deposited during the continentalization of the depositional systems of the Paraná Basin (Lavina, 1991; Milani, 1997). The Formation as classified by Gordon Jr. (1947) is defined at the base by the Serrinha Member and at the top by the Morro Pelado Member. Its depositional environments were the transition between coastal plains and deltaic and aeonian deposits.

Stratigraphically, the Rio do Rastro Formation is located in the upper portion of the Passa Dois Group, and is limited at the base and top by transitional contacts with, respectively, the Teresina and Pirambóia formations. Visually, the formation shows an intercalation between tabular and lenticular sandstones and shales. The members of the formation can be easily distinguished due to the differences in the geometry of the sand packages and by the coloration of their shales, that vary from grey (Serrinha Member) to purple and red (Morro Pelado Member) (Warren et al., 2008).

The Serrinha Member is between 90 to 130 m thick, and is composed of fine, well-sorted sandstones intercalated with greenish-grey, brown, bordeaux, and red siltstones and mudstones, with local occurrences of calcareous marl horizons or lens. The sandstones and siltstones display cross, wavy, climbing, and flaser bedding, though they can also sometimes be massive. The shale layers show parallel, wavy, and linsen lamination. Cross-bedding such as hummocky and sawalley are intercalated with fine deposits and heterolithic layers (Warren et al., 2008). Siltstones and mudstones display advanced spheroid disaggregation, which can be used to easily identify this member. Schneider et al. (1974) mentions that the different lithologies of this member were the result of the progradation of clastic sediments from tide plains, characterizing a transitional environment between the shallow water deposits of the Teresina Formation and the continental ones from the Morro Pelado Member. Aboarrage & Lopes (1986) consider the depositional environment for this member to be a transitional marine one. The progressively redder colours of Serrinha clearly indicate oxidizing environmental conditions towards the top of the unit.

The Morro Pelado Member displays a transitional contact with the Serrinha Member, and is made of lens, lobes and tabular layers of fine sandstones, laterally intercalated with red siltstones and mudstones. These packages can be between 80 and 150 m thick, and their colours vary between green, chocolate, yellow and white. The sandstone packages can be decimetric to metric and their main sedimentary structures are trough cross-bedding, and planar-parallel and cross lamination (Warren et al., 2008).

The depositional environment of this member is considered by Schneider et al. (1974) as strictly continental, with lacustrine and alluvial plain sediments covered by sand dunes under arid climatic conditions. Aboarrage & Lopes (1986) consider this member as having been deposited under a fluvial-deltaic environment.

The deposition of the Rio do Rastro Formation is attributed to an initially shallow marine environment (supra to infratidal) that transitioned to coastal plain deposits (Serrinha Member) and, finally, to a fluvio-deltaic depositional environment (Morro Pelado Member)

Regarding its fossiliferous content, this formation is known mainly for its pelecipods, conchostraca, palynomorphs, plant fragments, and the amphibian subclass Labyrinthodontia. Leaf and stem impressions were described by Bortoluzzi (1975), who identified the specimens "Dichophyllites" and " Paracalamites", and by Klepzig (1978), who described "Schizoneura", "Paracalamites", "Dizeugotheca", "Pecopteris", "Neoggerathiopsis" and "Glossopteris".

White (1908) mentioned the presence of Scaphonix in the sediments of the Rio do Rasto formation, discovered by Jango Fischer in 1902 in Santa Maria, Rio Grande do Sul. These fossils place the formation between the Upper Permian (top of the Tatarian stage) and the Lower Triassic (Anisian stage). Stratigraphically above the Rio do Rasto Formation is the Botucatu Formation, with the contact between both formations being an erosive discordance *(fig. 07 and 08)*.

Figure 07 - Disconformity between Rio do Rastro Formation and Basaltic rocks

Figure 08 - Mineral extraction from sediments from the Rio do Rastro formation.

Botucatu Formation

The Botucatu Formation encompasses an area of approximately 1.6 million km2, and can be observed not only in Brazil but also Paraguay, Argentina and Uruguay, with sediment packages between 80 and 400 m (Milani, 1997). This formation is characterized by large cross-bedded strata (1-30 m), which correspond to the residual deposits of aeolian dunes (Almeida, 1954; Scherer, 2002).

The sedimentary rocks of the Botucatu Formation correspond to the development of a desertic environment over the region. The lithology of this formation is composed of pink quartz sandstones, fine to medium granulometry, and with round, opaque grains. Among the aeolian deposits, there are conglomeratic sandstone deposits that were placed there by inundations, in addition to very coarse sandstones defined as aeolian sand sheets (Soares, 1975; Almeida & Melo, 1981; Scherer, 2002) *(fig. 09)*.

This formation was deposited between the Upper Jurassic and Lower Cretaceous, based on the ichnofossils found in the area (Bonaparte, 1996). The top of the Botucatu Formation is limited by the volcanic rocks of the Serra Geral Formation. Due to the

fact that sand lens can be seen between different magmatic flows, it is suggested that the aeolian system of the region persisted throughout the initial volcanism, leading to the creation of lava-sediment interaction features (Milani et al., 1998; Michelin, 2014).

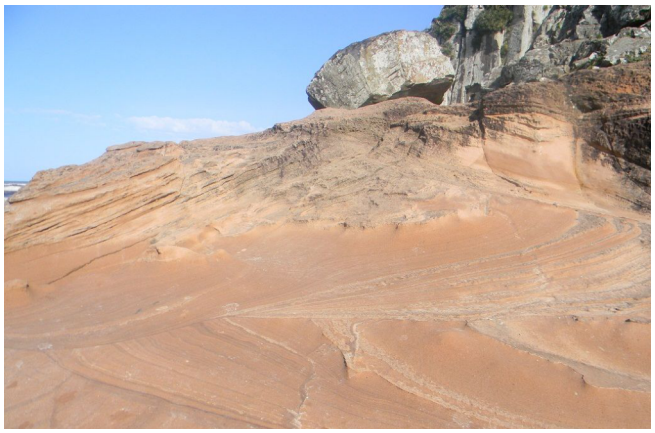

Figure 09 - Botucatu Sandstone in Guarita Geosite.

Peperites

Peperites are classified as volcanoclastic rocks, under the same subgroup that contains pyroclastic, epiclastic and autoclastic rocks, and hyaloclastites (Rawcliffe, 2016).

In this context, peperites are heterogenous rocks formed mainly in situ in the form of magma fragments that mixed with usually humid, unconsolidated sediments. They can be formed in a variety of paleoenvironments in which there is the contemporary occurrence of magmatism and sedimentation (White et al. 2000; Skilling et al. 2002; White & Houghton 2006; Rawcliffe, 2016). The term is essentially genetic, though it is also be used to describe volcanic breccia with a sedimentary matrix (Fischer 1960; Pettijohn 1975; McPhie et al.,1993; Reis 2013; Rios, 2017).

It is important to highlight that a number of factors can change the final characteristics of the peperite, such as the rheology of the magma, its composition, volatile content, flow speed/magma injection, rheology of the sediment, grain size, selection, permeability and structure, magma/water mix ratio, total volume of the magma-sediment mix, magma-sediment mix ratio, total volume of heated water in the pores of the sediment, confining pressure, and the nature of local and regional aspects (Busby-Spera & White 1987; Jerram & Stollhofen 2002; Skilling et al., 2002; Zimanowski & Büttner 2002; Petry et al., 2007; Waichel et al., 2007; Hole et al., 2013).

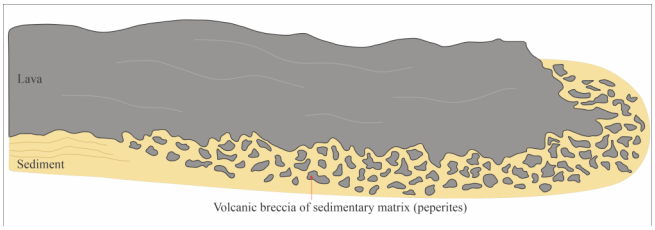

Figure 10 - Volcanic breccias of sedimentary matrix (peperites) generating block clasts. The flow movement of the front and base remobilizes and mixes the igneous clasts with the sediments. Modified from Rawcliffe (2016).

In the CCSAG area, the peperite matrix is composed by the same sand fraction seen in the sandstones of the region, which indicates that they are likely prevenient from the Botucatu Formation. The reddish coloration of the matrix that is in contact with its clasts is created due to a higher presence of iron oxides. The igneous clasts found inside the peperites vary greatly in size, from a few millimetres in length up to 50 cm, and correspond to vesicular or amygdaloidal basalts from the top or front of the flows, with vitreous borders due to rapid cooling. The different morphologies found in the igneous clasts vary from angular to fluidal (Skilling et al., 2002), evidencing that during its formation process, parts of the magma were still plastic, while others were already cooling down. In addition to the sand injection process, described as clastic dike, there is also an auto-breccia process that occurs during cooldown which is important in the formation of the peperites, which is responsible for the creation of the largest packages (> 1 m thick). In this case, the traction of the front and base of the magmatic flow is responsible for the remobilization and mixing of igneous clasts with the available unconsolidated sediments *(fig. 10 and 11)*.

Figure 11 - Type of occurrence of peperites

Serra Geral Formation

The rocks belonging to this formation are the result of intense fissure eruptions related to the break-up of the Gondwana during the Lower Cretaceous, creating one of the largest basalt provinces on the planet (Zalán et al., 1990; Milani et al., 1998; Melfi et al., 1988) *(fig. 12 and 13)*

The name Serra Geral was given by White (1906) for the magmatic province related to the magmatic flows and intrusions that cover an area of approximately 917,000 km2, with a volume of nearly 600,000 km3 (Frank et al., 2009) and a thickness of around 2,000 m, covering the central-southern regions of Brazil and its borders with Paraguay, Uruguay and Argentina. This unit is composed predominately of basalts and andesite-basalts of tholeiitic affinity, in contrast to the rhyolites and riodacites that can be seen in the Aparados da Serra region, and characterize a bimodal lithological association (basalt – rhyolite) (Wildner, 2004).

The compositional variations, geochronological data, textural characteristics, and the disposition of the flows and intrusive rocks of the basin allowed for the classification of nine distinct facies for the Serra Geral magmatism (Wildner et al., 2004). Among these, six are related to mafic magmatism (facies Gramado, Paranápanema, Pitanga, Esmeralda, Campo Erê and Alegrete) and three to intermediate to felsic magmatism (facies Palmas, Chapecó e Várzea do Cedro). From these, we will describe the Gramado, Palmas and Várzea do Cedro facies, in addition to the sedimentation related to the Serra Geral Formation, as these are the units present in the Aparados da Serra region.

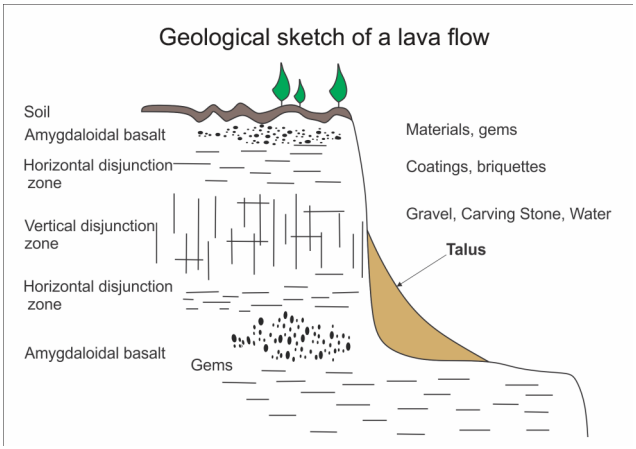

Figure 12 - Geological section commonly found in the Serra Geral Formation flow context.

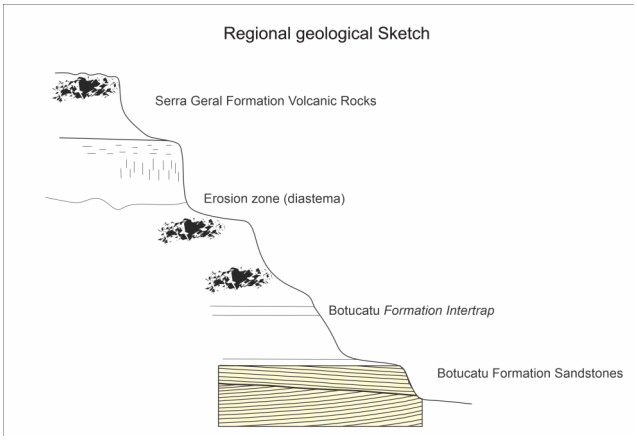

Figure 13 - Geological section exemplifying the transition from Botucatu Formation sandstones overlapped by Serra Geral Formation lava flows.Sand intertraps are visible between both formations trapped by the flows.

Gramado Facies

This facies has its type section spread throughout the southern escarpment of the Serra Geral, at the base of Aparados da Serra. It refers to a group of magmatic flows that represent the first volcanic events over the sands of the Botucatu Desert, amounting to a package around 300 m thick. These events had little lateral dispersion, and are frequently intercalated with sand layers, due to the fact that they were confined to inderdune spaces and the rugosity of the paleorelief that existed at the beginning of these events.

The intercalation between the desert environment and the volcanic flows are evidenced by the sandstone layers classified as intertraps. The period after the end of the development of the desert and the start of the volcanic events is characterized by the coalescence between magma flows, which mark the end of the filling of the basin.

The rocks of this facies are massive basalt flows, between 15 and 35 m thick, frequently showing flow textures, vesicular zones that are well-developed at the top and incipient at the base, a central portion of granular, homogenous rock, well-developed columnar disjunction, microphaneritic texture, compact, and of a dark grey to greenish-grey coloration. It is common for the vesicular zones to be filled by zeolites, carbonates, and apophyllite (Wildner, 2004).

Palmas Facies

These facies are characterized by being the thickest lava flows in the entire Serra Geral, with each flow reaching up to 80 m in thickness. Its basal contact shows an incipient and irregular tabular disjunction, its central portion is well-developed, massive, and shows a diffuse columnar disjunction, and its thick upper portion displays an extremely well-developed tabular disjunction.

The magmatic flows are predominantly acidic (riodacites), composed by light-grey to white mesocratic rocks, microphaneritic, with a predominance of vitreous matrix in which feldspar and clinopyroxene crystallites are immersed. Vitrification processes created spherulitic arranges that give the rocks a mottled aspect, known as salt-and-pepper texture, which is typical of this facies.

In the type section, which the Estrada do Sol route that connects Caxias do Sul to Tainhas, the lavas of the Palmas facies are located directly above the Gramado basalts, with the contact between the two facies being erosive, responsible for the generation of thick volcanogenic sedimentary deposits and of a paleorelief formed by fluvial channels that cut through conglomerate and plateau horizons. These sediments reveal the existence of temporal hiatuses in the transition between these two types of magmatism (Wildner, 2004).

Várzea de Cedro Facies

This facies is characterized by thin flows with small lateral extension, composed essentially of black coloured vitreous lavas, with a greasy glow and resinous aspect, characteristic of a pitchstone. They make very poor, stony soils, forming aligned ridges with a ruiniform aspect.

Lithologically, characteristics related to vitreous rocks are common for this facies, such as conchoidal fracturing, forming a perlitic texture, which is sometimes nucleated in microglomeroporphyritic arrangements of feldspars, pigeonite clinopyroxenes, and opaque minerals. The vesicular zones are poorly-developed, usually containing elliptical, centimetric geodes filled with milky quartz and/or zoned agate.

Chemically, they correspond to the most acidic portions of the volcanism. Thus, the Palmas Facies was created by the magma with the lowest temperature and greatest viscosity, which led to the development of textures such as heterogenous laminar flows and autobreccias, which are characteristic of a quench crystallization system (Wildner, 2004).

Non-Consolidated Deposits (Quaternary)

The quaternary deposits correspond to the sedimentary build-up from the last 2.58 Ma, related to the two most recent epochs that compose the Quaternary (Pleistocene and Holocene). They are usually composed of unconsolidated to semiconsolidated sediments and are represented by deposits related to the continental system (colluvial, alluvial fan, and fluvial deposits); to the coastal system (lagoon, paludal, aeolian, beach, deltaic, and estuarine deposits); and to the marine system (shallow and deep marine deposits). These deposits can be easily observed in the coastal plain, where they constitute the substrate of a series of ecosystems, including lakes, lagoons, dunes, coastal barriers, coastal plains, beaches, deltas, estuaries, and rocky coasts. The origin, development, and conFiguretion of the deposits are complex and associated to a series of local phenomena, such as the factors that control coastal dynamics (particularly winds, waves, tides, coastal drift, and associated currents); and also to global phenomena, particularly paleoclimatic variations that occurred throughout the Quaternary and the changes in the relative sea level that resulted from them (Villwock et al., 1986; Tomazelli & Villwock, 2000; Villwock et al., 2005).

In the area of the CCSAG, the quaternary deposits are represented, foremost, by sediments accumulated due to processes related to alluvial systems (alluvial fans and fluvial deposits); and associated to the Lagoon-Barrier systems (deposits of systems III and IV). Lagoon-Barrier type systems correspond to a number of sedimentary environment complexes whose origin and evolution are related to the coastal dynamics and variations of the relative sea level that occurred in the last 400 ka (Villwock et al., 1986; Villwock & Tomazelli, 1995). These comprise mostly transgressive dune fields, lakes, lagoons, frontal dunes, beaches, and associated subenvironments. The quaternary deposits can be easily seen in the Morro Grande, Timbé do Sul, Jacinto Machado and Praia Grande counties of Santa Catarina, and especially in the Torres county of Rio Grande do Sul *(fig. 06 - geological map)*.

Alluvial Systems: Alluvial Fan Systems and River Systems

In the area of the CCSAG, the alluvial systems are composed by alluvial fan and fluvial systems, represented by meandering, anastomosed, and rectilinear rivers. Alluvial systems are particularly common in the Morro Grande, Timbé do Sul, Jacinto Machado and Praia Grande counties from Santa Catarina and, subordinately, in the Mampituba county of Rio Grande do Sul *(fig. 06 - geological map)*. The fluvial systems and its correlated deposits can be mainly seen in Praia Grande, geosites G13 and G14, which corresponds to the Rio do Boi (Bull River) and Malacara Canyon, respectively, which are rivers that flow among fractures of the basaltic rocks of the Serra Geral Formation, creating block and rubble deposits. Another important river is the Mampituba, which flows through the entire coastal plain and empties in the Atlantic Ocean, marking the border between the south-southeastern portion of SC and the northeast of RS.

The alluvial fan (or colluvial-alluvial) deposits are sedimentary accumulations usually found in the foothills of mountainous regions. These deposits occupy an expressive portion of the western region of the Coastal Plain of the area, next to the high lands of the Serra Geral volcanism and the sandstones of the Botucatu Formation. The term "alluvial fan" is used to designate alluvial systems in which the drainage pattern is more distributary than tributary, different from typical fluvial systems, which are predominantly tributary (Assine, 2008). The are formed in plains and wide valleys when rivers, originating from nearby high areas, spread out due the way their channels open towards the coast. The topographic gradient decreases from the head to the base of the fan, and its typical vertical succession usually display ascendant granocrescence. Its most proximal portion has deposits that originate from gravitational processes, such as block free-fall and debris-flow (talus, eluvium, and colluvium deposits), that then grade, in its most distal portions, to sediments deposited underwater (fluvial and alluvial deposits). In the Coastal Plain, the establishment of these deposits possibly began at the end of the Neogene, and continue to this day (Tomazelli & Villwock, 2000, 2005). Rivers play a crucial role in the area, sculpting its relief and controlling the distribution of its different environments. The successive stages of fluvial evolution were proposed by Davis (1899), and consist of: youth, maturity, and senility. All these stages can be observed in the area of the aspiring geopark.

Coastal Plain

The Coastal Plain corresponds to an extensive low land area, relatively plain, situated throughout the coastal region. It is composed of a number of different deposits and sedimentary facies, whose origin and evolution are associated with global phenomena and continental, transitional and marine processes. They contain the most complete record of the Cenozoic in the SC and RS states. In the area of the CCSAG, the Coastal Plain can be observed in a small emerged portion of the Pelotas Basin, which, alongside the crystalline and sedimentary rocks of the Paraná Basin near the coast, make up the Coastal Brazilian Province (Almeida et al., 1977; Horn Filho, 2003). The Pelotas Basin is located in the extreme south of the Brazilian Continental Margin (Almeida et al., 1977), and its tectono-stratigraphic evolution is related to the breakup of the Gondwana Supercontinent, which began in the Cretaceous (around 135 Ma) and led to the opening of the South Atlantic Ocean in the Lower Cretaceous.

The sedimentary package that constitutes the Coastal Plain in the region is formed by alluvial fan lagoon-barrier type system deposits. These were developed throughout the Quaternary, particularly in response to changes in the relative sea level controlled by glacioeustatic cycles that occurred in the last 400 ka. Four lagoon-barrier systems are recognized in the coast of RS, with the oldest designated as I, and the most recent, which is still active, designated as IV (Villwock et al., 1986; Villwock & Tomazelli, 1995) *(fig. 14 A)*. These systems correspond to high frequency depositional sequences from the Pleistocene and Holocene epochs. Each system characterizes a maximum post-glacial marine transgression, with the ages of 325 ka (system I), 230 ka (system II), and 125 ka (system III) BP (before present) (Rosa et al., 2017), all accompanied by regressive events. The holocenic system (system IV) was deposited during the last transgressive glacioeustatic cycle that began around 18 ka (Villwock & Tomazelli, 1995). The maximum level reached during the last post-glacial marine transgression occured 5.6 ka ago, which was followed by a slow fall in the relative sea level toward modern values (Angulo et al., 2006).

In the area of the CCSAG, the two most recent lagoon-barrier systems can be observed: system III, which began in the Upper Pleistocene; and system IV, from the Holocene *(fig. 14 B)*. The deposits related to these systems correspond to the youngest, highly dynamic geological features of the complex coastal systems of the region, and include a series of distinct but closely related depositional environments and geomorphological elements of variable origin and evolution. Among these environments, the ones that stand out are the beaches, dunes (subsystems Barrier III and IV), coastal lagoons (subsystems Lagoon III and IV), as well as subsystems and deposits correlated to them, which can be seen in the Torres county (RS) *(fig. 06 - geological map)*.

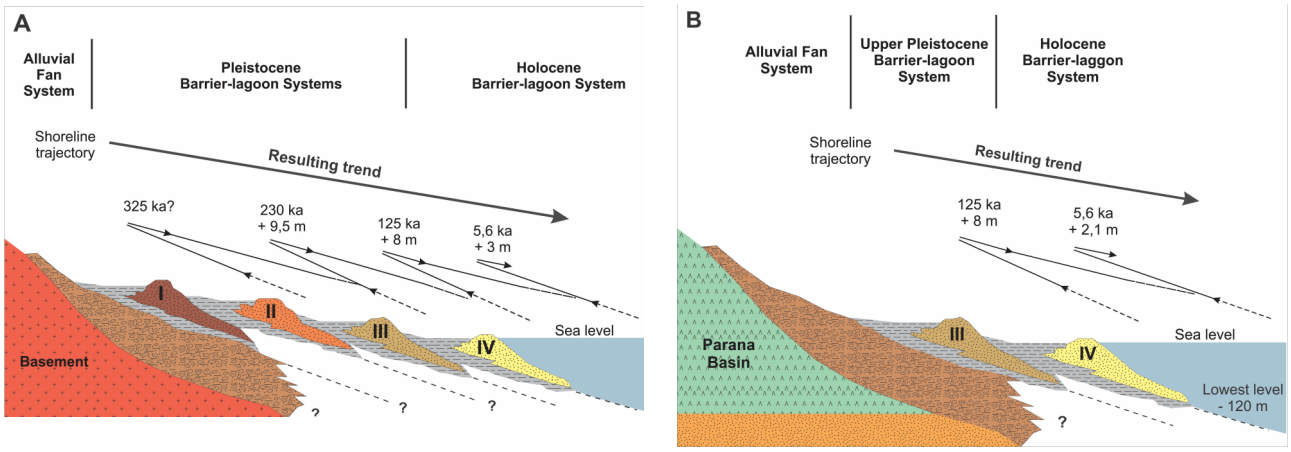

Figure 14 - Schematic profiles displaying shoreline trajectory, Lagoon-Barrier system ages and former maximum sea level altitudes. A) Register profile system from I to IV verified on Coastal Plain of RS between Porto Alegre and coast. B) Adapted Profile for Torres (RS) region, which only deposits related to Lagoon-Barrier III and IV systems are verified. (Modified and adapted by Rosa et al., 2017)

Lagoon III and Lagoon IV Subsystems: Coastal lagoons

Coastal lagoons are shallow water bodies situated in coastal plains and usually separated from the ocean by coastal barriers. The formation and evolution of the lagoons in the area of the CCSAG are typical of lagoon-barrier systems: the display elongated forms and are distributed parallel to the coastline, being separated from the ocean by sandy barriers. The coastal lagoons that stand out in the area are all located in Torres (RS), and consist of the Jacaré Lagoon, which belongs to the subsystem Lagoon **III** (belonging to the Lagoon-Barrier **III** system); and by the Itapeva and Violão lagoons, both belonging to subsystem Lagoon **III** (belonging to the Lagoon-Barrier **IV** system), which developed after the last marine transgressive maximum of the Holocene. The Itapeva Lagoon is considered a Protected Area (PA) as stablished by the Municipal Law nº 3.372/99, with its main aim being the preservation of the northeastern margin of this lagoon, in addition to aiding in the conservation of natural environments, in order to facilitate scientific research and environmental education activities. The lagoon plain deposits associated to the Lagoon **III** subsystem observed in the area *(fig. 06 - geological map)* were formed due to the blockage of ancient lagoon bodies that were stablished in low energy depressions, which correspond to the retrobarrier region of the Barrier **III** subsystem.

Barrier III and Barrier IV Subsystems

The Barrier **III** and **IV** subsystems are composed, generally speaking, of the deposits that evolved in the aeolian and beach systems associated to the Lagoon-Barrier **III** and **IV** systems. Barrier **IV** corresponds to the shore dunes and modern beaches, which are particularly visible in the Torres county (RS).

Coastal Dunes

The aeolian coastal systems are sedimentary environments in which wind is the main geological agent. They occur in coastal areas with a great supply of sand, forming in the rear region of sandy beaches and acting as transitional areas between the continent and the ocean. Three fundamental conditions are needed for the development of aeolian systems: sufficient wind speed, sand-sized sediment availability, and sufficient area for their development. The basic morphological classification of aeolian accumulations are the aeolian dunes, which constitute usually asymmetrical wavy bed shapes. Their conservation is of strategic importance to maintain the balance of the coastal region, as they perform a number of different environmental functions, such as acting as a protective barrier for the continent against sea surfs; stablishing the coastline, being particularly relevant for coastal dynamics and control of the erosive process; being essential in the formation and recharge of aquifers; and is an habitat in which numerous different elements of the fauna and flora live. Active shore dunes correspond to highly dynamic and unstable systems, which are characterized as highly fragile environments. In addition to their great ecological important, aeolian coastal systems also have great landscape and cultural relevance, and thus, their preservation should be encouraged.

In the area of the CCSAG, active shore dunes (subsystem Barrier IV) occur in the Torres county (RS), mainly in the form of frontal dunes interconnected to the Itapeva and Praia Grande beaches; or incorporating transgressive dune fields, such as the one associated to Praia Grande, which is strongly affected by human occupation; and, above all, the Itapeva dune field, which is contains numerous different kinds of dunes, such as transversal, barchan, barchanoid, domic, parabolic, among others. This dune field corresponds to geosite G06 and belongs to the Itapeva State Park, created by the State Decree nº 42,009/2002, with the aim of protecting its ecosystems, and promoting scientific research, environmental education, and ecological tourism activities. Besides the dune field, the park also contains restinga vegetation, dry and flooded fields, peat bogs, and swamps formed over extremely humid soils, created from the blockage of the lagoon environment. Thus, the Itapeva Park contains the crucial role of preserving one of the remnants of the natural landscapes of the coastal plain of the RS. In the western and northern margins of the Itapeva Lagoon and in the rear end of the Itapeva State Park and the urban area of Torres, the Barrier III subsystem can be seen. It can be observed over the base of the Serra Geral escarpments, among the rocks of the Botucatu and Serra Geral formations. In areas next to Torres, Barrier III occurs intercalated with coast deposits that belong to Alluvial Fan systems, indicating that during the last Upper Pleistocene transgressive maximum, the coast line directly reached the Serra Geral escarpment.

Beaches

The modern beaches of the Coastal Plain in the area of the CCSAG can be observed in the Torres county (RS), with the most notable ones being, from northeast to southwest: Praia Grande, between the mouth of the Mampituba River and Prainha – also known as Praia do Meio; Praia da Guarita, located in the Guarita State Park, which is a small cove surrounded by the Furnas and Guarita hills; and the Itapeva Beach, inserted in the Itapeva State Park. The Guarita State Park, or the José Lutzenberger State Park, is one of the most important tourist attractions in Torres, as it shows a unique landscape constituted by the contrast between the cliffs or basaltic towers and the ocean. It was established by State Decrees nº 21.540/1971 and nº 30.377/1981.

The Guarita and Morro do Farol parks correspond to geosite G05, which is composed of sandstone outcrops with preserved structures from the old desert that originated the Botucatu Formation at the base, covered by the basaltic rocks of the Serra Geral Formation, whose origin is connected to the break-up of the Gondwana and separation of the African and South American continents, followed by the opening and evolution of the South Atlantic Ocean; in addition to the peperites formed by the interaction between the sands of the Botucatu Desert with the great basic volcanic flows of the Serra Geral. The Torres county is the only region with rock outcrops in the modern coastline of RS, being also the only place where the volcanic rocks of the Serra Geral Formation reach the coast, in the form of large flows. In addition, the oceanic region of Torres contains the only marine island of the RS, at 1,8 km of the coastline, designated as Ilha dos Lobos. This island is made of basaltic rocks from the Serra Geral Formation, and is a wildlife refuge, containing a variety of shellfish, corals, and marine and terrestrial birds. In addition, it annually receives a population of sea wolves and sea lions during their mating seasons, who also use the area as a resting place when they migrate. It is the smallest Conservation Unit in Brazil.

Geomorphological Characteristics

Regarding the geomorphological evolution of the region, Dantas et al. (2005) describe that it originates from the fragmentation of the Gondwana Supercontinent, and corresponds to the opening of the South Atlantic during the Cretaceous. The entire morphological scenario of the coast of Santa Catarina has a post-Cretaceous history, with the most relevant fact in it being the uplift of the Serra Geral, composed of Gondwana sedimentary rocks of Paleozoic and Mesozoic age. Serra Geral represents a plateau edge escarpment, with its uplift taking place at the end of the Cretaceous and throughout the entire Paleogene and Neogene, creating height differences in the terrain of over 1,000 m.

Alongside the epeirogenic uplift of the coastal range, there was a progressive retreat of the plateau edge escarpment throughout the Cenozoic, which led to the establishment of an extensive coastal plain and the outcropping of Permian sedimentary rocks in the southern coast of Santa Catarina (Dantas et al., 2005). The geomorphological division used in this area of the geopark consists into two morphostructural domains: Paraná Basin, and Cenozoic Sedimentary Basins *(fig.15)*.

.The Paraná Basin morphostructural domain has an area of 158,360 km², in which relief forms were sculpted both on the Paleozoic and Mesozoic sedimentation phases and in the

predominantly effusive Jurassic and Cretaceous phases, which occurred previous to the Paleogene and Neogene cover. This domain encompasses the geomorphological regions of the Araucaria Plateau, Missões Plateau, Campanha Plateau, Centre-Oriental Santa Catarina Plateau, Central Rio Grade do Sul Depression, and Southeastern Santa Catarina Depression. Among these regions, the only that occurs in the area of the CCSAG is the Araucaria Plateau.

The Araucaria Plateau geomorphological region has very heterogenous characteristics, with its relief varying between wide plains to deeply sculpted channels such as the ones seen in Aparados da Serra. It occupies an area of approximately 61,300 km², comprising 38.8% of the Morphostructural domain of the Paraná Basin. This geomorphological unit encompasses four geomorphological units: Campos Gerais Plateau, Serra Geral Escarpment, Serra Geral Plateaus and Dissected Plateau Iguaçu – Uruguai Rivers, which will be discussed below, with the exception of the Dissected Plateau Iguaçu River, which is not present in the area of the geopark (Justus et al., 1986).

The Morphostructural Domain of the Cenozoic Sedimentary Basins correspond to an area of 29,373 km², which encompasses Quaternary sedimentary deposits. This Domain contains the geomorphological regions of the Coastal Plain, characterized by a low and relatively plain relief when compared to the previous domains. Its western, inner portion corresponds to alluvial fan and young fluvial deposits, which are associated to the highlands of Serra Geral, having been formed and developed from continental processes; while towards the extreme east of this Domain, which is the modern coastline, there are the deposits of the Lagoon-Barrier III and IV systems, which are deeply influenced by coast and marine processes, and are represented mainly by lagoon plains, mature and senile fluvial channels, inundation plains, dunes, dune fields, and beaches.

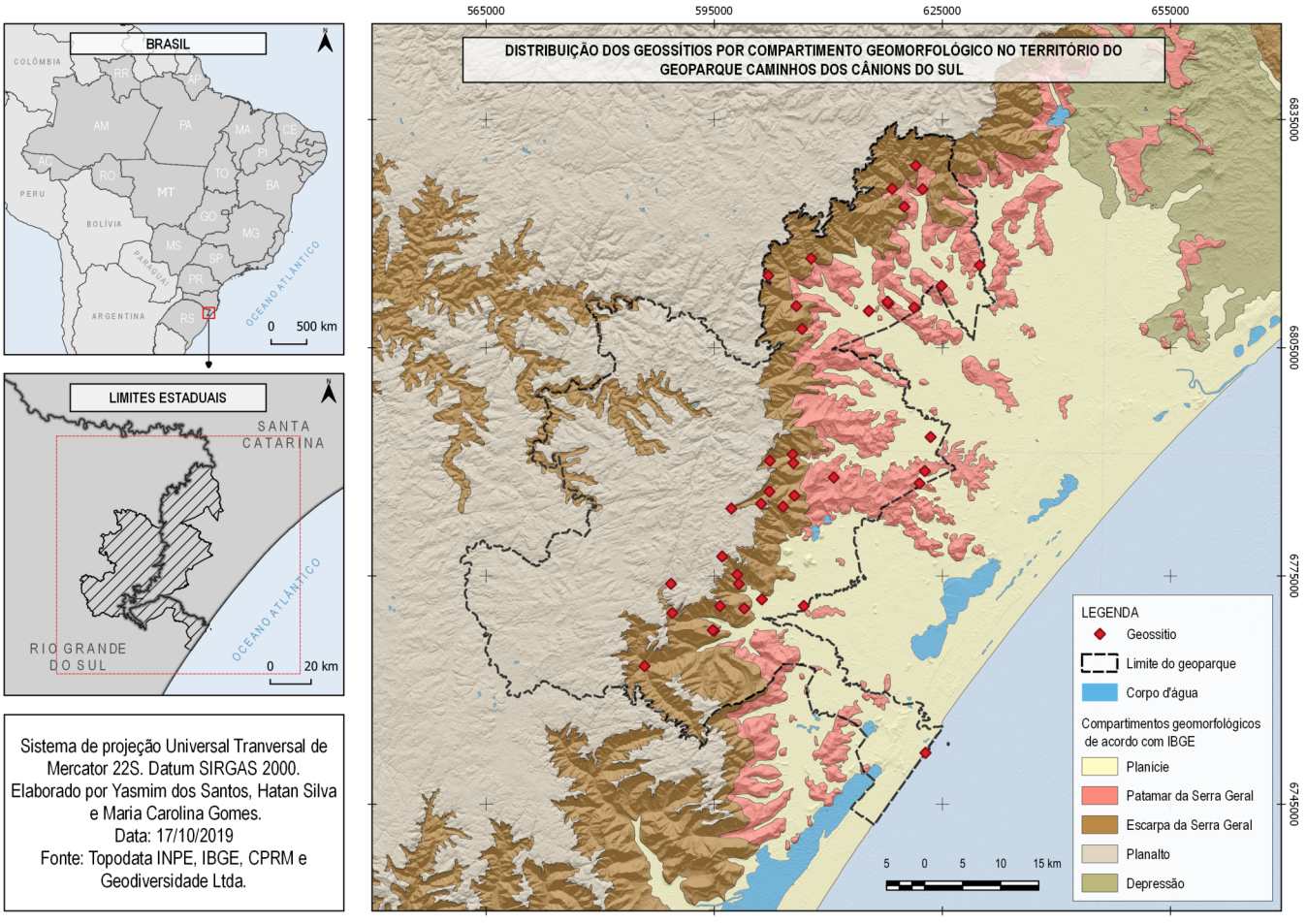

Figure 15 - Geomorphological Map of Geoparks Region

Campos Gerais Plateau Geomorphological Unit

With its immense area of 36,014 km2, this unit represents 58.4% of the Geomorphological Region Araucaria Plateau and 22.7% of the Morphostructural Domain Paraná Basin, and is considered the region with the highest altitudes of this domain. To the west, the area slopes slightly, while to the east, next to the Geomorphological Unit Serra Geral Escarpment, the highest altitudes are seen, between 1,100 and 1,200 meters high (Justus et al., 1986).

This geomorphological unit encompasses small portions of the headwaters of the Araranguá river basin, and is composed of extensive planed areas *(fig. 14)*, due to its current drainage network. The relief patterns are mostly extensive planed areas and wide, smooth hills, which predominate at the top of the Campos Gerais Plateau. The occurrence of plateaus is associated to the acidic volcanic flows, with are more resistant to chemical weathering processes.

The relief forms highlight the evolution of the dissection process, such as the areas that maintained their planar morphology and those in which erosive processes generated slope ruptures or valleys, causing the deposition of old sediments in the planning plain (Oliveira et al., 2015).

The combination of factors such as type of relief and cold climate of the plateau resulted in relatively shallow soils. These also slow down the chemical weathering of rocks and organic matter, creating dark soils rich in organic matter. Though the soil is somewhat fertile, the fact that it is very thin and highly saturated in aluminium, in addition to the low temperatures of the region, hampers agriculture in the area (Ker et al., 1986). The predominant vegetation is characterized by clear fields with the presence of araucaria forests in the form of gallery forests or in "capões" (a typically meridional Brazilian vegetal formation, consisting in a group of arboreous vegetation surrounded by plains) (Teixeira et al., 1986), that is, overall, well preserved. There are small occurrences of reforesting (silviculture) and agriculture.

Figure 16 - Exemplified photo of Planalto dos Campos Gerais geomorphological unit showing wide and smooth hills relief. Location: Canion Fortaleza, Brazil.

Serra Geral Escarpment Geomorphological Unit

This unit refers to the abrupt terminal escarpments of the Campos Gerais Plateau, sculpted from effusive basic rocks, with the difference between its base and top reaching up to a 1,000 m. The abrupt relief forms have fluvial valleys up to 500 m deep, which creates true canyons (Santa Catarina, 1986). Its area covers 13,282 km2, which comprises 21.3% of the Araucaria Plateau Geomorphological Region, and 8.3% of the Paraná Basins Morphostructural Domain (Justus et al., 1986).

This geomorphological unit shows an intense dissection due to the great erosive power of its drainage system, which confirms a powerful retreat process from the front of Serra Geral and a continuous accretion to the area of the alluvial-colluvial plains, being particularly notable the Araranguá and Mampituba rivers. The regressive erosion of the Serra Geral escarpment is not homogenous throughout the region, being more pronounced at the head of the main rivers (CPRM, 2010).

The area of influence of the drainage basin of the Araranguá river corresponds to the section with the greatest retreat of the escarpment, giving it an arc shape (Santa Catarina, 1986; Scheibe et al., 2010). In the border between Santa Catarina and Rio Grande do Sul, one of the rivers that ends in the Mampituba river forms a deep canyon regionally known as Itaimbezinho (Santa Catarina, 1986). It is important to note the powerful structural control exerted by the fracture and/or fault network that influenced the drainage channels of the area (Santa Catarina, 1986), which created trellis and rectangular drainage patterns (Dantas et al., 2005).

This geomorphological unit is mainly characterized by reliefs with high declivity (over 45º) scalloped escarpments, in addition to subvertical walls hundreds of meters high (Dantas et al., 2005) *(fig. 17, 18 and 19)*. These high declivity terrains are composed primarily by shallow soils (Ker et al., 1986). These soils are shallow due to the high vulnerability of the terrain to erosive processes and mass movements, which inhibit their development. The orographic rains, which occur due to the presence of the Serra Geral as a barrier, make it so that the resulting humidity from the frontal systems is retained, leading to an increase in the pluviosity of the area in favour of the plateau located on the leeward side (Dantas et al., 2005). These characteristics are favourable for the development and preservation of montane and submontane tropical forests (Teixeira et al., 1986). However, in low-lying areas, the native vegetation is being deforested for improper banana cultivation and, to a lesser extent, pine and eucalyptus forestry (Goulart & Jacques, 2005).

Figure 17 - Representative image of the contact of the geomorphological units Planalto dos Campos Gerais (the top) and Escarpas da Serra Geral (or Serra Geral). Note that here the relief marked by sub-vertical walls

Figure 18 - Representative image of the contact of the geomorphological units Planalto dos Campos Gerais (the top) and Escarpas da Serra Geral (or Serra Geral). Note that here the relief marked by sub-vertical walls

Figure 19 - Representative photograph of caves and columnar disjunctions from Serra Geral Formation in Coastal Plains region of Torres.

Serra Geral Plateaus Geomorphological Unit

The Serra Geral Plateaus geomorphological unit comprise 6.3% of the lower regions of the Araucaria Plateau, with an area of 3,576 km2, dominated by less steep slopes, where the rupture line of the slope, connected to the erosive escarpment, separates this unit from the Serra Geral Escarpment geomorphological unit (Oliveira et al., 2015). This unit corresponds to the extremities of the Serra Geral escarpment, being limited to the east by the Geomorphological Region Coastal Plains, and to the south by the Geomorphological Depression of the Jacuí River (Justus et al., 1986).

The predominant relief forms of this unit are hills with relatively shallow fluvial valleys, forms derived from strong structural control, and, in a few areas, plains (Justus et al., 1986). The relief is generally elongated and irregular, advancing over the Geomorphological Unit Coastal Plains as true interfluvial spurs, with a few isolated mesas having been created due to the retreat of the escarpment (Santa Catarina, 1986).

In the escarpment region of Aparados da Serra, situated on the eastern border of the unit, there are deep dissection levels and drainage notches that are controlled by the intense structural control of the area. The interfluve of the Araranguá and Mampituba rivers is represented by the dissected and lowered relief forms of the Serra Geral Plateaus unit, which in this area is not connected to Aparados da Serra Geral, advancing eastwards until the western border of the Sombrio Lagoon (Santa Catarina, 1986).

In terms of land use, the continuous increase of farmland is replacing the native seasonal deciduous forests in the Caí and Taquari basins (Justus et al., 1986).

Coastal Plain Geomorphological Unit

This unit corresponds to the morphostructural domain of the sedimentary deposits inserted in the Coastal Plain Province. It is characterized by a continuous, low, usually sandy plain, with a NE – SW elongated rectilinear coastline, represented by wide indentations and large seaward advancements (Santa Catarina, 1986). This geomorphological unit is subdivided into the Internal Coastal Plain and External Coastal Plain deposits (Silva & Leite, 2000).

The Internal Coastal Plain deposits encompass (i) the alluvial or colluvial-alluvial fans located on the hillside of the Araucaria Plateau; (ii) and the Pleistocene and Holocene Lagoon III and IV deposits, located between the colluvial – alluvial deposits to the west and the External Coastal Plain deposits to the east.

Colluvial-alluvial deposits are considered transitional areas, influenced both by the continent and the sea, and are characterized by plain, discontinuous areas that gently slope eastward (Villwock & Tomazelli, 2007). They are mainly controlled by gravitational processes such as creeps and landslides, and are subdivided into colluvial ramps (in which fine-grained material predominates) and talus deposits (in which coarse-grained material predominates). Ramps are significantly more common than fans in these deposits, due to the existence of numerous points of sedimentary influx that favour coalescence, as well as sediment rework and posterior erosion (Villwock & Tomazelli, 2007).

The lagoon deposits are characterized by muddy plain areas with no dissection, where plains and lagoon terraces predominate, in addition to a smaller presence of lakes, dunes, and sandy bars next to lacustrine bodies (Santa Catarina, 1986).

Alluvial deposits occur throughout the drainages associated to fluvial systems, being characterized by channelled and unchanneled torrential flows. The main rivers that empty in the area are the Mampituba, Sanga do Areal, Itoupava, Moura, and Pinheirinho. These rivers have their heads in the escarpment of Serra Geral, pass through the large coastal plain, and empty in lagoons or directly into the Atlantic Ocean. In areas next to the Coastal Plain in the area of the CCSAG, the Sombrio, Itapeva, and Caverá lagoons can be seen. The most representative lagoon is the Itapeva, which is bordered in great part by rocks of the Serra Geral and Botucatu formations.

The External Coastal Plain deposits are aeolian and marine deposits of Barriers III and IV (Santa Catarina, 1986). In terms of morphology, these deposits are composed of aeolian dunes, sandy beaches, and channels that connect the Lagoon subsystem and the open sea. The expressive dune fields partially cover the rocks of the basement, and are related to the reworking of marine terraces (Silva & Leite, 2000).

Barrier III in the area of the CCSAG can be seen at the base of the Serra Geral escarpment. This indicates that during the transgression that created Barrier III, the coastline directly reached the escarpment, which allowed for the formation of caverns due to marine erosion *(fig. 18)*, such as the ones that can been seen next to the Itapeva lagoon to the south of Torres (Villwock & Tomazelli, 2007). Regarding its geomorphology, Barrier III is composed mainly of parabolic dunes that are oriented according to the predominant NE winds (Silva & Leite, 2000).

Barrier IV is characterized by free or vegetated dunes, which can be barchanoid, barchan or transversal, oriented by the predominant NE winds (Silva & Leite, 2000; Villwock & Tomazelli, 2007), in addition to sandy beaches.

In Barrier IV, the Torres promontory stands out, being one of the touristic attractions of the area. It corresponds to three "towers" (Centro, Guarita and Fora) formed out of the effusive rocks of the Serra Geral Formation, which correspond to the only basalt outcrops of the eastern coast of South America (Santa Catarina, 1986). The basalt shows columnar disjunctions and ends in abrupt cliffs next to the ocean *(fig. 20)*.

Figure 20 - Representative photograph of caves and columnar disjunctions from Serra Geral Formation in Coastal Plains region of Torres.

Structural Features

The lithologies that comprise the Paraná Basin have a structural control that is intimately related to the geological processes that led to the break-up of the Gondwana Supercontinent *(fig. 21)*. The Basin developed over a pre-Cambrian basement of igneous and metamorphic rocks from the Tocantins and Matiqueira provinces, in addition to sedimentary rocks of the Camaquã, Itajaí, Castro and Piranhas basins. The current limits of the Paraná Basin are regional structures resulting from the tectonic evolution of this basement, from the end of the Brazilian Cycle to the fragmentation of the Gondwana Supercontinent.

The substrate is made by a combination of cratonic nuclei and mobile marginal belts, whose weakness zones, with the two main directions of N45°-65°W and N50°-70°E, are responsible for the control and tectono-sedimentary development of the Paraná Basin during the Paleozoic. The reactivation of these structures reflects the dispersion of the tectonic efforts originated in the occidental margin of the continent, generated by a convergent system. The Mesozoic evolution of the basin is associated to the break-up of the Gondwana Supercontinent. The intense basaltic magmatism of the Serra Geral Formation marks the latter period.

The fragmentation was accompanied by a great uplift of the entire eastern border of the newly created South American continent and the western border of the African Continent. Thus, the volcanic flows and overlaid rocks were topographically uplifted, leading to the creation of Serra Geral and Serra do Mar (Wildner, 2009). In the coastal area of the Rio Grande do Sul and Santa Catarina, the Atlantic coast began its evolution during the Cretaceous, where great faults parallel to the coastline led to the abatement of several blocks of the newly formed Serra Geral escarpment. These faults are responsible for the existence of the remnants of the original escarpment in different topographic heights. The association between tectonics, erosive processes and relative sea level variations that occurred later are responsible for the current distance between Serra Geral and the beach zones of the Atlantic Ocean.

Numerous tectonic-scale structures can be seen in the Paraná Basin *(fig. 22)* such as the Ponta Grossa Arc, Rio Grande Arc, and the Torres Synclinal. These mega-structures exert great influence in the basin, from delimitating its borders, to the formation of sub-basins during the syn-volcanic and subsidence periods. These tectonic structures developed from the Devonian onwards, and were particularly active from the Triassic to the Jurassic (Fúlfaro et al., 1982).

The Ponta Grossa Arc has an extension of around 600 km, being one of the most notable structures of the region, both due to the amount of it that is exposed, and due to the accentuated curvature of the crystalline basement towards the centre of the basin. There is a dike swarm in the region, which results in important lineaments that create NW-SE magnetic anomalies.

The Rio Grande Arc, situated in Rio Grande do Sul, also exhibits an inflection of the crystalline basement. Between these two arcs there is the Torres Synclinal, a great folded structured with a NW-SE orientation. In this region, staggered faults were develop, which lowered the sediments of the basin, with some blocks being located below sea level (Petri & Fúlfaro, 1983).

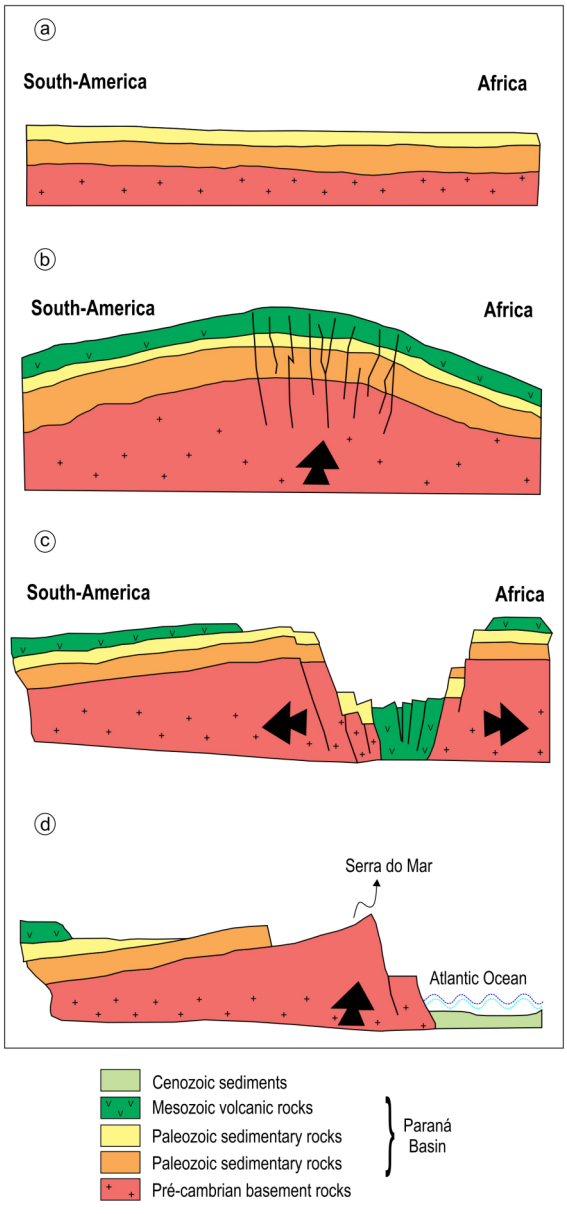

Figure 21 - Rift model for South American and African continents. a) Paleozoic - Gondwana Supercontinent, South America and Africa continents still joined. b) Jurassic - Beginning of continents separation. c) Cretaceous - Rift of Gondwana and beginning Atlantic Ocean formation. d) Current geological-geomorphological profile of the eastern portion of the state of Paraná.

Although the name Torres Synclinal is widely used (Simões et al., 2014; Lima et al., 2012), according to Holz et al. (2006), it has no relation to the actual structural geology of the region. To those authors, the depression between the Rio Grande do Sul and Santa Catarina states where the synclinal is positioned is related to a sheer zone (Torres-Pousadas Lineament – Philipp, 1998) directly connected to an inversion of the paleorelief, which was later inundated by a marine transgression. Thus, the Torres Synclinal was formed by a depression during the Permian, significatively influencing the sedimentation of the region.

In the Serra Geral Formation, the Torres Synclinal is subdivided in three portions (Waichel et al., 2012): a main valley, an intermediate zone, and the southern rise, each with their own stratigraphy and thickness, displaying thus syn-volcanic subsidence processes related to the structural evolution of the synclinal. In this region, five main volcanic episodes were recognized: basic volcanic episode 1, basic volcanic episode 2, acidic volcanic episode 1, basic volcanic episode 3, and acidic volcanic episode 2.

The first basic volcanic episode covered the paleoerg of the Botucatu Formation, preserving the morphology of the dunes. This first episode is constituted mainly by pahoehoe flows. The second basic episode represents the climax, creating pahoehoe flows up to 500 m thick in the main valley. The first episode of acidic volcanism is characterized by exposed domes in the main valley and in the southern rise. The third basic volcanic episode can be seen in the main valley and intermediate area, with pahoehoe and a'a flows. Lastly, the second acidic volcanic episode represents the last volcanism of the region and comprises tabular acidic flows. The contacts between these five volcanic events is smooth, and the absence of paleosoils suggest that the volcanic piles throughout the Torres Synclinal originated from eruptions that took place in a short time interval (Waichel et al., 2012).

In addition to arcs, the NW structures are also represented by tectonic and/or magnetic lineaments (from the Rio Camaquã to the Araxá-Rio Grande lineament). A few of these lineaments, such as Rio Camaquã, Rio Uruguai, Paranápanema, and Araxá-Rio Grande, are oriented parallel with many faults and oceanic lineaments, thus suggesting a sea-continent continuity (Asmus, 1984).

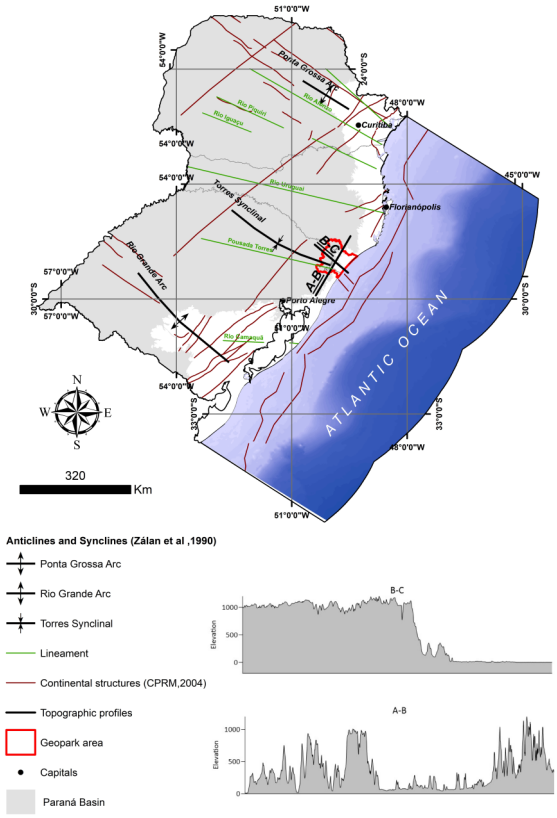

Figure 22 - Structural map displaying main tectonic features found in Paraná Basin. Torres Sinclinal macroform highlighted , which is the main structure of geoparks region, moreover longitudinal and transverse profiles compose its geometry

E.1.1.2 List and description of the geological sites within the proposed Geopark

A total of 37 geosites were mapped. From these, 30 were selected as being the most representative of the local geodiversity *(tab. 03)*. They were chosen based not only on their geological relevance, but also on their educational potential, cultural relevance, and scenic beauty. The lack of scientific studies was another factor in this selection. This selection was made based on quantitative and qualitative methods adapted from Brilha (2005).

The methodology used to select these sites consisted in the following steps: (i) a systematic revision of current scientific papers, government archives, and tourism lists; (ii) interviews with local inhabitants and guides, foresters, scientists, and other professionals that work or live in the territory; and (iii) field trips conducted by the project itself.

Field work in the indicated geosites was based on data previously collected by the Serviço Geológico do Brasil, CPRM (Brazilian Geological Service) (Godoy et al., 2011), in addition to information provided by people that live in the region. After a few field trips, new data was obtained by the company Geodiversidade, which was hired to aid in updating available data and mapping new possible geosites. Field activities were conducted using maps to aid in identifying and locating important information about the area, such as geographic accidents, relief break, structural elements, lithologies, rock outcrops, and others.

	GEOLOGICAL SITES	GEOLOGICAL FEATURES	RELEVANT CONTENT	GEOGRAPHICAL COORDINATES
G01	**Rio do Boi** Praia Grande (SC)	River located between fractures of the basaltic rocks of the Serra Geral Formation. Block and pebble deposits.	Landform	29° 00' 46,28" S 49° 56' 58,09" W
G02	**Morro dos Cabritos** Praia Grande (SC)	Basaltic rock and fluvial deposits outcrop.		29° 11' 8.77" S 50° 0' 54.53" W
G03	**Cachoeira Magia das Águas** Praia Grande (SC)			29° 11' 17.57" S 49° 58' 56.49" W
G04	**Cachoeira do Ventura** Praia Grande (SC)			29° 12'51.79" S 50° 1' 29.03" W
G05	**Cânion Malacara** Praia Grande (SC)	River located between fractures of the basaltic rocks of the Serra Geral Formation. Block and pebble deposits.	Landform	29° 08' 53.71" S 49° 59' 31.51" W
G06	**Cachoeira da Onça** Praia Grande (SC)	Basaltic rock and fluvial deposits outcrop.		29° 9' 33.16" S 49° 59' 23.39" W
G07	**Cânion Fortaleza** Jacinto Machado (SC)	Canyon that developed between fractures in the basaltic rocks of the Serra Geral formation. Many volcanic flows are visible from it.	Landform	29° 2' 57.55" S 49° 56' 58.91" W
G08	**Cânion da Pedra** Jacinto Machado (SC)	Basalts with tabular and columnar disjunctions.		29° 04' 01.22" S 49° 55' 51.62" W
G09	**Morro do Carasal** Jacinto Machado (SC)	Acidic rock occurrences (rhyolites) with lava flow textures.		29° 04' 01.22" S 49° 55' 51.62" W
G10	**Cachoeira do Zelindo** Jacinto Machado (SC)	Basaltic rock and fluvial deposits outcrop.		29° 0' 54.99" S 49° 55' 3.31" W
G11	**Morro Itaimbé** Jacinto Machado (SC)	Botucatu Sandstone outcrop: cross-bedded sandstone lithofacies.	Landform	29° 1' 23.67" S 49° 44' 24.58" W
G12	**Paleotocas Índios Xocleng** Jacinto Machado (SC)	Paleoburrow dug into the Botucatu Sandstone.	Paleontological	29° 1' 54.16" S 49° 52' 17.62" W
G13	**Cachoeira da Cortina** Timbé do Sul (SC)	Basaltic rock and fluvial deposits outcrop.	Landform	28° 49' 44.52" S 49° 54' 56.24" W
G14	**Fenda da Raia** Timbé do Sul (SC)	Basaltic rock and fluvial deposits outcrop.	Landform	28° 49' 30.26" S 49° 47' 29.33" W
G15	**Cascata do Padre** Timbé do Sul (SC)			28° 51' 21.73" S 49° 54' 27.48" W
G16	**Paredão da Areia Branca** Timbé do Sul (SC)	Botucatu Sandstone outcrop: cross-bedded sandstone lithofacies.	Landform and Stratigraphic	28° 49' 22.05" S 49° 47' 33.52" W
G17	**Toca do Tatu** Timbé do Sul (SC)	Paleoburrow dug into the Botucatu Sandstone.	Paleontological	28° 46' 20.66" S 49° 53' 43.33" W
G18	**Cachoeiras Rio do Salto** Timbé do Sul (SC)	Rio do Rastro Formation	Landform	28° 49' 45.38" S 49° 45' 25.19" W
G19	**Cachoeira do Bizungo** Morro Grande (SC)	Outcrop of the Rio do Rastro Formation that directly overlays the basalts of the Serra Geral Formation – Chronological discordance.	Landform and Stratigraphic	28° 42' 36.00" S 49° 46' 17.23" W
G20	**Paleotoca da Aparência** Morro Grande (SC)	Tunnel excavated in sandstone from the Botucatu Formation by large animals, either giant armadillos or sloths, who died off over 10,000 years ago.	Landform and paleontological	28° 45' 4.78" S 49° 45' 20.07" W
G21	**Paleotoca Furnas Xocleng** Morro Grande (SC)			28° 41' 19,54" S 49° 47' 17.11" W
G22	**Mineração Angelgres** Morro Grande (SC)	Outcrop of the Rio do Rastro Formation	Paleontological and Stratigraphic	28° 46' 42.52" S 49° 40' 8.00" W
G23	**Cachoeira do Tatu** Morro Grande (SC)	Outcrop of the Rio do Rastro Formation	Landform	28° 41' 20.02" S 49° 44' 49.72" W
G24	**Cânion Itaimbezinho** Cambará do Sul (RS)	Canyon that developed between fractures in the basaltic rocks of the Serra Geral formation. Many volcanic flows are visible from it.	Landform	29° 09' 30.62" S; 50° 04' 47.37" W
G25	**Cânion Fortaleza** Cambará do Sul (RS)			29° 03' 46.32" S; 49° 57' 23.74" W
G26	**Cachoeira dos Borges** Mampituba (RS)	Outcrop showing tabular basalts lithofacies, representing the base of the flow.	Landform	29° 17' 37,75" S 49° 59' 17,93" W
G27	**Santuário Nossa Senhora Aparecida** - Mampituba (RS)	Botucatu Sandstone outcrop: cross-bedded sandstone lithofacies.	Geo Stratigraphic	29° 12' 55,09" S 49° 58' 09,90" W
G28	**Parque da Guarita and Morro do Farol** Torres (RS)	Sandstones of the Botucatu Formation, displaying structures of the ancient desert: peperites, formed from the interaction between the sands of the desert and volcanic flows; basaltic rocks of the Serra Geral Formation, originated from the separation between the African and South American continents.	Landform	29° 21' 27,00" S 49° 44' 01,23" W
G29	**Dunas Itapeva** Torres (RS)	Quaternary aeolian sand deposits, originated from coastal zone wind action.	Landform	29° 22' 34" S 49° 45' 23" W
G30	**Ilha dos Lobos** Torres (RS)	Serra Geral Formation	Landform	29° 20' 49.06" S 49° 42' 16.18" W

Table 03 - Relation of Geosites and their geological features.

E.1.1.3 Details on the interest of these sites in terms of their international, regional, national, or local value

The scientific, educational, and geotouristic interest in the sites was measured through the method developed by Brilha (2016). Their relevance (local, regional, national, international) was also rated based on Brilha (2016), and is shown in *(tab. 04)*.

The area proposed by this project to be a Geopark fits all the criteria set by UNESCO, with its considerable area, infra-structure for tourism in privileged points in the Campos da Serra, its historical-cultural importance, and the great relevance of its geological, geomorphological, and paleontological sites. It is important to highlight the relevance of the geopark in promoting the value of our regional geological patrimony, the preservation of its geodiversity, peculiarity, and representativity, and of science as a whole (UNESCO, 2019).

Among the 30 geosites listed, 8 have international relevance (G05, G07, G12, G21, G24, G25, and G28), 5 of national relevance (G01, G22, G27, G29 E G30), and 17 of regional importance. 33% of the geosites stand out due to their scientific

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Among the 30 geosites listed, 8 have international relevance (G05, G07, G12, G21, G24, G25, and G28), 5 of national relevance (G01, G22, G27, G29 E G30), and 17 of regional importance. 33% of the geosites stand out due to their scientific value (G13, G14, G19, G20, G24, G25, G27, G28, G29 and G30), 100% are of educational or didactic interest, and 100% are relevant from a geotourism perspective. In addition, other geosites are also recognized for their historic, archeologic and/or cultural significance. Most of the geological contexts that exemplify the geology of the territory are represented in the selected sites.

Geosites G01, G05, G06, G07, G08, G09, G24, and G25 are located in the Aparados da Serra region, which is known to contain the greatest concentration of canyons in Brazil. Its dazzling beauty has an incalculable geological value due to its part in one of the greatest magmatic events that ever occurred in the planet, between 135-119 million years ago, related to the break-up of the Gondwana Supercontinent (Godoy et al., 2011 – Brazilian Geological Service).

The Paleoburrow, located in Santa Catarina (G12, G17, G20 and G21), represents an important biogenic structure built by large mammals from previous ages. They can be 60 m long, 2.4 m high, and 3.3 m wide, indicating that these animals moved large amounts of sediments as they burrowed. Although these animals are known from other parts of the world, nowhere else have these structures been preserved in such large numbers.

The Guarita Park geosite (G28), located in the Torres county, has as its main attraction a geomonument known as "Guarita", due to the fact that the 30 m tall tower resembles a security cabin. This geosite is located in a 13 ha tourist area, and contains important geological features, such as the interaction between magma flows and non-consolidated aeolian sediments. These interactions led to the formation of peperitic breccias, in which volcanic rock fragments immersed in sediments can be observed. This geosite contains essential tourist amenities, such as access roads, trail signalization, numerous attractions, and an integration between environment and geological and biological history. Due to these reasons, the Guarita Park Geosite was classified having international relevance (Godoy et al., 2011 - Brazilian Geological Service).between 135-119 million years ago, related to the break-up of the Gondwana Supercontinent (Godoy et al., 2011 – Brazilian Geological Service).

	GEOLOGICAL SITES	RELEVANCE
G01	**Rio do Boi** Praia Grande (SC)	National
G02	**Morro dos Cabritos** Praia Grande (SC)	Regional
G03	**Cachoeira Magia das Águas** Praia Grande (SC)	Regional
G04	**Cachoeira do Ventura** Praia Grande (SC)	Regional
G05	**Cânion Malacara** Praia Grande (SC)	International
G06	**Cachoeira da Onça** Praia Grande (SC)	Regional
G07	**Cânion Fortaleza** Jacinto Machado (SC)	International
G08	**Cânion da Pedra** Jacinto Machado (SC)	Regional
G09	**Morro do Carasal** Jacinto Machado (SC)	Regional
G10	**Cachoeira do Zelindo** Jacinto Machado (SC)	Regional
G11	**Morro Itaimbé** Jacinto Machado (SC)	Regional
G12	**Paleotocas Índios Xocleng** Jacinto Machado (SC)	International
G13	**Cachoeira da Cortina** Timbé do Sul (SC)	Regional
G14	**Fenda da Raia** Timbé do Sul (SC)	Regional
G15	**Cascata do Padre** Timbé do Sul (SC)	Regional
G16	**Paredão da Areia Branca** Timbé do Sul (SC)	Regional
G17	**Toca do Tatu** Timbé do Sul (SC)	Regional
G18	**Cachoeiras Rio do Salto** Timbé do Sul (SC)	Regional
G19	**Cachoeira do Bizungo** Morro Grande (SC)	Regional
G20	**Paleotoca da Aparência** Morro Grande (SC)	Regional
G21	**Paleotoca Furnas Xocleng** Morro Grande (SC)	International
G22	**Mineração Angelgres** Morro Grande (SC)	National
G23	**Cachoeira do Tatu** Morro Grande (SC)	Regional
G24	**Cânion Itaimbezinho** Cambará do Sul (RS)	International
G25	**Cânion Fortaleza** Cambará do Sul (RS)	International
G26	**Cachoeira dos Borges** Mampituba (RS)	Regional
G27	**Santuário Nossa Senhora Aparecida** - Mampituba (RS)	National
G28	**Parque da Guarita and Morro do Farol** Torres (RS)	International
G29	**Dunas Itapeva** Torres (RS)	National
G30	**Ilha dos Lobos** Torres (RS)	National

Table 04 - Relation of Geosites and their relevance.

Paleoburrows

Paleoburrows are biogenic structures similar to tunnels that were dug by vertebrates (Bergqvist & Maciel, 1994). They were relatively permanent dwelling structures for these animals, created in the more altered and friable parts of the rock, which would have made digging easier for the organism (Buchmann et al., 2003). In Brazil, paleoburrows are found in Rio Grande do Sul, Santa Catarina, Paraná, and São Paulo.

For palaeontologists, paleoburrows are considered a kind of ichnofossil, that is, marks left behind by the paleofauna, such as tracks, claw marks, faeces, among others. Paleoburrows are, therefore, the largest and most well-preserved ichnofossils in the world. Generally, paleoburrows are found empty; when they are found filled by sediments, they are called "crotovines". The record left by the building organism in the walls and ceiling of the paleoburrows vary depending on the type of rock, but generally consist in claw marks, carapace impressions, or movement marks.

Paleoburrows can display complex architectural arrangements, which are frequently identified as the "turning chamber", wider rooms located usually in the middle of the burrow that the animal used to turn around or to let another animal of the same colony pass through. The "terminal chamber" is typically an oval or round chamber positioned at the end of the tunnel, where the organisms that lived there rested (Smith, 1987; Damiani et al., 2003).

The morphology of the paleoburrows vary depending on the organism that created them. Usually, in a transversal view, vertebrate burrows are ellipsoidal or round. Size greatly varies, depending mainly on the animal that created it. However, as a norm, the size of the burrow should be proportional to that of the burrowing organism, as minimizing the diameter of the reduces energy use by the animal (Laundre, 1989; Miller et al., 2001). Burrows can be simple, with a singular tunnel, or can be a complex system of interconnected tunnels. The majority of the known burrow systems are composed of tunnels a few centimetres wide and many meters long, with numerous chambers. These burrows were used for numerous different reasons, such as having a safe place to eat, eventual or permanent residence, refuge against predators, and others.

The occurrence of paleoburrows and crotovines in South America is relatively high, and their discovery dates back to 1928, when the first descriptions of these structures were made in the Mar Del Plata city, Argentina. In Brazil, the first paleoburrows were described in the beginning of the 80s in the Rio Grande do Sul state (Villwock et al., 1986).

Many of these biogenic structures were identified in the last years in the Rio Grande do Sul and Santa Catarina states. Frank et al. (2010a, b) described the occurrence of these structures with varied sizes, attributing them to the Pleistocene megafauna. Among them, 56 tunnels with lengths varying between 3 and 50 m and a diameter between 0.8 and 1.3 m were found. Adding all together, the entire length of these tunnels is over 700 m. Three of the tunnels are particularly large, with a diameter varying between 2 to 3 m, a height of 1.5 m, and a length of 40 m.

The paleoburrows in the CCSAG were excavated at least 10,000 years ago, and mainly by two groups of giant mammals that belonged to the local megafauna: armadillos and sloths. At the time, the relief was similar to what is seen today, though the beaches were located a few kilometres farther from the highlands, and the plains were similar to modern African savannahs. According to professor Luiz Carlos Weinschutz and his team, who study these structures in the territory, "there are no doubts regarding the bioerosive origin of these structures, which, as in previous cases, will require detailed studies to identify which animal excavated them. However, due to their large dimensions, we suggest the possibility that they were created by sloths of the genus Milodon, or they could have even been intercepted by structures made by other animals such as armadillos of the Propaopus genus" *(fig. 23 - PRELIMINARY REPORT Universidade do Contestado – Caminhos dos Cânions do Sul GEOPARK – Luiz Carlos Weinschutz et al.)*.

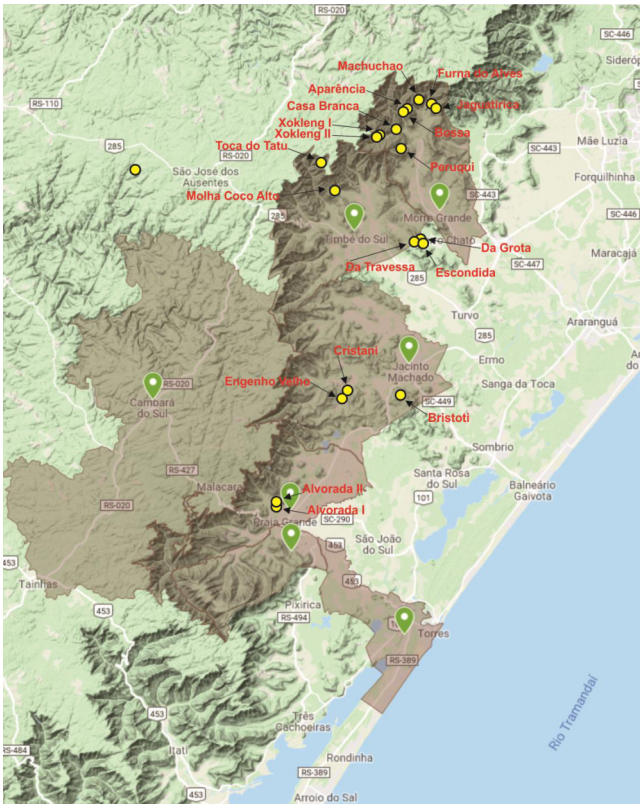


Figure 23 - Paleotoca location map (CENPALEO / UnC) and field photographys.

As far as is currently known, tunnels excavated by large paleovertebrates can be found only in South America. The rare paleovertebrate tunnels found in other continents, even when described in literature as “large”, “mega”, or “gigantic”, have lengths smaller than 6 m and maximum diameters of 50 cm.

In the area of the CCSAG, the presence of these tunnels is considered exceptional even in comparison to other Brazilian localities, both due to the quality of their preservation and their sheer abundance. The tourism potential for these occurrences is particularly promising when one takes into account the fact that they occur in areas with lush forests and alongside structures of archaeological relevance.

Figure 24 - Paleoburrows

E.1.1.4 Current or potential pressure on the geological sites regarding their preservation and proper maintainance

The pressures on the inventoried geological sites (CPRM, 2011; Geodiversidade, 2018) identified in the CCSAG territory are mainly mining and the impact of visitation (graffiti, excavation and rubbish). This result reflects the fragility of the environment and the vulnerability associated with anthropic activities, highlighting the care that should be taken when promoting these environments for the direct use of natural resources and visitation, whether for education or tourism. Another factor of degradation are the natural hazards of extreme events that have shaped the terrain over time. Such extreme events, specifically related to severe atmospheric instabilities, are also associated with the occurrence of socio-environmental disasters such as floods, windstorms and mass movements. A recent study has shown that the inventoried geosites in the CCSAG area are well maintained due to the historical relationship of land use by local communities that depend directly on landscape conservation for their survival (Geodiversidade, 2018).

Among the geoconservation strategies of the Geopark territory, we can highlight at least seven actions under implementation since 2007, namely: training, meetings, speeches, holding events such as traveling exhibition about the Geopark and educational exhibition, support for events related to sustainable tourism, exchanges with other Geoparks and attraction signaling. From the inventoried geosites, a great potential for educational use was identified, making it possible to combine geoeducation with geoconservation. In this strategy, geosites can serve as hands-on labs for the all school grades, as an extension of the classroom, facilitating the learning process for students and assisting teachers in Earth science teaching from the interpretation and observation of rocks. and its structures, landscapes, human occupations and economic activities that were developed in the region, always associated with local geodiversity.

Another strength of the territory is the promotion of sustainable development, a commitment made by the Intermunicipal Consortium that manages the territory, especially when it comes to geotourism. The tourism use of these geosites enables a new offer for this market in the region, providing synergy and the development of other economic sectors associated with the tourism chain, such as handicrafts, gastronomy, hotels, itineraries, guides and local drivers, among others. This movement, integrated with the conservation and educational use of geosites, form the basis for the main actions in the construction of the Geopark. Finally, the geoconservation strategy is a fundamental step in this contemporary concept of territorial development, which are the geoparks. The occurrences of geological heritage of scientific, educational and recreational interest enable the establishment of actions, programs and partnerships within the sustainability basis of geoparks: geoconservation, geoeducation and geotourism.

E.1.1.5 Current status in terms of protection of geological sites within the aUGGp

In the area of CCSAG, most geosites have legal protection provided by the federal law n. 9.985, establishing the National Protected Areas System, and the law n. 12.651 which provides for the permanent preservation areas. The geosites in the territory lying on springs, streams, slopes above 45 ° and hilltops are under the umbrella of federal environmental laws, state and municipal, ensuring the actions of geoconservation based on the existing legal protection. It should be noted that the main geosites inventoried occur in 10 protected areas, listed by UNESCO Biosphere Reserve program. In this case, the

points of interest are part of the core zone of the Reserve of the Atlantic Forest Biosphere high priority biodiversity conservation. Recognition of the Geopark will create a synergy of actions for nature conservation and economic development by integrating valuing of social diversity, and conservation of biodiversity and geodiversity of international significance.

E.1.2 Boundaries

The CCSAG limits correspond to the political / administrative limits of the municipalities.

E.1.3 Visibility

With the aim of increasing the visibility of the Geopark and the interest of the communities involved, the Communication Branch develops continuous promotion activities in addition to providing support to the other branches of the CCSAG. A few examples of these outreach actions are described below:

Permanent communication policy

The Communication Branch is constantly publishing content in the Geopark's official website (www.canionsdosul.org, available in two languages) and social media pages. We are also working towards the creation of graphic materials such as directional signalization and interpretative panels for the Geopark's main geosites (in two languages), in addition to the creation of banners, folders, posters, and digital pamphlets in order to spread awareness about the activities developed by the project and to provide information regarding environmental education, geoconservation, and tourism.

The permanent communication policy also includes press office activities, such as providing news for spontaneous publications in media outlets such as newspapers, magazines, news websites, radio, and television channels.

Campaign Caminhos dos Cânions do Sul Geopark: I'm part of it

Distribution of 10 thousand stickers for the campaign "I'm part of it", used by the population to demonstrate support for the Geopark, placed in schools, commercial establishments, vehicles, and residences.

Itinerant Exhibition Cânions do Sul Geopark

For 11 months, this exposition travelled through the seven counties that comprise the Geopark, affixing itself in different periods in each city, particularly during traditional events, in which it always attracted a large public. Over six Thousand people visited the exposition. Through informative panels with texts, images and illustrations, we explained what the Geopark is, its benefits to the sustainable development of the region, the geological and cultural aspects of its territory, its biodiversity, its economic characteristics, and the many educational activities that had been carried out by the project. The exhibitions also displayed objects of interest such as rocks and minerals, crafts created by native communities, old tools that were used by Italian and German immigrants, and even tools used by the old "tropeiros".

Encounters with specific groups

We have met with many different communities to both explain and convince them of the importance of the project, and to understand the living realities of these groups, so that we can better understand how they would like to participate in the activities of the Geopark. We promote frequent meetings with specific groups such as guides, drivers, tourism agencies, hotel managers, business associations, cooperatives, farmers, researchers, public agencies, and traditional communities.

Geopark Day

A special day in which we incentivize the population to discover the main geosites of the territory, so that they can understand their geological relevance. Throughout the day, we provided the community with guided tours to the canyons, hills, waterfalls, and paleoburrows of the region.

Educational and Cultural Showcase

Gathering students and teachers from the seven counties of the territory, the Educational Branch organized the "1st Educational and Cultural Showcase of the Geopark", which displayed 34 projects developed by students of the counties' schools, ranging in age from 4 to 18 years old. They presented works related to regional culture, environmental education, and geosciences. In addition to the exposed projects, one of the main objectives of the Showcase was to promote interaction between the many students, making it so people from different counties could meet each other and learn about the realities of other schools and other cities.

Support to events and special projects

We incentivize through sponsorships or logistic support events held by specific groups that promote culture, tourism, education, geoeducation, and scientific research in the territory.

E.1.4 Facilities and infrastructure

The territory of the Caminhos dos Cânions do Sul Aspiring Geopark has a road infrastructure that allows for easy access to its geosites and integrating counties, and is well connected to the main highways of the South Region of Brazil, such as: federal highways BR 101 and BR 285, state highways RS 453 (Sun Route) and ERS 389 (Sea Road) in the Rio Grande do Sul side, and the SC 290 in the Santa Catarina side, all of which are paved. There are also two more highways that are not paved: the SC 108, between Jacinto Machado and Praia Grande, and the Serra do Faxinal, between Praia Grande and Cambará do Sul, the latter of which is on the process of being paved, pending environmental licenses. The regional airport is located in the city of Torres, with a paved road 1500 m long, 30 m wide and 8 m high. It currently receives only sporadic flights, as no airlines currently operate regular commercial flights in the area.

The territory as a whole contains good tourism infrastructure, allowing it to adequately receive and tend to its visitors. Torres alone has around 6,000 beds, being the fourth largest city in the Rio Grande do Sul state in terms of hotel capacity. There are around 160 hosting facilities (hotels, inns, camping, motels, local hosting, etc.) in the territory, and 200 food facilities between restaurants, pizzerias, and snack bars, offering a wide gastronomic variety. In the territory, there is a total of 41 travel agencies, around 200 tour guides and local drivers, and 6 tourist transportat companies. In Torres, Praia Grande, Jacinto Machado and Cambará do Sul, there are four Tourist Information Centres – TICs, which provide visitors with: information about the territory, tourist itineraries, attractions and trade, guides and drivers, and the most relevant aspects of the historic, cultural and geological patrimony of the region.

Next to the Aparados da Serra National Park, the main geosite of the territory in terms of geological importance, there is a visitor service centre fully equipped with bathrooms and leisure space, which has already housed itinerant exhibitions about the Cânions do Sul Aspiring Geopark and contains explanatory plaques and informative panels about the geology and importance of the region. The José Lutzenberger State Park – Guarita Park in Torres – was establish as a special area of touristic interest (State Decree 30.377, October 14, 1981), and is the second main geosite in terms of geological importance in the territory. It contains an entrance gantry, bathrooms, snack bars, and a space reserved for institutional events. Still in Torres, there is an event centre with room for 800 people in the Lutheran University of Brazil – Ulbra, with whom the Consortium has a Cooperation Term with. There are three museums in the territory: the Museum of History, Anthropology, Oceanography and Art being implemented in Torres, the Dr. Santo Borneo Cultural Centre in Cambará, and the County History Museum in Jacinto Machado, which is being converted into the Museum of Geosciences with backing from the Ministry of Tourism, and will also house the TIC of the city. There is also the recently opened Surf Memorial Chalet in Torres.

Events held in the territory are excellent strategies to increase tourism flow throughout the year. The "Festival Internacional de Balonismo" (International Ballooning Festival), a balloon competition sporting event, is held in Torres at the beginning of May, is in its 32nd edition. It attracts pilots from many different countries, and in its last edition had an attending public of over 200 thousand people. Still in Torres, the seaside New Year's Eve, a traditional event that holds numerous shows, attracted a public of 480 thousand people in the 2018/2019 turn, in addition to surf championships and other sport modalities. Cities such as Praia Grande ("Natal dos Cânions", Christmas in the Canyons) and Jacinto Machado ("Natal Encantado" Enchanted Christmas) are already well-known in the region for their end-year festivities, particularly their Christmas schedule, with numerous cultural attractions and national shows. Timbé do Sul and Morro Grande stand out for their cultural and sports

events. Mampituba has the traditional "Festa da Banana" (Banana Festival) and "Festa do Mel" (Honey Festival). In summary, many festivities are held all around the territory: religious, traditional fairs, rodeos, anniversary of the emancipation of counties, festivities related to the territory's ethnicities, culture and history, etc., throughout the year, as an attraction for tourists and visitors.

Future installations

Geosciences Museum

The Museum of Geosciences, which will be implemented in Jacinto Machado, seeks to provide the community with geoscientific knowledge through research, preservation of technical and historical collections, and teaching the history of the geosciences in the Santa Catarina state, Brazil, and the world. It will be built in the current area of the historic museum, with the resources for its construction having already been provided by the Ministry of Tourism – Transfer Agreement n° 875560/2018. The collection of the museum will be donated by the geologist that spearheaded the project, Rodigo Sato, member of the Scientific Educational Committee – SEC.

Concession of the National Parks

Two Federal Conservation Units – CUs – that exist in the territory are currently in the process of concession for public use. The proposal is the concession of the national parks Aparados da Serra and Serra Geral to the private sector for a period of 30 years, with the tasks of environmental education, supervision, research and surveillance, among others, continuing to operate under the current management body, the "Instituto Chico Mendes de Conservação da Biodiversidade" - ICMBio (Chico Mendes Institute of Biodiversity Conservation). The expectation of the federal government, based on economic viability studies, is the increase in the number of visitors in these parks from the current 200,000 a year to 1,250,000 a year, after a period of eight years.

With proper financial aid, the current infrastructure of the CUs will be greatly improved, providing more comfort for visitors and allowing for the possible creation of new park trails and an increase in the national and international marketing of the touristic attractions in these CUs. For the surrounding communities, the higher number of visitors will bring the opportunity for greater regional economic development and an increase in the number of jobs in the tourist sector.

Paving of the Serra do Faxinal road

The Serra do Faxinal road is the main connection between the Praia Grande and Cambará do Sul counties, and is one of the most important elements for the development of tourism in the territory. This road connects Santa Catarina to Rio Grande do Sul, and passes in front of the Aparados da Serra and Serra Geral national parks. Through the road are also visible the Rio do Boi valley, the geosite Itaimbezinho Canyon, and the entire coastal plain of Torres. However, two years ago, work on paving the road has stopped after environmental institutes asked for new studies regarding the fauna of the area. Regional leaders have moved to solve these issues as fast as possible in order to continue this important work. With proper financial aid, the current infrastructure of the CUs will be greatly improved, providing more comfort for visitors and allowing for the possible creation of new park trails and an increase in the national and international marketing of the touristic attractions in these CUs. For the surrounding communities, the higher number of visitors will bring the opportunity for greater regional economic development and an increase in the number of jobs in the tourist sector.

Paving of Serra da Rocinha and installation of the Tourist Information Centre – TIC in Timbé do Sul

Serra da Rocinha is a cinematographic location with a panoramic view of the canyons and beaches of southern Santa Catarina and northern Rio Grande do Sul. Located in the county of Timbé do Sul/SC, it contains one of the highest free flight ramps in Brazil, and is one of the entryways for the Caminhos dos Cânions do Sul Aspiring Geopark. The area has great historic and cultural value, as it was the path taken by the troops that transported supplies by horse back when there were no other routes. It was the target for one of the most important highway projects in the country, the BR 285 highway, which begins in Araranguá/SC, crosses through numerous RS counties, and reaches the border of Argentina, totalling 674.5 km in length. This highway is fundamental for the connection between Rio Grande do Sul, Santa Catarina and Argentina. In the territory, a stretch of 22 km of land

Revitalization of the Morro do Farol

Also called "Torre Norte" (North Tower), "Morro do Farol" (Lighthouse Hill) is a popular tourist attraction due to its natural beauty and visual perspective. Among the three seafront hills in Torres, Torre Norte is the only with vehicle access, and is the favourite spot for both tourists and inhabitants of the city to watch the sea. From it, it is possible to see numerous beaches, hills, the Violão Lagoon, the highlands, the dunes of the Itapeva Park, and the Wildlife Refuge Ilha dos Lobos (Wolf Island), the last two being CUs. It is also a propitious area for paragliding. Morro do Farol is also a perfect spot to watch black whales, which can be commonly seen in Rio Grande do Sul between August and November as they search for warm waters to procreate. In 1977, the area also housed an indigenous cemetery and the São Diogo Fort and, in 1911, had its first lighthouse built.

Currently, the Morro do Farol is undergoing great reforms, with the aim of improving its pavement, illumination, and urban access.

Revitalization of the Parque do Balonismo

The "Parque do Balonismo" (Ballooning Park) is the area that houses the International Ballooning Festival, which consolidated Torres as the Brazilian Capital of the sport, being considered one of the most consecrated and traditional festivals of its kind in the country and, consequently, in Latin America. The Ballooning Festival is a balloon competition with numerous modalities that annually gathers over 60 Brazilian and foreigner pilots. The park is currently being renovated to improve its infrastructure, providing it with: fencing of the area, construction of pavilions, and construction of a TIC, toilets, multipurpose room and parking for buses.

E.1.5 Information, education and research

The CCSAG is located within two touristic regions. In the Rio Grande do Sul state, there is the "Região do Litoral Norte Gaúcho" (Northern Rio Grande do Sul Coastal Region), which is known for its beaches, lagoons, rivers, dunes, cliffs, Atlantic Forest, sports, and infrastructure. This area is very popular with Uruguayan and Argentinean tourists. In the Santa Catarina state, the territory belongs to the "Caminhos dos Cânions do Sul" (Southern Canyons Paths) region, whose main attraction, as the name suggests, are its canyons, in addition to waterfalls, paleoburrows, natural parks, rural tourism, ecotourism and nature tourism. The two regions contain protected areas that contribute to the valorization and conservation of our natural patrimony, in which can be highlighted geological elements of national and international relevance. The territory also belongs to the "Reserva da Biosfera da Mata Atlântica" (Atlantic Forest Biosphere Reserve).

Tourism in the CCSAG is an in-development activity that significatively impacts the economy of the area. Thus, people that work in the tourism trade are extremely important, as they are the ones that have direct contact with visitors and tourists. Due to the peculiarities and access characteristics of the attractions and for tourist safety, the CCSAG has opted, during this first phase, to focus on training activities for local tour guides, drivers, and tourism agencies, in order to provide them with pertinent information about the area so that they can better inform the general public. To this end, several training sessions and events directed at these workers were held, in which there was always a great degree of participation. One result of these encounters, which is supported by the Consortium, was the creation of the "Grupo Voluntário de Busca e Resgate" – FACES (Volunteer Search and Rescue Group), which covers the entire territory.

Below is a table that details the training sessions and events that have been done so far.

DATE	ACTIVITY	CONTENT DISCUSSED
December of 2013	**Geology and Regional Geomorphology Courses –** Praia Grande/SC*.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
August of 2015	**Geology and Regional Geomorphology Courses –** Cambará do Sul/RS.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
May of 2016	**Geology and Regional Geomorphology Courses –** Jacinto Machado/RS.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
May 09, 17, 26 and 31, 2017	**Geology and Regional Geomorphology Courses –** Mampituba/RS.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
October 22 to 24, 2017	**1º Meeting of the Drivers from Aparados da Serra – Brazilan Canyons –** Jacinto Machado/SC.	First aid, venomous animals, geology, Geoparque Cânions do Sul Project.
March 20, 2018	**Introduction to geology for tour guides and drivers in the territory of the Cânions do Sul Geopark.**	Introduction to geology for tour guides and drivers.
August 06,14,22 and 30, 2018	**Geology and Regional Geomorphology Courses –** Morro Grande/SC.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
June 08 and 09, 2018	**2º Meeting of the Drivers from Aparados da Serra – Brazilan Canyons** – Jacinto Machado/SC.	Trail management, paleoburrows as potential tourist attractions, canyonism, etc.
September 01, 09,17 and 23, 2019	**Geology and Regional Geomorphology Courses** – Timbé do Sul/SC.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
October 20, 21 and 22, 2019	**3º Meeting of the Drivers from Aparados da Serra – Brazilan Canyons** – Jacinto Machado/SC.	Geological Risk Areas, voluntary rescue group, National Park concessions, UNESCO Global Geoparks.
October 28 and November 05, 2019	**Training for local tourism agencies for the commercialization of the "Georroteiro Cânions do Sul: Um destino. Muitas experiências" (Georoute Cânions do Sul: One destinaton. Many experiences.)**	Roadmap and tariff of the "Georroteiro Cânions do Sul: Um destino. Muitas experiências" (Georoute Cânions do Sul: One destinaton. Many experiences.)

Table 05: Training sessions and events for tour guides, local drivers, and tourism agencies.

**The Geology and Regional Geomorphology courses were an initiative of the "Agência de Desenvolvimento Regional de Araranguá" – ADR (Araranguá's Regional Development Agency) in partnership with the "Associação dos Municípios do Extremo Sul Catarinense" – AMESC (Association of the Counties from Santa Catarina's Extreme South), institutions that were the precursors of the Cânions do Sul Geopark project.*

Also in the development and implementation phase are interpretative panels for the main geosites in the Geopark's territory. These panels are being elaborated with the assistance of the Educational and Scientific Committee, Conservation Units Managers, researchers, tour guides and drivers, local historians, among others. These panels will display multidisciplinary content; they will, however, always highlight the meaning of the Geopark and the importance of its geological and geomorphological patrimony, with language appropriate to the general public.

Still within this context, we would like to emphasize a number of partnerships made with universities and researchers from the region and its surrounding area. As there is only a single university in the territory, the management of the CCSAG spared no effort in seeking additional partnerships in both states. The following table describes the universities with which the project has partnered with, and the main objectives of each agreement:

UNIVERSITY/ENTITY	OBJECTIVE OF THE AGREEMENT	PLACE OF ORIGIN
Universidade Luterana do Brasil – ULBRA (Lutheran University of Brazil)	Establish the ways and conditions through which the participants will pool their efforts, resources, and competencies for joint activities to promote regional, educational, scientific, and technological development.	Torres/RS
Instituto Federal Catarinense – IFC (Santa Catarina's Federal Institute)	Create internships for high school and undergraduate vocational students.	Sombrio/SC
Universidade do Contestado – UnC (Contestado University)	Promote through the partnership educational, research, and extension activities between the Paleontological Center and the Geoparque Cânions do Sul project; develop technical and scientific collaborations on topics of common interest.	Mafra/SC
Universidade do Extremo Sul de Santa Catarina – UNESC (University of Santa Catarina's Extreme South)	Technical cooperation between the participants for the mapping of archaeological sites, mapping of paleontological sites, mapping of landscape patrimony areas, tourism planning, and training courses in heritage and environmental education in an area located within the Consortium's territorial limits.	Criciúma/SC
Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina – EPAGRI (Agricultural Research and Rural Extension Company of Santa Catarina)	Technical and scientific cooperation in areas of common interest for the development of the Geoparque Cânions do Sul project.	Florianópolis/SC

Table 06: Partner universities and entities.

As a result of these partnerships, the following has already been achieved:

- The "spring protection and restoration of degraded environmental areas" project, which is being developed in partnership with EPAGRI. The project has already restored numerous degraded areas along river margins, built eight reserves around natural water springs along the slopes of the Serra, and has distributed over ten thousand native tree seedlings, involving the area's schools and the wider community in these important activities;

- Survey of the bioerosive structures (paleoburrows) located in the region that comprise the counties of the CCSAG, as well as the development of studies regarding other potential local paleontological attractions in the region, by the Universidade do Contestado – UnC;

- Archaeological research and studies developed by UNESC;

- Training of teachers and students, which will be described in section E.5;

- Seven trainees, who are developing their course conclusion papers in Tourism Management in the territory, in addition to conducting tourism inventories;

- In addition, a cooperation agreement with the Instituto Federal de Santa Catarina – IFSC Araranguá is being formalized for the execution of the project "Gestão do conhecimento tradicional guarani: estratégias de resgate, valorização e divulgação por meio das Tecnologias de Informação e Comunicação - TIC" (Management of Guarani traditions: strategies for recovering, valuing, and divulging their culture through Information and Communication Technologies), to be developed in the Nhuú-Porã Indigenous Village.

E.2.1 Natural Heritage

Biodiversity

The region that encompasses the CCSAG is completely located in the Atlantic Forest Biome, which is considered to be the richest in terms of biodiversity in the whole world. Although only less than 10% of its original area remains, it still contains an exceptional floral and faunal abundance. The richness in species is related to the wide altitude gradient, humid climate, and great environmental diversity such as: beaches; restinga; dune fields; humid areas such as lagoons and rivers; and numerous kinds of forests, as listed below:

TYPE	CHARACTERISTICS OF THE FLORA
Restinga vegetation	In the restingas, which are sandbanks parallel to the coastline (Coastal Plain), vegetation is mixed, being composed of trees, shrubs, epiphytes, vines, many ground bromeliads, and ferns.
Dense Ombrophilous Forest	Located in the hillsides and in the lower areas of the region, such as in the cities of Torres, Mampituba, Praia Grande, Jacinto Machado, Timbé and Morro Grande. It is characterized by an evergreen vegetation with a great quantity of shrubs, ferns, bromeliads, orchids, and palm trees, with trees that can reach 50 m in height. Its characteristic "Urtigão da Serra" (*Gunera manicata*) can be found between the altitudes of 900 m and 1,800 m.
Mixed Ombrophilous Forest	Also known as the Araucaria Woods (*Araucaria angustifolia*), this type of forest is characteristic of the highlands, as seen in Cambará do Sul.
Swamp forest	Occurs in the lowlands of the coast in discontinuous pockets. The soil of this type of forest is extremely saturated with water and rich in organic matter.

Table 07 - Characteristics of the Flora

Regarding its fauna, the CCSAG area encompasses almost the entirety of the Zoogeographical Region of the Atlantic Forest. Like its flora, its fauna is highly diverse, with numerous endemic species spread throughout its numerous different environments. This justifies the existence of numerous conservation units in the region, such as the national parks Aparados da Serra and Serra Geral in Cambará, Jacinto Machado and Praia Grande; the Itapeva State Park and the Lagoa Itapeva APA ("Área de Proteção Ambiental" – Environmental Protection Area), both in Torres; and the Silverão APA in Mampituba.

Among the many animal species whose geographic range includes the area of the Geopark, we can highlight: the puma *(Puma concolor)*; the azure jay *(Cyanocorax caeruleus)*; the skull tree iguana *(Liolaemus occipitalis)*; the gold tegu (Tupinambis teguixim); and the campo flicker (*Colaptes campestris*).

The following endemic species are considered vulnerable or threatened: "Rã-das-pedras" *(Cycloramphus valae)*; "Sapo-guarda" *(Elachistocleis erythrogaster)*; "Sapinho-Verde" *(Melanophryniscus cambaraensis)*; "Sapinho da Barriga Vermelha" *(Melanophryniscus dorsalis)*.

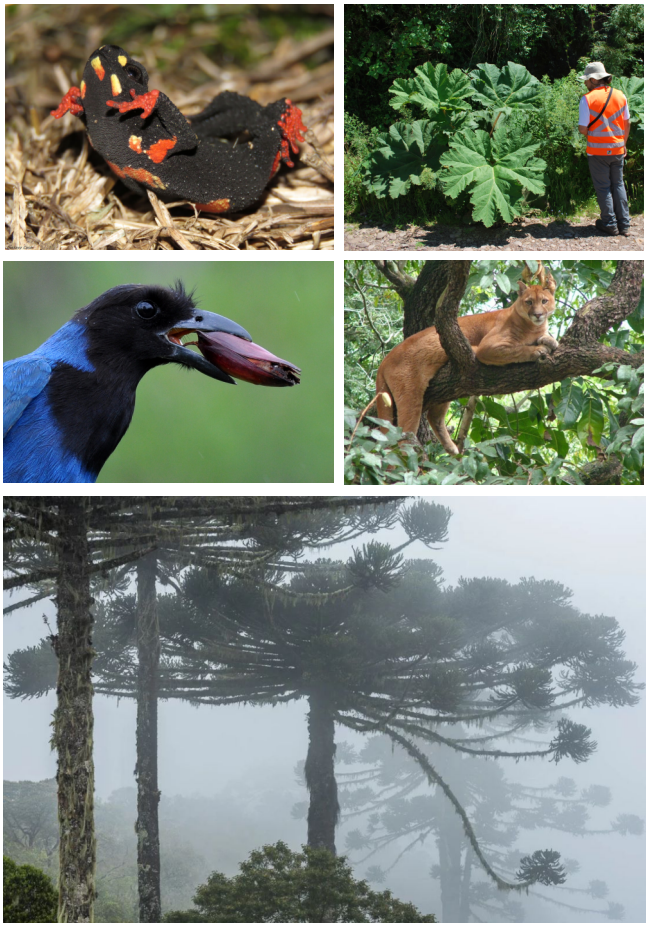


Figure 25 - Araucaria angustifolia

All this richness is protected through the ten Conservation Units spread throughout the territory, which were legally defined by federal, state, and municipal agencies. These units have the important function to help guard representative samples of significant and ecologically viable populations, habitats, and ecosystems of the national territory and its jurisdictional waters, thus preserving the existing biological patrimony, as established in the law of the "Sistema Nacional de Unidades de Conservação" (National System of Conservation Units) – SNUC (MMA, 2019 - https://www.mma.gov.br/areas-protegidas/unidades-de-conservacao/o-que-sao).

The table below shows a list and pertinent information for each of the ten Conservation Units in the territory.

	CONSERVATION UNIT	CATEGORY	AREA (HA)	ADMINISTRATIVE LEVEL	LEGAL ACT	LOCATION
1	**Aparados da Serra National Park**	Integral protection	13,141,05	Federal (ICMBio)	Decree n° 47.446 from 17/12/1959	Cambará do Sul/ RS Praia Grande/ SC
2	**Serra Geral National Park**	Integral protection	17,301.98	Federal (ICMBio)	Decree n° 70.296 from 17/03/1972	Cambará do Sul/ RS Jacinto Machado/ SC Praia Grande/ SC
3	**Wildlife Refuge Ilha dos Lobos**	Integral protection	142.39	Federal (ICMBio)	Decree n° 531 from 20/05/1992	Marine territory of Torres/ RS
4	**RPPN "Recanto do Robalo" (Sea Bass Nook)**	Sustainable use	9.95	Federal (ICMBio)	Decree s/n° from 7/2005	Torres/ RS
5	**Itapeva State Park**	Integral protection	1,000.00	State (SEMA/ RS)	Ordinance n° 57 from 18/04/2002	Torres/ RS
6	**Tainhas State Park**	Integral protection	6.654,66	State (SEMA/ RS)	Decree n° 42.009 from 2002	Cambará do Sul/ RS
7	**Aguaí State Biological Reserve**	Integral protection	7,676	State (FATMA/ SC)	State Decree n° 19.635 de 01 from July, 1983.	Treviso, Siderópolis, Nova Veneza, Morro Grande
8	**APA ("área de proteção permanente" – permanent preservation area) "Rota do Sol" (Sun Route)**	Sustainable use	54,670.50	State (SEMA/ RS)	Decree n° 23.798 from 17/12/1959	Cambará do Sul/ RS
9	**APA Itapeva Lagoon**	Sustainable use	436.99	Municipal (Torres/ RS)	Decree n° 37.346 from 11/041997	Torres/ RS
10	**APA Silveirão Plateau**	Sustainable use	6,272.6	Municipal (Mampituba/ RS)	Municipal Law n° 654, from 13/02/2012	Mampituba/ RS

Table 08 - Conservation Units in the territory

In addition to these conservation units, there is also the Atlantic Forest Biosphere Reserve, a program created by UNESCO in 1972, sustained by the Man and the Biosphere Programme – MaB from UNESCO, developed alongside the "Programa das Nações Unidas para o Meio Ambiente" (United Nations for the Environment Program") – ONUMA, the "União Internacional para a Conservação da Natureza" (International Union for the Conservation of Nature) – UICN, and other international development agencies. Its functions are: a) Biodiversity protection; b) Sustainable development; and c) Traditional scientific knowledge (Notebook 11), which covers the entire 2,830 km2 of the territory and beyond, as shown in the map below:

For such, and seeking to develop actions that help fulfil these objectives, the CCSAG already acts alongside the Conservation Units in the promotion of tourism and environmental education activities, through programs aimed at schools, promotion the "georroteiro", and training of tourist guides, among other activities listed in items E1.5 and E.5. Together, these elements give value and aid in the protection of the environmental richness of the territory, and thus promote sustainable economic and social development. We have no doubt that the status as a UNESCO Global Geopark would aggregate great value to the territory, and would certainly contribute in our efforts to preserve nature and aid in the sustainable development of the region. The title would give greater credibility and visibility to the project, considering the fact that UNESCO is an institution of worldwide renown and respect.

E.2.2 Cultural Heritage

In the territory of CCSAG there are numerous areas of interest to be promoted within the scope of the Historical and Cultural Heritage and its interface with rural tourism, cultural tourism and ecotourism. Geological aspects are intrinsically linked to the cultural identity of the region, contributing to urban formation, economic activities and

even in the creation of historical toponyms, such as the city of Torres, relative to the seaside basaltic cliffs, and also the cities of Mampituba (name of the main river that bathes the county), Praia Grande (formerly known as Praia Grande de Seixos) and Morro Grande (due to the canyons). The seven counties of the territory have immense diversity in their material and intangible heritage and the implementation of the Geopark will encourage proposals for public policies and specific legislation to safeguard and preserve local cultural assets.

Although the Intermunicipal Consortium responsible for CCSAG management supports initiatives related to the preservation of culture, it had not yet sought professionals specialized in this subject to carry out the necessary studies on the cultural heritage of the region. This has recently changed with partnerships formalized between the Consortium and many universities. The Culture Work Group is currently in the final stages of its implementation. This group will aim to research and systematize studies and reports related to cultural heritage, both material (urban centers, archaeological and landscape sites, archaeological collections, museum, documentary, bibliographic, photographic and cinematographic archives, among others) and immaterial (local knowledge and practices, celebrations, fairs and shrines that house collective cultural practices and also theatrical, visual, musical or recreational cultural expressions).

The main objective of this group will be to promote the preservation and / or conservation processes of our material and immaterial cultural heritage, in order to enhance and integrate the communities of the territory into the project, strengthen local identities, preserve their memory, and contribute to socioeconomic development of the region. The Work Group will consist of universities, associations, culture managers, historians and other institutions and individuals interested in the subject. In order to recognize and enhance the artistic / cultural expressions of emerging social groups, the Quilombola São Roque Community and the Nhuu Porã Indigenous Village will be invited to join the group.

Prior to the creation of this Work Group, which will conduct further studies, we initially identified as the main representative aspects of the culture of the territory: the architecture of the colonial period, the handicraft (especially the pieces produced by the indigenous people), the handicraft weaving with typical mountain sheep wool and the typical gastronomy of the region, among other traditional habits and customs of the peoples of the seven counties influenced mainly by the Italian, German, Azorean colonization and the activities of the drovers.

These are the planned strategic actions: the inventorying, mapping, documentation and promotion of the cultural heritage of the territory, through the acquisition and support of safeguard projects, producing and processing information on such assets, as well as the promotion of improved social conditions and support for its maintenance and continuity, especially from traditional communities.

Regarding the cultural assets registered as heritage in the territory, only the São Domingos Church in Torres is identified as a Cultural Heritage of the State of Rio Grande do Sul (Registration No. 15 in the Heritage Book, on 02/07/1983) and its surroundings, delimited as heritage in February 2017.

The São Domingos Mother Church is also known as São Domingos das Torres Mother Church, in reference to São Domingos and to the geological formations by the sea (cliffs) called "Torres". It was built from 1819 and opened on 24/10/1824. Built in the North Tower (Morro do Farol), the church was one of the landmarks of the development of the region. The building is representative of the Portuguese-Brazilian colonial architecture. The church was expanded in the period between 1857 and 1858, when it underwent maintenance work. In 2011 a restoration began with resources coming from various sources and the work was completed in April 2017. It is one of the main tourist attractions of Torres and it is always open to the public. Information about the characteristics of the Church and its cultural importance are available through on-site signs, the city's tourist folder, special websites and social networking sites.

No other assets registered as cultural heritage and recognized in other Unesco programs have been identified in CCSAG territory.

E.2.3 Intangible Heritage

The intangible cultural assets characteristic of CCSAG are considered to be the knowledge and practices preserved by the memory of the peoples of the region, such as: prayers, rites and popular beliefs; jokes, songs and popular expressions; traditional dances; regional literature; production of homemade remedies made

from native plants; legends and tales (influenced especially by the geological features of the territory, such as stories about fantastic characters in lagoons, caves, sea, rivers and waterfalls, involving stories about treasures, mermaids and animals with magical powers).

The first step towards valuing and promoting intangible cultural heritage is to know and organize knowledge about these subjects, work that will be done by the Culture Study Group, as mentioned in item E.2.2.

Similarly, the inventorying, mapping, documenting and promotion of heritage are foreseen through the acquisition of safeguard projects, with the production and processing of information on assets of this nature, as well as the promotion of the improvement of social and material conditions. Fundamental to its maintenance and continuity, especially in traditional communities.

No intangible cultural assets registered as heritage or recognized in other UNESCO Programs have been identified.

E.2.4 Involvement In Topics Related To Climate Change And Natural Hazard

Climate change has been a global concern due to the risks that it could bring to humanity. In the territory of the CCSAG, due to its morphological characteristics, climate change could lead to severe problems, increasing risk in all natural areas in the territory:

- Oscillations in the level of the Atlantic Ocean could lead to the destruction of a large part of the coastal plain and the drainage systems that empty on it;
- Increase in rainfall could lead to a larger number of landslides and block falls, which would disrupt the slopes, canyons and valleys of the area and increase the risk of tourism in the region;
- Droughts would negatively affect the rich fauna and flora of the territory.
- Research groups from many universities, such as professor Jairo Valdati, of the Geography Department from the Universidade do Estado de Santa Catarina (University of the Santa Catarina State) – UDESC and Masato Kobiyama, coordinator of the Research Group on Natural Disasters of the Hydraulic Research Institute from the Universidade Federal do Rio Grande do Sul (Federal University of Rio Grande do Sul) – UFRGS, are currently monitoring and working on the area of the canyons, with the aim of predicting where new risk areas could appear in the region. In addition, they work on knowledge dissemination and in the training of tourist guides.

E.3 MANAGEMENT

The organization responsible for the management of the Caminhos dos Cânions do Sul aspiring Geopark is the "Consórcio Intermunicipal Caminhos dos Cânions do Sul" (Intercounty Consortium Caminhos dos Cânions do Sul), created in 2017, which encompasses seven counties from two states of the federation, with the aim of strengthening the territorial management of the area, and promoting mutual collaboration between public and private institutions and regional, national and international agencies in order to achieve a common goal. The main mission of the Consortium is to contribute to the preservation, appreciation and promotion of the natural and cultural patrimony of the region, with a particular emphasis in its geological patrimony and traditional communities, deepening and spreading scientific knowledge, developing educational programs, and fomenting geotourism and the sustainable development in the territory.

The creation of the Consortium was a decision made by the local governments based on the Federal Constitution, and was done as a way to better manage and implement shared public policies. However, public consortiums in Brazil are defined as a "legal person composed

exclusively by Federation members (Union, States, Federal District, and Counties) pursuant to Law 11,107 of 2005, with the aim of stablishing federal cooperative relations of common interest, constituted as a public association with legal personality, or as a private legal person without economic purposes".

Due to the fact that the Consortium is composed exclusively by federation members, since associations between private and public institutions are not permitted, and having no other appropriate tools within Brazilian Legislation for the better management of the territory, it was decided that the only way for the community to participate in the organization of the project was through the creation of work groups. The first of these work groups was the tourism agencies one, for the organization and commercialization of the region's geotourism.

E.3.1 Master Plan

The CCSAG has a five years plan for numerous actions related to the following activities: geology and geopatrimony (geoconservation), landscape protection, geotourism and economy, agriculture and forestry. the Master Plan is contained in Annex 1 - self-evaluation form, item II 2.1

E.3.2 Organizational Structure

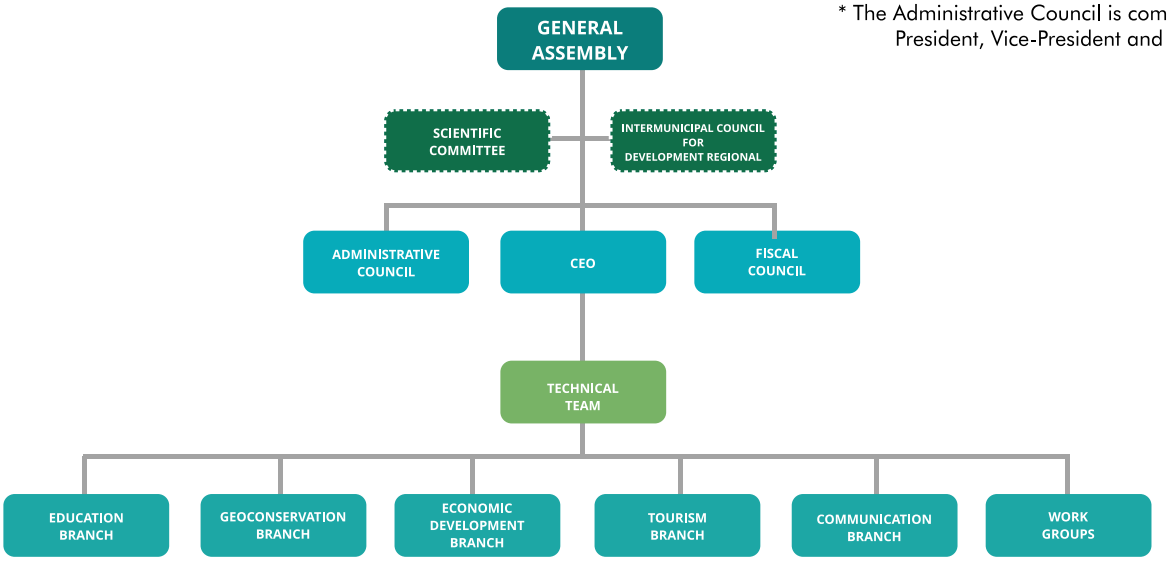
The organization structure of the Consortium encompasses the General Assembly, the Regional Development Intercounty Council, the Educational and Scientific Committee, the Administrative Council, the Technical Team and its branches, which are: education, geoconservation, economic development, communication, and work groups.

The General Assembly is the ruling body of the Consortium, containing the leaders of the executive powers, and is composed by one president, one vice-president, and a secretary, which are elected annually. The Regional Development Intercounty Council is still in constitution. The Administrative Council is the executive branch of the Consortium, alongside the Executive Board, which administrate and manage the Consortium according to the statute, its bylaws, and the decisions of the General Assembly. The Executive Board also coordinates the Technical Team. The Fiscal Council is the supervisory and advisory body, and is composed by three mayors, which are annually elected. The Educational and Scientific Committee is an advisory collegiate.

INTERMUNICIPAL CONSORTIUM CAMINHO DOS CÂNIONS DO SUL		
Mayor Name	**County**	**Role**
Valdionir da Rocha	Morro Grande/SC	President
Schamberlaen José Silvestre	Cambará do Sul/RS	Vice-President
João Batista Mezzari	Jacinto Machado/SC	Secretary
Dirceu Gonçalves Selau	Mampituba/RS	Fiscal Council
Roberto Biava	Timbé do Sul/SC	Fiscal Council
Henrique Matos Maciel	Praia Grande/SC	Fiscal Council
Carlos Alberto M. de Souza	Torres/RS	Consortium Member

Table 09 - Intermunicipal Consortium

* The Administrative Council is composed by: President, Vice-President and Secretary.



E.3.3 Technical team

With the exception of the Executive Director, who works exclusively for the Consortium, the Technical Team is composed of state employees that were ceded by its integrating counties, and have a specific workload as defined through ordinance. These employees accumulate functions both in their counties and in the Consortium.

However, accounting and legal services are done by a specialized agency, contracted by bidding. Such is the case for other specialized services, whose specialists are hired based on demand, such as: consultants for geology, tourism, designer, communication, translators, among other, whose professionals are included in the technical team for the duration of their work.

TECHNICAL TEAM	
Function	**Name**
Executive Director	Gislael Floriano
Technical Coordinator / Geologist / Sanitation Specialist	Maria Elisabeth da Rocha
Coordinator of the Tourism Branch / Graduate in Business Administration / Public and City Management Specialist / Graduated in Tourism Management	Edineia Maria Pallú
Coordinator of the Educational Branch / Undergrad in History	Fabiano Souza da Silva
Coordinator of the Communication Branch / Graduate in Social Communication – Public Relations / Communication Planning and Image Crisis Management Specialist	Priscila Ventura Gamba
Journalist / Specialist in Integrated Communication and Business	Itaionara Recco
Environmental Engineer	Amanda Rosa Crepaldi
Geologist	Henrique Venâncio Redivo
Agronomist / Seed Specialist	Eder Luis Dal Toé
Agricultural Technician / Law Student	Jorge Duarte Scandolara Júnior
Administrative Agent	Luciano Réus Pereira
Administrative Agent	Michelle Bertoti
Graduate in Tourism / Environmental Management Specialist	José Junior Ramos Mota
Graduate in Tourism	Daniela Daitx
Tourist Driver	Marcelo Biava
Tourist Driver	José Carlos Zanata
Graduate in History/ Afro-Brazilian History and Culture Specialist / Law student	Renata Carreira Corvino
Bachelor of Accounting Sciences	Francis Selau de Oliveira
Lawyer	Remi Scheffer da Silva

Table 10 - Technical team

The geologist Maria Elisabeth da Rocha, scientific coordinator, is exclusively dedicated to the geopark project. We would like to highlight the feminine presence in the management of the development processes of the Cânions do Sul geopark project, as three of the four currently filled management positions are held by women, who also compose practically 50% of the technical team.

E.3.4 Educational and Scientific Committee - ESC

Another important group that participates in the activities of the Consortium is the Educational and Scientific Committee – ESC, an advisory collegiate with a multidisciplinary composition. One of its main functions is to promote and conduct scientific studies in the territory of the Caminhos dos Cânions do Sul Aspiring Geopark (CCSAG).

EDUCATIONAL AND SCIENTIFIC COMMITTEE	
Name	**Performance Area and Representation**
Luiz Henrique Fragoas Pimenta (Scientific Coordinator)	PhD in Geography – Use and Conservation of Natural Resources – CAIPORA Cooperative for Nature Conservation
Carlyle Torres B. de Menezes	Degree in Mining Engineering, Masters in Mineral Resources, PhD in Mineral Engineering and Post-doc in Ecology – University of the Extreme Santa Catarina South – UNESC.
Carlos Augusto Brasil Peixoto	Degree in Geology, Specialization in Geology and Environment, MBA in Environmental Management, Masters in Geography-Environmental Analysis – Brazilian Geological Service – CPRM.
Carolina Braghirolli Stoll	Degree in Tourism, Masters in Tourism and Hospitality Management – Santa Catarina's Federal Institute – IFC – Sombrio Campus.
Claus Troger Pich	Degree in Biology, Masters in Genetics and Molecular Biology, PhD in Biotechnology, Post-doc in Cellular and Molecular Biology – Federal University of Santa Catarina – UFSC – Araranguá campus.
Christian Linck da Luz	Degree in Biology and Geography, Masters in Systematic Botany, PhD in Environmental Geography – Environmental Consultant at the Executive Secretariat of the Mampituba River Basin Committee.
Cristina Covello	Degree, Masters and PhD in Geography – Use and Conservation of Natural Resources.
Cristine Lopes de Abreu	Degree in Agronomic Engineering, Degree in Biology, Graduate in Geography, Degree and Masters in Agriculture – University of the Santa Catarina State – UDESC.
Daner Rosskamp Ferreira	Degree in Aquaculture Engineering, Degree in Geography, Masters in Aquaculture – University of the Santa Catarina State – UDESC.
Daniel Galvão Veronez Parizoto	Degree in Geography, Specialization in Disaster Risk Management, Masters in Geography, Environment and Development, PhD in Geography – Use and Conservation of Natural Resources – Federal University of Santa Catarina – UFSC.
Gabriela Camboim Rockett	Geographer and PhD in Marine Geology – Federal University of Rio Grande do Sul / North Coast Campus
Jairo Valdati	Degree and Masters in Geography, PhD in Environmental and Territory Geology (Physical Geography) – University of the Santa Catarina State – UDESC
Jaqueline Posser Gallina	Degree in History, Technologist in Cooperativism, Masters in Rural Extension – Santa Catarina's Federal Institute – IFC – Santa Rosa do Sul.
Leila Maria Vasquez Beltrão	Degree, Specialization, Masters and PhD in Geography – Urban and Regional Development – Santa Catarina's Federal Institute – IFC – Sombrio Campus.
Luiz Augusto Ferreira Verona	Degree in Agronomic Engineering, Specialization in Agroecology, Familiar Agriculture (and others), Masters and PhD in Vegetal Production, Post-doc in Construction and Use of Indicators of Sustainability.
Maria Carolina Villaça Gomes	Degree in Geography, Graduation, Masters and PhD in Physical Geography, Post-Doc in Geography – University of the Santa Catarina State – UDESC
Mario Jorge C. Coelho Freitas	Degree in Biology, Masters and PhD in Education. Brazilian Association of Scientific Research, Technology and Innovation for Reducing Risks and Disasters.
Marco Bimkowski Rossoni	Degree in Geology and Masters in Geochemistry – State Foundation of Environmental Protection Henrique Luis Roessler – FEPAM/RS.
Maurício Dalpiaz Melo	Degree and Masters in Geography – Use and Conservation of Natural Resources, Education Federal Institute IFSC – Araranguá Campus.
Michel Marques Godoy	Degree in Geology and Technician in Hydrology – Brazilian Geological Service – CPRM.

Orlando Ednei Ferretti	Degree, Masters and PhD in Geography – Federal University of Santa Catarina – UFSC
Samanta da Costa Cristiano	PhD in Marine Geology – Federal University of Rio Grande – FURG
Sung Chen Lin	Masters in Educational Policies and Systems, PhD in Geography – Educative Processes - GERED/SC
Silvia Regina T. Christóvão	Degree in History, Specialization in Contemporary History, Masters in History – Open University of Brazil – Praia Grande.
Valéria Veras	Degree in Sanitary and Environmental Engineering, Specialization in Geography – Regional and Urban Development, Work Safety Engineering and Hydrographic Basin Management – Federal University of Santa Catarina – UFSC.
Yasmim Rozzolli F. dos Santos	Degree in Geography, Masters student in Geography – Federal University of Santa Catarina – UFSC

Table 11 - Educational and Scientific Committee – ESC

E.3.5 Resources

The Intermunicipal Consortium Caminhos dos Cânions do Sul, which manages the Caminho dos Cânions do Sul Aspiring Geopark, has its own revenue in a monthly apportionment of R$ 3,000.00 (three thousand reais) per county. In total, a value of R$ 252,000.00 (two hundred and fifty-two thousand reais) is annually transferred to the Consortium's coffers. All money raised is being invested in the Caminho dos Cânions do Sul Aspiring Geopark.

As defined by the Consortium Statute, Art. 10, the General Assemblage meets in the fourth trimester of each term to evaluate and approve the Goals Plan and the Revenue and Expense Budget for the next term. They also elect the new members for the Management and Fiscal Council.

Another way that the Consortium acquires resources is through parliamentary amendments (quotas for state and federal deputies) or direct agreements with Ministries, though no such agreements have been made yet. However, perspectives for 2020 are encouraging, based on the results of many meetings throughout the year.

As the Consortium is a nonprofit public institution, it does not sell products.

Other forms of investment in the Geopark Project are the resources that individual counties invest in their basic and tourism infrastructure, sanitation, education, healthcare, agriculture, etc.

The resources allocated for 2019 were distributed among the following budget lines:

SERVICE	INVESTMENT
Maintenance and funding of the Consortium	R$ 147.999,00
Communication and Marketing	R$ 17.076,00
Promotion and Dissemination of Information about the Territory	R$ 25.000,00
Training	R$ 73.000,00
Miscellaneous investments	R$ 16.000,00
Partnerships with universities	R$ 35.000,00
TOTAL	**R$ 252.000,00**

Table 12 - Resources allocated for 2019

E.4 OVERLAPPING

In Brazil there are seven biosphere reserves, including the Atlantic Rainforest Biosphere Reserve (RBMA), which is the first Biosphere Reserve created in the country, between 1991 and 2008 covering 78,000,000ha (of which about 79% in land environments 21% in marine environments) across 17 states, including Rio Grande do Sul and Santa Catarina. Each Biosphere Reserve represents a set of natural environments that aims to make human activities compatible with the rational use of natural resources. The overlap in the territory of the Aspiring Geopark contributes positively to this process of territorial management, in pursuit of sustainable development, since a UNESCO Global Geopark also seeks to promote the geological processes, characteristics and relevant periods for the region, as well as historical subjects related to geology or its striking geological beauty.

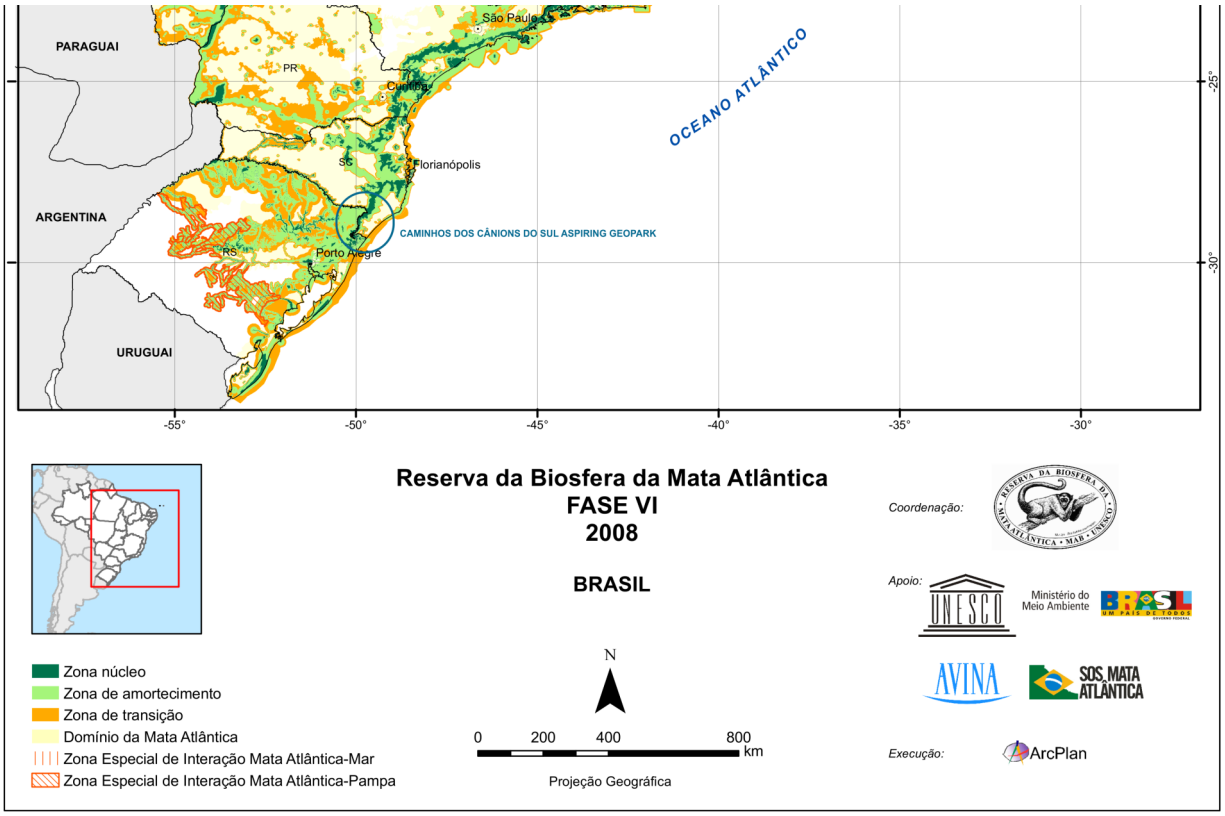


Figure 26 - Map Biosphere Reserve

E.5 EDUCATIONAL ACTIVITIES

Education is a practice that can reach many different parts of society. Thus, it is fair to consider it the main driving force of the CCSAG.

In the counties that correspond to the CCSAG territory, there is a total of 47 municipal schools, 22 state schools, and 5 private schools, encompassing Elementary School. Elementary School, High School and Youth and Adult Education. These schools serve students of various age groups and different social situations, with approximately 879 municipal teachers at their disposal.

To involve and publicize the importance of the Geopark in the territory, a work group was created by the Education Branch, which has representatives of each county of the territory, appointed by their respective education departments. This group has a coordinator that organizes the agenda and the meetings that take place every two months, within a pre-established agenda and with the possibility of extra meetings. In the meetings, project actions are discussed, planned, and evaluated. These discussions showed that our schools have already developed many projects in the sustainability, environment, culture, diversity. On the other hand, more actions need to be taken on the importance of geology, tourism, and the potential of material and immaterial heritage.

COUNTY	SCHOOLS			
	STATE SCHOOL	N° OF TEACHERS	MUNICIPAL SCHOOL	N° OF TEACHERS
Cambará do Sul	3	70	6	98
Mampituba	2	13	3	36
Torres	9	400	17	510
Morro Grande	1	29	3	40
Timbé do Sul	1	46	2	46
Jacinto Machado	3	92	10	97
Praia Grande	3	57	6	52
TOTAL	22	707	47	879

Table 13 - Schools

From the meetings with the Education Branch, it was possible to list a number of topics that need a deeper knowledge of the territory. Partnerships emerged with companies, public institutes, public and private universities for the training of education professionals about: UNESCO Global Geoparks and the potential for the development of educational activities, aspects of geology and geomorphology, palaeontology, archaeology and patrimonial education in the region of the CCSAG. In addition to online courses about geodiversity and archaeology, offered to the education professionals of the territory. During this period, approximately 600 professionals were trained.

From these encounters and trainings, it was noticed a particular engagement in the creation of projects, didactic sequences, showcases, events, field trips, and cultural activities that moved the region through the schools. It was defined by the Education Branch that three dates would be fundamental to promote the Geopark Project in the territory, to be included in the school calendar: the first is April 22 – Earth Day, with open fairs for the community, demonstrating the entire geodiversity of the territory, in addition to conscientization and preservation actions. June 05 – Environment Day, filed trips to study areas in need of preservation, seedling planting, giveaways of native seedlings and guided visits to the geosites. And September 27 – Tourism Day, with photographic competitions, lectures, and promotion of the tourism potential of the region. In addition, throughout the school year, various activities, such as visits to universities, museums, laboratories, and interviews with older residents were conducted, in order to preserve and protect the patrimony. These actions are carried out with a holistic focus on the natural and cultural value of the territory, based on the triad of geoconservation, geoeducation, and geotourism.

As a way of recording and archiving all activities developed in the schools of the territory, the project sends reports of the actions taken during the school year. These reports are archived in the schools and in the central library of the project. There is also an archive of publications about the territory.

In these modern times of technological innovations, social media are tools that can provide knowledge in a fast and more accessible manner. Thus, school activities are promoted in a way that contributes to the divulgation of the project.

A successful strategy developed by the Education Branch were the organization of training events that were carried out during the pedagogical week (week before the return to school in which the entire faculty receives training). Thus, it was possible to reach a great number of teachers, with partnerships with universities having been fundamental to enable the realization of these events.to school in which the entire faculty receives training). Thus, it was possible to reach a great number of teachers, with partnerships with universities having been fundamental to enable the realization of these events.

DATE	ACTIVITY	CONTENT DISCUSSED
December of 2013	**Geology and Regional Geomorphology Courses –** Praia Grande/SC*.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
August of 2015	**Geology and Regional Geomorphology Courses –** Cambará do Sul/RS.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
May of 2016	**Geology and Regional Geomorphology Courses –** Jacinto Machado/RS.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
May 09, 17, 26 and 31, 2017	**Geology and Regional Geomorphology Courses –** Mampituba/RS.	UNESCO Global Geoparks, Geology and Regional Geomorphology.
October 22 to 24, 2017	**1º Meeting of the Drivers from Aparados da Serra – Brazilan Canyons –** Jacinto Machado/SC.	First aid, venomous animals, geology, Geoparque Cânions do Sul Project.
March 20, 2018	**Introduction to geology for tour guides and drivers in the territory of the Cânions do Sul Geopark.**	Introduction to geology for tour guides and drivers.

Table 14 - Capacitation during pedagogical weeks

DATE	INSTITUTION	TRAINING	NUMBER OF TEACHERS TRAINED
February 2018	**Consulting Company (Geodiversidade)**	UNESCO Global Geoparks and their potential for the development of educational activities	221
February 2019	**Universidade do Contestado (Contestado University) – UnC – Mafra/ SC**	Natural History with an emphasis on Palaeontology	603
Fevereiro 2019	**Universidade do Extremo Sul Catarinense (Extreme Santa Catarina South University) (UNESC)**	Patrimonial education and regional archaeology	540

Table 15 - Teacher Training Courses 2018/2019

E.6 GEOTOURISM

The territory of the Caminhos dos Cânions do Sul Aspiring Geopark is already located in an area in which tourism is an important regional economic force. However, it is the aim of the Consortium to transform the area into the countries' most popular geotourism destination, something that would be strongly helped by the region's incorporation into UNESCO's Global Geoparks Network.

To fulfil this objective, the Aspiring Geopark implemented the first "georroteiro" of the territory, seeing as geotourism is a poorly known activity in Brazil. In the eyes of the population, this product is what was need to properly integrate the seven counties. In its first phase of implementation, two geosites in each county were considered, totalling fourteen geosites. The criteria that led to the selection of these geosites were: a) their geodiversity, biodiversity, and scientific importance; b) their potential for touristic attraction; c) their accessibility; and d) their access infrastructure. The total route comprises seven itineraries, and can be made in twelve days, though the tourist has the option of only partially experiencing it. The selected geosites will contain interpretative panels which will provide information regarding the area's geodiversity, biodiversity, history, culture, and a few curiosities, in addition to road and tourist signage.

Tourist amenities recommended in the route (hotels, inns, restaurants, coffee shops, transportation and leisure services, etc.) were selected mainly based on their geographic proximity to the geosites.

As a key factor for this project, the engagement of the community, the tourism sector, and of local guides is important. For such, training courses were provided to the public in order for them to understand what the georroteiro and its goals were, the latter of which beng to provide tourists with unique and unforgettable experiences as they learn about the evolution of the planet Earth through our geological patrimony.

Commercialization of the georroteiro will be done through local agencies, keeping in mind the project's philosophy of local sustainable development. Promotion of the route will be done through a partnership with the tourism sector and the Intercounty Consortium Caminhos dos Cânions do Sul, and will consist in its divulgation in the institutional website, in social media outlets, newspaper articles, participation in national and international tourism markets, etc. The launch was a great success, with the georroteiro being present at FESTURIS Gramado/RS – "Feira Internacional de Turismo" (International Tourism Fair), which is considered by the tourist trade the most effective business fair in Latin America. The event featured the presence of the Tourism Ministry, the President of the "Empresa Brasileira de Turismo" – EMBRATUR (Brazilian Tourism Company), the National Ecotourism Secretary, state and municipal authorities.

It is the hope of the Consortium that this will attract an ever-increasing number of tourists and visitors, providing the CCSAG alternatives to stimulate socioeconomic growth in the region and incentivize the creation of local businesses and craft industries involved with the area's tourism, in addition to making the territory a more competitive touristic destination with more diverse and interesting experiences.

Figure 27 - Georroteiro being present at International Tourism Fair

E.7.1 Sustainable Development Policy

The sustainable economic development of the seven counties that comprise the territory has at its core the creation of the Caminhos dos Cânions do Sul Aspiring Geopark. The project has been able to build in the community a sense of belonging, and this union makes them stronger. In other words, it has been working towards breaking long standing paradigms regarding intercounty competition and unit. Based on the concept that we are all one, the public policies that are currently being worked on aim for the promotion, conservation, research and dissemination of different aspects of the natural, historic and cultural patrimony of the territory. The sustainable development policies that promote the integration between important community entities and account for the public or private intersectoral territorial management agencies for the consolidation of the Aspiring Geopark were defined as follows:

>>> Geotourism and economy: increase in tourism infrastructure, attractions and geotourism products, and training of local guides and drivers. Foster and develop activities that seek to stimulate the socioeconomic development of the region and incentivize the creation of local businesses and craft industries involved with the area's tourism, community-based tourism, and overall make the territory a more attractive destination for tourists by providing a wide array of different and interesting experiences;

>>> Geoeducation: plans have already been made to include teachers, students and their families in events that seek to educate the population in the value of the geological, natural and cultural patrimony of the territory, in environmental conservation, and in the sustainable development of the region. With its large student audience, the CCSAG has been involved in the last two years with around 76 public schools (municipal and state), with a total of 12 thousand students, distributed among seven counties and two states: Santa Catarina and Rio Grande do Sul. The "Trabalho da Educação" Group (Education Work) has the responsibility of planning, supporting and overseeing the execution of the Educational Program of the Geopark to its counties. This program has as its objectives: give teachers and students the opportunity to know and understand the geological record of the CCSAG; contribute in the dissemination of knowledge about the aspiring geopark's natural and cultural patrimony to the schools in its territory; contribute in the training of teachers, administrators and students, incentivizing them to spread their newly gained knowledge about not only the world, but of good environmental practices; promote an open space for new pedagogical practices, as well as incentivize the creation of more didactic-pedagogical material; integrate, strengthen and streamline work in socio-educational networks; provide and support schools with practical experiences such as field trips, contributing to the valorisation and recognition of the cultural and natural patrimony of the region;

>>> Geology and geopa-trimony: conservation through actions that promote research and divulgation of the geosciences, particularly geology, geomorphology, and geoconservation;

>>> Landscape protection: promote the protection of the landscaped based on environmental education actions and the valorization of natural spaces by incorporating geological history to the existing natural and cultural narratives, in view of current legislation.

>>> Agriculture: stimulate and develop actions that allow for the development of farming activities, promoting mainly the strengthening of family and organic farming.

Numerous plans, partnerships and local and national strategies are fundamental to guide and integrate these actions, such as:

- The Federal Constitution of 1988;
- The 2030 Agenda for Sustainable Development;
- The 2018-2022 National Tourism Plan;
- The 2019-2021 Map of Brazilian Tourism, with its commitments and recommendations as established by the Ministry of Tourism;
- The "Programa Nacional de Fortalecimento da Agricultura Familiar" – PRONAF (National Program for Strengthening Family Farming)
- The Brazilian Forest Code

- Law n° 12,608, from April 10, 2012, that instituted the "Política Nacional de Proteção e Defesa Civil" – PNPDEC (National Policy for Civil Protection and Defence); it describes the "Sistema Nacional de Proteção e Defesa Civil" – SINPDEC (National System for civil Protection and Defence) and the "Conselho Nacional de Proteção e Defesa Civil" – SINPDEC (National Council of Civil Protection and Defence), and authorizes the creation of a disaster information and monitoring system;
- Law n° 9,985, from July 18, 2000, which implemented the "Sistema Nacional de Unidades de Consevação da Natureza" (National System of Nature Conservation Units) and gives other providences;
- Atlantic Forest Annual Project: Monitoring of the Aichi Goals – CDB 2020 in the Atlantic Forest Biome;
- Plans for the management of Protected Areas;
- Decree n° 6.040, from February 7, 2007, that installed the "Política Nacional de Desenvolvimento Sustentável dos Povos e Comunidades Tradicionais" – PNPCT (National Policies for the Sustainable Development of Traditional Communities and Populations) and other related legislations;
- Bylaw of the Indian – Law n° 6001, from December 19, 1973;
- Tourism Development Plans for the seven counties;
- Master Plan for the seven counties;
- Plan for the Annual Goals and Economic Development of the Consortium;
- The project is facing the difficult challenge of turning the territory into Brazil's main geotourism destination and promoting the socioeconomic development of the region through the valorization of its geological, historical and cultural patrimony. Guided by the technical and specific aspects of the plans and organizations described above, it will stay committed to continuously search for and obtain permanent opportunities and benefits for the local community.

E.7.2 Partnerships

The Caminhos dos Cânions do Sul Consortium has, since its inception, tirelessly sought to establish partnerships for the development and consolidation of the Cânions do Sul Geopark Project. Considering that the territory is very extensive and that the aim of the project is to empower the local community, it would be impossible to properly develop effective actions with only the technical team and resources of the Consortium. Thus, partnerships are essential and indispensable to reach the main objective of the project, which is the sustainable development of the region. Below is a list of some of the ongoing and prospecting partnerships:

- Local social and productive organizations that established a collaboration protocol with the Caminhos dos Cânions do Sul Aspiring Geopark. An example is the partnership consolidated with the "Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina" – Epagri (Agricultural Research and Rural Extension Company of Santa Catarina);
- Sustainable Tourism, with local guide and driver associations of the counties and associations linked to tourism that develop geotourism and training activities. A good example is the activities of the "Geopark Day", in which local communities can take guided tours to the geosites;
- Public institutions that have a thematic and/or territorial relationship with the Caminhos dos Cânions do Sul Aspiring Geopak: Ministries of Tourism, Agriculture and Environment, Municipal Councils of Tourism, Agriculture and Environment, "Associação dos Municípios do Extremo Sul Catarinense" – Amesc, (Association of the Municipalities of the Santa Catarina Extreme South), "Associação dos Municípios do Litoral Norte" – AMLINORTE (Association of the Municipalities of the Northern Coast), among many others. These institutions have the financial means to strengthen and develop tourism in the region. This implicates the integration of public management and planning agencies of national, regional and local scale into the project;
- Relevant academic institutions that signed cooperation terms with the Consortium for the development of research, teaching and extension:

Contestado University – UnC, Lutheran University of Brazil – ULBRA, Federal Institute of Santa Catarina – IFC, University of Southern Santa Catarina – UNSEC;

- The international Community, particularly UNESCO's Global Geoparks Network and the Latin America and Caribbean's Geopark Network.

The Geopark is developing a proceedings and criteria manual for dealings with local trades (hosting, restaurants, tourism agencies, guides, etc), in order to delineate the rules of potential partnerships, the use of the Aspiring Geopark Logo, the necessity of qualifying and meeting security requirements, etc. It is important to highlight that all enterprises in the territory of the project have already undergone some sort of training, awaiting only the formalization of partnerships.

An attractive for possible partnerships will be the visibility that will be given to partners of the project through the institutional website and official social media pages of the Aspiring Geopark, promotional materials, participation in fairs, etc.

E.7.3 Full And Effective Participation Of Local Communities And Indigenous Peoples

The traditional communities belonging to the territory of the Aspiring Geopark are the Indigenous Village Nhuu Porã, located in the Campo Bonito area, Torres/RS, and the Quilombola Community São Roque, located in Pedra Branca, Praia Grande/SC. The two communities combined make up to a total of 396 people, equivalent to 0.55% of the total population of the territory. The integration of the CCSAG with these communities is still in its early stages, and will require greater knowledge about their culture and traditions.

In the Torres county, there is an indigenous village of the Guarani ethnicity – the Nhuu Porã Village, located in Campo Bonito, near the BR 101. Around 216 people from 36 families live there, accounting for 0.3% of the total population in the CCSAG territory.

This village began as an indigenous settlement that installed itself beneath a fig tree in 1994, in the opposite margin of the BR-101, next to the Jacaré community. In 2008, due to the duplication of the BR-101, the Union acquired the area in which the village is currently located. At the time, they were 12 families. Currently, their territory encompasses 98 ha, and contains houses, a school in which are taught the regular curriculum and the Guarani Mbya language and culture, enough land for agriculture, and a water reservoir. There is still the need for the construction of a living centre and medical installations.

In Guarani tradition, men hunt, fish and gather, while women plant, harvest and prepare the food. However, due to the loss of their territories, their living habits have changed. The Guarani are led by their elders, known as Karaí (shamans), which deal with social and political matters as needed (IECAM, 2018).

Currently, their economic activities revolve around selling handcrafts made out of wood and straw. They practice subsistence agriculture, and occasionally receive baskets of goods from the government and other institutions

In meetings with their chief, the technical team of the project was informed that numerous agencies currently conduct activities in the village: Emater, such as the IECAM – Instituto de Estudos Culturais e Ambientais (Cultural and Environmental Studies Institute), IFSC – Instituto Federal de Santa Catarina (Santa Catarina's Federal Institute), etc. The Geopark project has approached these institutions with the intent of creating partnerships, in order to not only learn more about the culture and customs of the Guarani, but also to aid in fulfilling the needs of their society. We are currently developing a cooperation agreement with the IFSC for the following extension activity: "Gestão do conhecimento tradicional guarani: estratégias de resgate, valorização e divulgação por meio das Tecnologias de Informação e Comunicação - TIC" (Management of Guarani traditions: strategies for recovering, valuing, and divulging their culture through Information and Communication Technologies – ICT).

The São Roque Quilombola Community is located in the Pedra Branca region, which divides the counties of Praia Grande/SC and Mampituba/RS. Its construction took

place throughout the XIX century, with the flow of people from São Francisco de Paula and Campos de Cima da Serra towards the coastal region. The highlands were dedicated to cattle raising, and is where farmers and slaves lived. Many of the latter fled towards the coast, while others were sent to farms in the more fertile floodplains.(https://noticias.ufsc.br/2007/10/especial-pesquisa-ufsc-contribui-para-identificacao-de-comunidades-quilombolas-2/ Acessed: November 13, 2019)

Currently, around 30 families live in the area, which represent 0.25% of the population in the territory, which subsist by growing corn, beans and manioc, as well as providing crop services to other farms.

In May 2004, the association of the community was formed, and in June of the same year, the Palmares Foundation gave the community the title of "Comunidade Remanescente de Quilombos" (Remaining Community from Quilombos). Still in 2004, they were integrated to the "Núclero de Estudos Sobre Identidade e Relações Interétnicas – NUER" (Centre of Identity and Interethnic Relations Studies), connected to the Anthropology Department of UFSC, which began their studies in the area in January 2005, under the coordination of professor Ricardo Cid Fernandes. (https://noticias.ufsc.br/2007/10/especial-pesquisa-ufsc-contribui-para-identificacao-de-comunidades-quilombolas-2/ Acessed: November 13, 2019)

In 2018, the president of the National Institute of Colonization and Agrarian Reform, through Ordinance n° 1,483, recognized and declared as belonging to the São Roque Quilombola Territory an area of 7,327,6941 ha (seven thousand and twenty seven hectares, sixty nine ares, and forty one centiares), situated between the counties of Praia Grande, in the Santa Catarina state, and Mampituba, in the Rio Grande do Sul state.

However, from that total, only 4,658,8723 ha (four thousand, six hundred and fifty eight hectares, eighty seven ares and twenty three centiares) are properly regulated, which corresponds to the region identified and delimited by the São Roque Quilombola Territory, excluding the areas that overlap with the national parks Aparados da Serra and Serra Geral. Negotiations between the community and the government regarding these overlapping territories are still ongoing.

The relationship between the Geopark project and the São Roque community is incipient. Although there have been a few encounters with them, their adherence to the project is still not defined, as the Consortium will have to formalize the proceedings, which will also require the orientation of the anthropologists of the "Movimento Negro Unificado (MNU)" (Unified Black Movement). We believe that this relationship is important, as it will allow for the technical team of the Geopark project to obtain the necessary knowledge and proper channels in which to help the community prosper, within the possibilities and reach of the Consortium. The Consortium will also seek to properly explain the aim of the project to the community, and find in which way they can be involved in the actions of the Aspiring Geopark.

Currently, one of the ways in which these populations contribute to the project is through advisory and deliberative councils. The Indigenous Village Nhuu Porã, who have a seat in the Municipal Health Council of the Torres county, and the Quilambola Community is represented in the Advisory Council of the Aparados da Serra National Park, with headquarters at the Conservation Unit of the Chico Mendes Institute for Biodiversity Conservation-ICMBio in Cambará do Sul/RS.

E.8 NETWORKING

Throughout the creation process of the CCSAG, one of the set goals was to build a contact network to exchange experiences and information, as well as increase the number of potential opportunities available to the project. The events held in the territory, where managers, the technical team, and the community participated, were fundamental in providing an understanding about the inner workings of the UNESCO Global Geoparks, their challenges, and their importance. Below is a table with information about all activities in the territory.

DATE	INSTITUTION	PROJECT REPRESENTATIVE	PURPOSE OF THE ACTIVITY
October 07, 2011	**Araripe UNESCO Global Geopark**	Flávia Fernanda de Lima – Executive Secretary (at the time)	Lecture about the Araripe Geopark – Brazil
October 07, 2011	**Arouca UNESCO Global Geopark**	Dr. Artur Sá (Scientific Coordinator of the Arouca Geopark – Portugal, President of the "Faculdade de Ciências da Vida e do Ambiente" (College of Life and Environmental Sciences) of the "Univ. de Trá-os-Montes e Alto Douro" (University of Trás-os-Montes and Alto Douro), Coordinator of the UNESCO Geopark chair – Sustainable Regional Development and Healthy Lifestyles, and Member of the UNESCO Global Geopark Evaluator	Lecture about the Arouca Geopark
October 07, 2011	**UNESCO Portugal**	Elisabeth Silva (Head of the Science Sector of th National Commission of UNESCO – PT, Coordinator of the UNESCO Global Geoparks Portuguese Forum and Expert for the International Geosciences and Geoparks Program).	Lecture about UNESCO Global Geoparks
March 06, 2018	**Araripe UNESCO Global Geopark**	Dr. José Patrício Pereira Melo (Rector of the "Universidade Regional do Cariri" – URCA (Regional University of Cairi) and Member of the UNESCO Global Geoparks Program Council).	Lecture about UNESCO Global Geoparks and the Araripe Geopark
May 24, 2018	**Torotoro Aspiring Geopark**	1. Rodrigo Cybis Fontana (Geologist, Master in Geosciences, Masters Student in Sustainable Development, Geólogo, Chair in the Latin American Forum of Environmental Sciences UNESCO/Rede UNITWIN Argentina, PhD in Geosciences, Graduate Program of the "Universidade Federal do Rio Grande do Sul" (Federal University of Rio Grande do Sul), Brazil.	1º Technical-Scientific Encounter on Geoparks of Bolivia and Brazil.
May 24, 2018	**Aspirante Geopark Torotoro**	Gonzalo García Crispieri (President of the Dr. Manuel Garcia Capriles (MGC), one of the main organizations that pushed for the creation of the Andean Torotoro Geopark (Potosí, Bolivia). Architect and Master in Environment and Natural Resources Engineering – Universidad de Loyola (University of Loyola), La Paz, graduate in Governability and Political Management – Universidad del Valle (Valley University) – Universidad George Washington (George Washington University), and graduate in Conservation and Historical Building Management – Universidad de Lund (Lund University), Sweden).	1º Technical-Scientific Encounter on Geoparks of Bolivia and Brazil
May 24, 2018	**Aspirante Geopark Torotoro**	Rualdo Menegat (Professor in the Paleontology and Stratigraphy Department of the Geosciences Institute of the UFRGS, geologists, Master in Geosciences (UFRGS) PhD in Sciences in the Area of Landscape Ecology (UFRGS), Honoris Causa Causa (UPAB, Peru). Scientific advisor for the National Geographic Brazil, member of the UNESCO/Unitwin Network board – Latin-American of Environmental Sciences Forum (FLACAM), honorary member of the National Forum of Geology Courses, member of the International Geological Science Union (INHIGEO-IUGS) and President of the Brazilian Session of the International Association for Geoethics (IAGETH)).	1º Technical-Scientific Encounter on Geoparks of Bolivia and Brazil

Table 16 - Networking in the Geoparque Cânions do Sul territory

Equally important were the opportunities for experiences that the technical team obtained through technical visits, participation in lectures, meetings, conferences and internships, as detailed in the table below:

PERIOD	INSTITUTION	REPRESENTATIVE	PURPOSE OF THE ACTIVITY
October 24, 2018	**Arouca UNESCO Global Geopark**	Ana Lúcia de Lima (Technical Team Turismologist)	Technical visit
October, 2018	**Nazionale and Sesia Val Grande UNESCO Global Geopark and Naturale Adamello Brenta UNESCO Global Geopark**	Bruna Teresa (Consortium intern)	Technical visit
November 08 and 09, 2018	**Seridó Aspiring Geopark/RN, Brazil.**	Fabiano Souza (Coordinator of the Education Branch of the Consortium)	Participation in the I Potiguar Encounter of the Seridó Geopark (lecturer).
February 24-27, 2019	**Araripe UNESCO Global Geopark/CE, Brazil**	Gislael Floriano (Executive Director of the Consortium)	Participation in the 1° Summer School Araripe Geopark Course (lecturer) and V Reunion of the Latin America and Caribbean Geopark Network.
September 02-30, 2019	**Arouca UNESCO Global Geopark**	Edinéia Maria Pallú (Coordinator of the Tourism Branch – Technical Team)	Professional internship
September 25-27, 2019	**15° European Conference of Geoparks, Sevillha/ES**	Edinéia Maria Pallú (Coordinator of the Tourism Branch – Technical Team)	Participation in the 15° European Geopark Conference
November 05-08, 2019	**Grutas del Palácio UNESCO Global Geopark**	Maria Elisabeth da Rocha (Geologist of the technical team of the Consortium)	Participation in the V Latin-American and Caribbean Symposium about Geopark – Uruguay. Reunion of the Latin America and Caribbean Geopark Network.

Table 17 - Networking Table for the Technical Team of the Cânions do Sul Geopark

E.9 SELLING OF GEOLOGICAL MATERIAL

CCSAG is not involved in the sale of geological material. The materials extracted by mining companies are used in construction and public works and are in accordance with the legislation in force in our country. In Brazil, mineral deposits are considered public goods, extracted by state concession. To obtain the concession, companies must be formally constituted for this purpose and the legislation requires compliance with rules and conditions. Such requirements include so-called environmental conditions, which must be strictly met for licensing to occur.

F. INTEREST AND ARGUMENTS FOR BECOMING A UNESCO GLOBAL GEOPARK

The CCSAG has been building its history since 2007. In the beginning, the territory was formed by 2 counties, later it reached 19 and, in 2017, it was consolidated with 7 counties. Throughout this process, hard work and dedication guided the actions, which were gradually being expanded. Many institutions have headed the project management and made no effort to reach the current stage. From 2017, with a formally constituted management structure, the project has positioned itself as an Aspiring UNESCO Global Geopark, following a territorial development strategy, made with people and for people, based on the recommendations and concepts of protection, education and sustainable development. Investments were made in studies, training, and promotion of the territory, through geotourism (creating an itinerary), education (school activities and environmental education) and science (technical cooperation with universities and other entities), providing opportunities for growth for the society.

These advancements are the result of the effort and commitment of the technical team in partnership with the scientific committee, which brings together specialists from different areas, both supported by the consortium managers, who converge to promote the sustainable development of the territory. These actions, as developed so far, have as main focus to bring the knowledge of geosciences to the local population, seeking the enhancement and protection of geological heritage, geoconservation, landscape protection, as a way to foster the development of tourism, economy, sustainable agriculture and, consequently, improving the living conditions of communities.

The region has a scenery with beautiful landscapes, formed by the largest canyons of Latin America, rivers and waterfalls, dunes, lagoons, swamps, the Atlantic Rainforest, rocky shores, a small island used by fur seals and other marine animals to rest, pinnipeds, beaches and other natural features. These features attract a large number of national and international tourists, mainly promoting ecotourism. The territory has 10 legally constituted Conservation Units, 6 of which are fully protected, a fact that guarantees the preservation and conservation of the natural heritage. CCSAG still has the privilege of being fully inserted in the Biosphere Reserve due to its exceptional biodiversity.

The possibility of the territory being granted the status of a UNESCO Global Geopark is widely welcomed by the inhabitants, who see in this process the opportunity to enhance the local economy, attracting qualified public to the region. The school community is also absolutely involved with the proposal, considering the excellent work being done to sensitize students and promote geosciences.

This set of factors highlights the strengths of our development strategy, with its aspiring status as an UNESCO Global Geopark reinforcing, consolidating and broadening the commitment made with the population to advance the idea of Geopark as an empowerment path to the local communities, protecting, educating and interacting with the natural and cultural heritage in a sustainable way.