

The spa space over time - the case of the São Pedro do Sul medical spa (Portugal)

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Abstract. São Pedro do Sul medical spa facilities are supplied by natural hot mineral water, from several groundwater abstractions, one of which is a natural hot spring with a temperature around 68.6°C, maintaining a constant flow of about 10 L/s, as registered in the last decades, although it can be likely that, according to the available data, this flow and temperature has presented itself steady for past millenniums. Well, a natural resource, with these characteristics, was certainly a motive of search and likely even disputes most probably since the time of the last glaciation, more than 10,000 years ago, in which the entire region where São Pedro do Sul is currently located, it would have been essentially covered by snow. This situation, since the most ancient times, has had an almost constant occupation leading to various constructions that suffered metamorphoses over time, with perfect evidence found at the time of the Romans, around 2000 years ago, later during the reign of the first king of Portugal (King Afonso Henriques) around 1169 A.D, ending at the time period of the last Portuguese Queen (Queen D. Amélia), around 120 years ago. Currently, the São Pedro do Sul medical spa has two bathing facilities operating simultaneously: the Thermal Center (known today as D. Afonso Henriques Bathhouse), and Rainha D. Amélia Bathhouse. It has been the Medical Spa of Portugal that has had the most revenues for several decades, having already exceeded in some years the 5.000.000 € /year, essentially from the classical health thermalism, although in the concession it is also officially stated the use of wellness thermalism, the sale of cosmetic products and the sale of energy from the heat produced by the resource. Thus, due to the importance of this resource, it is fundamental to have research on the various areas of knowledge associated with it. In the present paper, after a brief presentation of factual elements about the place, characteristics of the resource, and economic elements, an explanation is made about the place and equipment for the exploitation of the resource, presenting elements about the human occupation around it, throughout the time, showing finally, the actual panorama of the organization of the thermal space, between the Bathhouses and other types of equipment, as hotels, gardens, leisure spaces, and others, of the area of the São Pedro do Sul medical Spa.

1. Introduction

In the present paper, there is the objective of highlighting the evidence of how the birth of a special urban place, as it is the case of a health and leisure spa, starts by the fact that, in this particular place, there is an available natural resource, special by the fact that, there is a natural hot groundwater in it, in a region where this occurrence is an exception. Now, because this natural resource is really uncommon and special, it ended up imposing itself naturally, in relation to the development of local human society. At this location, people have settled in, from an early age in terms of human civilization; over time, a function of local and regional human history, relations between man and the place have developed, leading to significant changes over time. Now, according to the importance of this phenomenon, it is necessary, to investigate, clarify, and based on these investigations, design better the future, in terms of various interventions to be made, including urban planning, architectural, and others, in order to achieve the most sustained development of the location.

The region under analysis, corresponds to the "Hydromineral and Geothermal Field of São Pedro do Sul - HGFSPS", traditionally designated as São Pedro do Sul medical spa, which according to Portuguese laws, namely Law no. 54 of 2015 [1] corresponds to a Concession of a geological resource (hot natural mineral water) with official licensing for two major groups of applications: i) medicinal uses, associated with thermalism, with balneotherapy and related practices, ii) geothermal uses with geo-heat (thermal energy) to heat buildings, heat sanitary waters, and heat greenhouses for the production of tropical fruits. Some elements on the hydrogeological characteristics of the place and the applications of the resource can be observed in several published works [2,3,4,5] about São Pedro do Sul medical spa. The resource is underground water that due to its chemical characteristics is called bicarbonate-sodic sulphurous water, with a total mineralization of about 360 mg/L, presenting characteristic pH values (higher than 8.0), relatively significant fluoride concentrations (≈ 18 mg/L), and silica (≈ 70 mg/L), including sulphur in its smallest form ($\text{HS}^- \approx 3.5$ mg/L), and also presenting a total sulphuration of about 20mL/L, with a typical "rotten eggs" smell. The places of the two existing natural hot mineral springs (Traditional Spring and Vau Spring), and also the location of an ancient Castro, known as Bath Castro, as well as the old Roman baths (Roman Bathhouse), and the current operating baths (Queen Amélia Bathhouse and Thermal Center) are shown in Figure 1.

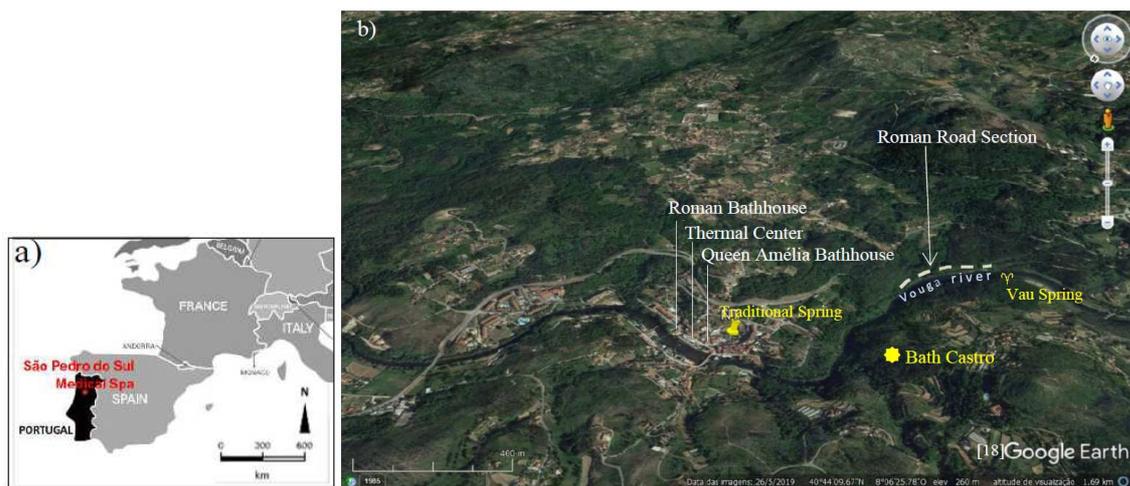


Figure 1. Geographic setting of the "Hydromineral and Geothermal Field of São Pedro do Sul- HGFSPS" (a), and its natural springs, as well as of the old Bath Castro and of the Thermal Bathhouses (b).

In order to show the importance of the place in economic terms, it is presented in Figure 2: i) the evolution of users in classical thermalism and revenues, over about 3 decades; ii) the energy consumption and respective revenues from the natural heat, which one of the main local hotels uses

(Hotel do Parque); iii) and still, the number of units of cosmetic products with origin in natural mineral water and respective revenues, since this application began. It is emphasized, for example, the fact that the number of users in classical thermalism reached about 25000 people in 2001, and also the fact of the revenues in thermalism, from treatments (baths, showers, inhalations, and others) have reached, in several years, annual amounts of about 5×10^6 euros. Well, these numbers show the economic importance of the place, which despite being small, and in the interior of Portugal, attracts many people; such occurrence leads to more demand in the area of hotels (hospitality, accommodation), restaurants, tourism and in particular urban occupation, resulting in some issues, given that any decisions about the local, to be made must always be carefully considered, since in the field of Natural Springs, there is always the potential risk of contamination. Should that occur and under Portuguese law, the medical space would be closed, causing everything around it would wither and die. So it is truly important to analyse everything that has happened over time in the location of these natural springs, as this has been the starting point of what is nowadays the region.

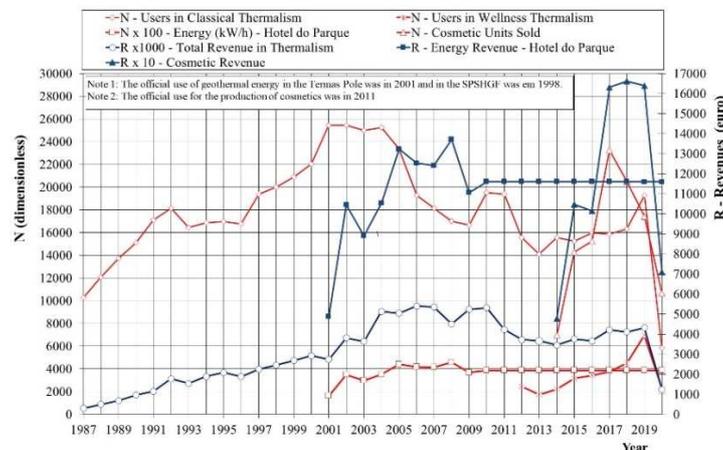


Figure 2. Evolution of the main applications of the geological resources of the HGFSPS.

2. Previous situation to the time of Roman occupation

In the Palaeolithic, the initial phase of prehistory, the first hominids appeared, and with them the dislocation to lands with warmer climates or natural resources. The main characteristic of those people was their ability to make use of the most basic resources provided by nature. Those people hunted, gathered, controlled fire, and executed instruments of chipped stone, wood and bone (knives and axes). Since they needed to keep warm, they took advantage of the heat they made with stones and pieces of wood, but also of the heat available in places where it spontaneously appeared, such as the heat of groundwater from natural springs, to heat their homes (shelters), their food, using it to wash some food and even to treat wounds. Probably, the Traditional Spring [5], was the anchor of an interesting group of people during the last glaciation (Wurnian, about 10000 years ago or more) because, the fact that the water springs sprout at about 68°C , would attract the human communities of that time, in order to use this water spring for heating the interior of a large hut or shelter of the time (Fig.3); that image was inspired by debris found in excavations inside the Traditional Spring (Fig. 3c) when it was being improved [6]. Subsequently, it was perhaps at the end of the Bronze Age, about 4000 years ago, that the territory of the natural hot spring of São Pedro do Sul had significant activity. The group of settlements in Beira Alta (region, where São Pedro do Sul, is inserted) is dated from this period, having had acquired importance and a set of characteristics, seeming to have its own individuality [8]. It was during this period that the Bath Castro (Fig.4) appeared, located on the right bank of the Vouga River, and about 400 m from the Traditional Spring, which is currently the most important but still so, very close to the Vau Spring, located on the same riverbank, where the Bath Castro is situated (Fig.1b). The Bath Castro, according to Cortesão [9], is "*perhaps the most archaic of the Castro settlements that ever visited ... it is the Citânia do Banho ... which on one side overlooks*

the Vouga valley and one of its tributaries there the dwellings are dug out of the rock... one of these dwellings, completely embedded in the rock, even has the appearance of a noble cave or furna... In spite of its primitive ruggedness, this settlement was romanized...". It is worth pointing out the existence of stairs in the streets of the Castro, facing the hillside that serves the Vouga River, probably to gain access to the river and from there navigate to the hot springs, taking advantage of the water for what would have been the thermal treatments of the time.

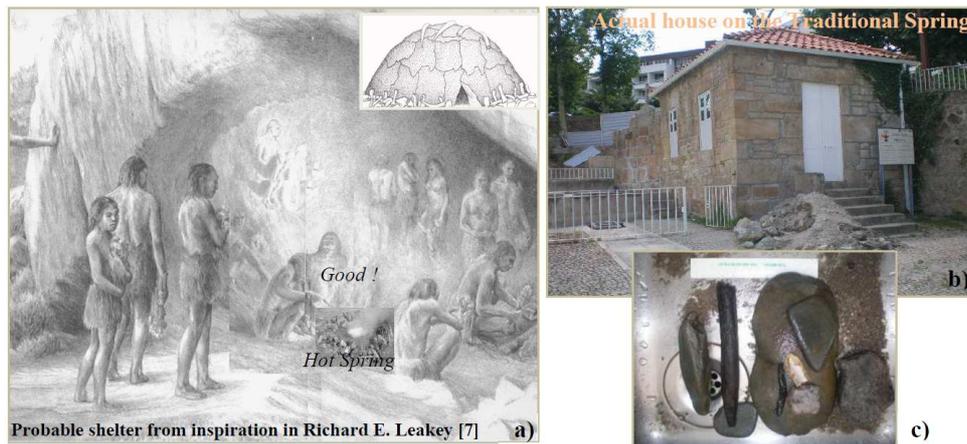


Figure 3. Elements on the primordial use of the natural hot water of the S. Pedro do Sul medical spa area: a) probable perspective of living in the Traditional Spring area, about 10 000 years ago or more, during the last glaciation phase that reached the territory that is currently Portugal (according to Ferreira Gomes [5]); b) exterior view of the actual house on the Traditional Spring; c) remains of materials found inside the Traditional Spring abstraction.



Figure 4. Elements of the Bath Castro: a) Ruins of a house in the Bath Castro; b) View from the Bath Castro, towards the medical spa area [10].

3. The Roman Bathhouse

The Romans started the invasion of the Iberian Peninsula in 218 B.C., and, with this process, the whole society and economy suffered alterations [10]. The Roman way of life settled in the Peninsula and in the Bath Castro region, leading to the abandonment of the highest positions (where the settlements were installed) to move to the plain, thus changing the people's habits. Road networks were built in the territory that is now Portugal, and new spaces were created and developed, such as the area close to the Traditional Spring, leading to the construction of a bath (the Roman Bathhouse), which also coexisted for some time with the Bath Castro settlement. The Roman bathhouse, on the left bank of the Vouga River, about 135m away from the Traditional Spring, is attributed to the Romans (1st century B.C.), confirmed by the name “Balneum”, the name from which the word bath derives, for which the place became known after those people left, as well as the ruins and archaeological remains that have survived until today (Fig.5). Excavations have uncovered Ionic columns, shafts,

capitals, several pools, P1 (cold water pool) and P3 (indoor hot or tepid water pool), as well as a votive inscription to the god Mercury. The first installations dating from the 1st century A.D.; indicate that they were small, modest baths, with a simple functional scheme, with only the essentials, without large entrances, private rooms, waiting rooms, meeting rooms, nor promenades. It was a building consisting of a single floor, built in a cohesive way, as a single block, non-deformable. It did not obey, therefore, a strict metric, and was characterized by the succession of spaces created, that is, by the path the user took. There was no hypocaust or heated walls because the water itself, which sprang up at a temperature of above 60°C, arrived hot at the bathhouse (and needed cooling) and therefore also heating the interior environment. With a retrograde circulation that dominated in small baths, the absence of some compartments meant that certain rooms replaced others. That building suffered immense changes over time. It also shows the Nordic influence in which the longitudinal layout prevails, and the organization of the hot rooms is done in blocks and the hot and cold-water system is well defined. In the spatial question, alongside the characterization of the thermal water or its degree of sacralization was very important and contributed to the differences in the internal composition. However, this was already a building that according to Frade and Moreira [11], made a distinction of the types of baths by gender, that is, there were baths for men and baths for women. In the case of these small installations, and if they could not be held in different rooms, the baths would be held at different times. Because of the internal organization of the various spaces and the understanding of the practices that took place there, this building constitutes the best example in Portugal of what was a Roman medicinal bathhouse [10].

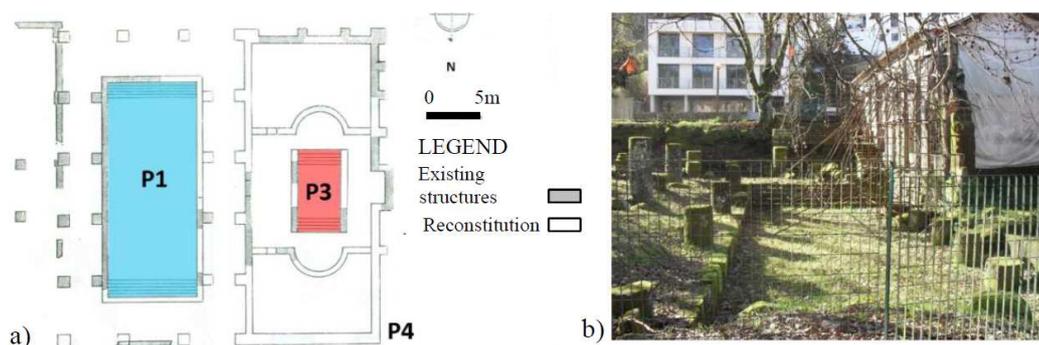


Figure 5. Elements of the Roman Bathhouse: a) plan of the building beginning in 100 A.D. [11], b) view from the north side showing essentially the remains of the outdoor pool [10].

With the fall and dismemberment of the Roman Empire, there is an interruption in the life of the Caldas Lafonenses baths (so, called since the 12th century) [10]. On this date, the Bathhouse was frequented by illustrious figures of the Portuguese court, among which stands out, the first Portuguese king (Afonso Henriques). In 1169, the first Monarch of Portugal, was in lands of Lafões, to treat a fracture that he had suffered in a leg during the battle of Badajoz. His presence greatly changed the functioning and the life of Caldas Lafonenses region and of the building mentioned (3rd alteration) in such a way that these baths were forever associated with the first king of Portugal. These early centuries were periods with dictatorships and invasions, especially barbarian invasions. In this phase, the foundations for an architecture that accentuates above all heavy relationships, the architectural taste for raw material and rough stones begin. In this building, which was already an existing building, there was a need to adapt not only the building itself to the needs of the time but also to the taste of the people, and, with this 3rd alteration/extension, there is an interruption of cohesion (due to the small extensions), of lightness, demonstrating a regression and a not clear conscience of the spatial composition. The spaces become variations of the same theme, and without radical interventions. The walls are straight. The roofs and floors are basic and rudimentary, and the length and width vary a little according to the needs. It is an architecture that expresses itself more in terms of skeleton, strong, and without the “dermis” constituted by adornments. In medieval times, the bathhouse was assumed as a public space (of general use by the community). They were community buildings in this period and

the volumetry of the buildings increased timidly in height. The royal, municipal, and statutory powers assumed a dynamic attitude in the organization of the whole space, ordering the construction, expansion and opening of streets, constructing buildings and equipment. They disciplined the external appearance of buildings, their alignment levels, the uniformity of their frontages, structures and construction materials. Subsequently with King D. Manuel I, the baths underwent several alterations, not only at the social level but also at the building level, through several enlargements (the 4th and 5th alterations). For several centuries, the planimetric arrangements of the baths' nucleus have contoured, integrated, and altered the Roman baths, their area and volumetry, being this one subjected to internal transformations, expansion works, made necessary by the influx of users and hygienic impositions. The building, as an entity in itself, had Roman architectonic characteristics at its base however, in the Manueline period, the various enlargements were the reflection of a class that received treatments in it. The solution adopted in this group seems to have been initially the construction of the walls and pavements in granite (taking advantage of the existing bathing area from the Roman period) up to the ceiling of the first floor, and the use of wood and adobe at the upper level (with the creation of the upstairs floor). It is also worth mentioning the enlargement of the building to the side, between P1 and P3, with the creation of a hospital and a chapel. This 4th expansion took advantage of the double height of the building destined for the baths. In the 17th century, the Baths underwent new changes. In 1684, under the guidance of King D. Pedro of Portugal, the hospital was subjected to new expansion works, probably the 5th alteration. From a functional point of view, the creation of two floors allowed, in part, to differentiate a treatment area, a rest area, and also differentiate the private sphere from the social sphere. The increasing elevation of the buildings presented great benefits, but also imposed greater demands in terms of construction techniques and materials. This type of building, to which successive constructions were added, formed an example of a multicellular two-story building, broad, stocky, with a marked horizontality, the result of successive additions of distinct modules, caused by the increase in the demand for patients, of nobles and monarchy, and the demand for comfort by urban elites that marked the end of the Middle Ages. From this initial bathhouse, which had differentiated spaces, classes and genders, with a modest architecture, there was little left and the number of users was decreasing. Thus, the functions with bath activities of that building were subsequently abandoned, and transferred to a new bathhouse, built in 1884. In the 50s of the 20th century, the building, now without the practices of thermalism, was adapted to accommodate an Elementary School, and later, in the 60's, it was adapted to a Coffee shop until it was completely closed. After, the building, after being abandoned and suffering floods from the Vouga River, ended up in complete ruin. This building and associated space, meanwhile, became the target of archaeological excavations and studies, namely by Frade in 2000 [10], which led to the perception of the various changes over time, with the presentation of several documents of great quality how is it exemplified in Figure 6, and that led to better knowledge about the occupation of the place, besides having been also a great contribution, for its rehabilitation. Following, and with the impetus of those studies, the Municipality of S. Pedro do Sul, together with other entities associated to culture and heritage preservation at a national level, developed a project to recover the said building for a museum of purely observational character, authored by the Architect Mendes Ribeiro [12]. The inauguration of this building (Fig.7), as the Museum "Roman Bathhouse", was recently held in 2019/08/07 [13], with a ceremony, presided over by the Minister of Culture of Portugal.

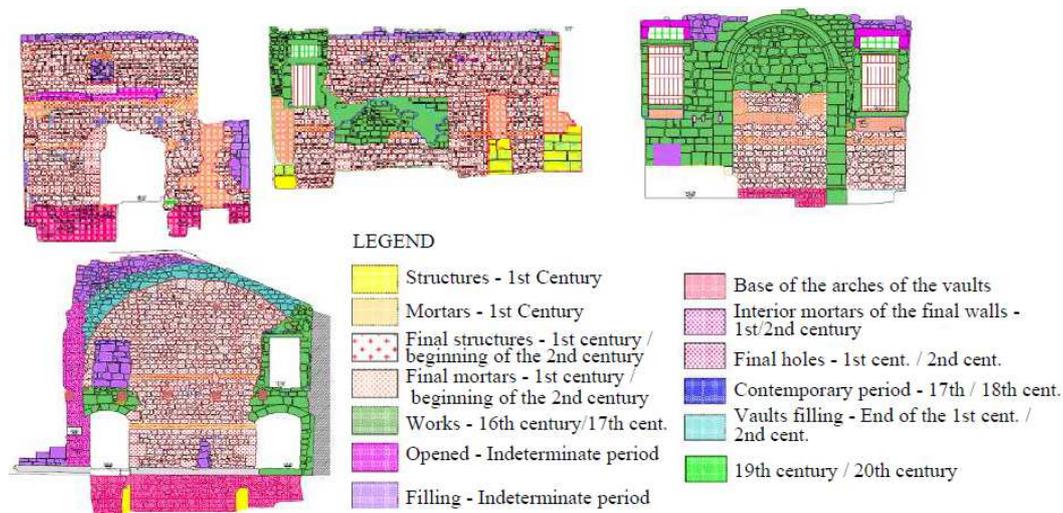


Figure 6. Examples of images resulting from the study of the morphological and stratigraphic evolution of the Roman baths over time, in the area of S.P.Sul medical spa (by Frade, in 2000, in [11]).

4. Bathhouses in operation: Queen D^a Amélia and Thermal Centre

When looking at the 19th century, it can be seen, especially in Europe, that the most striking feature is a new developed and dynamic landscape. The introduction into architecture of new materials and new construction techniques is the most significant manifestation in the field of construction, of the 19th century culture, and, not being a merely technical phenomenon, marks the clear passage between the past and the present of architectural history, without which it is impossible to think of the birth of the Modern Movement [10]. In the last two decades of the 19th century, the baths that were in the process of development underwent a profound transformation, both at the functional and material level, thus appearing, in 1884, the new Bathhouse, commissioned by the Municipality of São Pedro do Sul, and which came to be called, later, Queen D^a Amélia Bathhouse (Fig.7). The Queen D^a Amélia Bathhouse was in full operation for a century, although, it was progressively improved in the 19th century, through expansions and alterations, namely when Queen D^a Amélia visited again. The building, with a large reception room and well-organized spaces, was a landmark in the architecture of the time; it had two symmetrical wings, connected by a vestibule, with well-lit and spacious sanitary installations at the time which impressed bathers. It was a structured building, with rules, disciplined and very modern for the time. In 1909, a casino was installed on the upper floor of the Queen D^a Amélia Bathhouse, consisting of ballroom, toilets, buffet, billiard room, and reading room. In 1910, the casino was remodelled. In 1914, the building was subjected to works and a new right-wing was built, with a showers room, connected to six rooms with bathtub and a large inhalations room and another one for sprayings and submerged showers. However as the years go by, the materials wear out, and fashions evolves, and so several works were carried out, as in 1936 when the conclusion of a new remodelling is marked, namely of its atrium. The fame of the thermal waters of São Pedro do Sul, during the 20th century, was successively increasing, and successively increasing the affluence of users, leading to the necessity of creating a new Bathhouse. That ended up happening in 1987, with the birth of the Thermal Centre (Fig.7). Thus, the use of Queen D^aAmélia Bathhouse was gradually abandoned, ceasing functions at that time as baths, with the beginning of the operation of the Thermal Centre. Meanwhile, in 1998, a new remodelling of Queen D^aAmélia Bathhouse starts, recovering it and adapting its bath equipment to become adequate to the users' needs. The S. Pedro do Sul Baths, due to its grandeur, became like this, since the year 2002, with two bathhouses operating simultaneously, a situation at the time unprecedented in Portugal. The Thermal Centre, or better known today as D. Afonso Henriques Bathhouse, includes other treatments that the Queen D^a Amélia Bathhouse does not have, such as Physiotherapy and Balneotherapy in large pools, with excellent views, to the Vouga

River, which is contiguous. Some detailed elements about the interior architecture and its equipment can be observed in works by Carriço, in 2013 [10,14].



Figure 7. Images of the territory of the bathhouses of São Pedro do Sul medical spa, with implantation of the bathhouses in relation to the Traditional Spring: 1) Museum of the Roman Bathhouse, 2) Queen D^a Amélia Bathhouse. and 3) Thermal Center (D. Afonso Henriques Bathhouse).

5. The organization of the spa space territory

The main organization of the spa territory of the HGFSPS, is an immediate consequence of the natural location of origin of the thermal springs, and the political and related actions of the local power and even of the central power. For natural reasons the HGFSPS is organized in two great sectors: the Spa Pole, more to the north, where the Traditional Spring occurs, and the Vau Pole, to the south, with a spring but of little significance in terms of natural flow. The Spa Pole, nowadays is linked by the fact that there are two bathhouses functioning there, throughout the year, in thermalism activities. The Vau Pole is characterized by the use of geothermal energy for the climatization of tropical fruit greenhouses. In technical terms, currently in S. Pedro do Sul, it is common understanding that the HGFSPS corresponds to the territory of about 980ha, which corresponds to the territory integrated in the Protection Perimeter of the resource [2], and that includes three areas: Immediate Zone, Intermediate Zone and Extended Zone. Those protection zones are safeguarded by the impositions foreseen in the Portuguese law [1], but there are some difficulties in fulfilling these impositions completely, since there is already improper occupation at the site, probably given it was the site of installation of Roman people. The current scenario constitutes an urban occupation with a lot of significance in the area of the Traditional Spring, as shown in Figure 7, with greater difficulty consequently in “reorganizing the territory”, and that is, only possible, with studies and technical analysis -scientific case by case, which will arise, when there is a need to make improvements/modifications to existing houses, or to build a new hotel, or any other equipment that is intended; the prohibitions are easily imposed, when the technical-scientific analysis of the impact of each case is clearly of pernicious potential to the quality of the resource of the aquifer system which supplies the springs.

In order to facilitate the aforementioned reorganization and management of the territory of spa areas, the Portuguese law [15] leaves open the possibility of instituting a figure called "Territorial Delimitation of the medical spa", in order to harmonize the activities of the baths, in that area of the territory, with the various occupations and activities that may take place there. The Municipality of São Pedro do Sul, the managing entity of the local territory, is committed to having a working instrument, in order to manage the territory favouring of the defence of the resource and the adequate coexistence of the various activities, made a study [16], which was approved by the central power, with publication in Portuguese law [17], which among others, presents the coordinates of the polyline to defines the Territorial Delimitation of the Medical Spa. This document [16], in addition to a basic descriptive memory, presented a set of separate maps, of which the “Plan for the location of tourism, spa and leisure units stands out, as it allows a view of the main players and spaces in the area where the resource is exploited; in Figure 8, an extract of it is shown, where it is possible to observe the various components of occupation of the territory for that space, namely the location of the

Bathhouses, hotels, leisure and sports spaces, as well as elements of the walking and hiking routes environmental interpretation that can be enjoyed in the area. The elements that characterize the territorial space of the São Pedro do Sul medical Spa are: i) the existence of the two bathhouses closer to each other, both owned by the municipality of São Pedro do Sul and separated by a street; ii) the existence around the bathhouses of about 23 privately owned hotels; iii) an urban patch of private houses and flats, in a tangle of narrow alleys in the central area, interspersed with some restaurants and traditional commerce shops, especially in the square in front of the Queen D^a Amélia Bathhouse (Fig.7, Fig.8); iv) existence of some green spaces and gardens, notably: a) the Thermal Garden, in the Traditional Spring area (P2, Fig.8), which was leafier in the past and where there was even a wonderful space with banana trees (unique as they are typical of tropical climates), but which has been simplified, to minimize the potential negative impact on the aquifer system), b) the garden on the left bank of the Vouga River, with development from the area of the Inatel Palace Hotel to the Museum (old Roman Bathhouse), c) the gardens on the right bank of the Vouga River, with some associated car parks; v) the Vouga River, which flows from east to west, with a small lock, allowing a mirror of water that ennobles the whole place; vi) the three bridges over the Vouga River, one further west, which that serves the Municipal Road - EM (for conditioned traffic and pedestrians) and the other two to the east of the former, which serve only pedestrians, making the two banks very close for spa users and tourists; vii) finally, the road axes: a) the EM that some years ago had an intense traffic, as it served the traffic between neighbouring cities (S. Pedro do Sul and Vouzela), b) the National Road, relatively recent, which surrounds the spa pole territory, being of great importance for keeping the traffic away from the medical spa area.

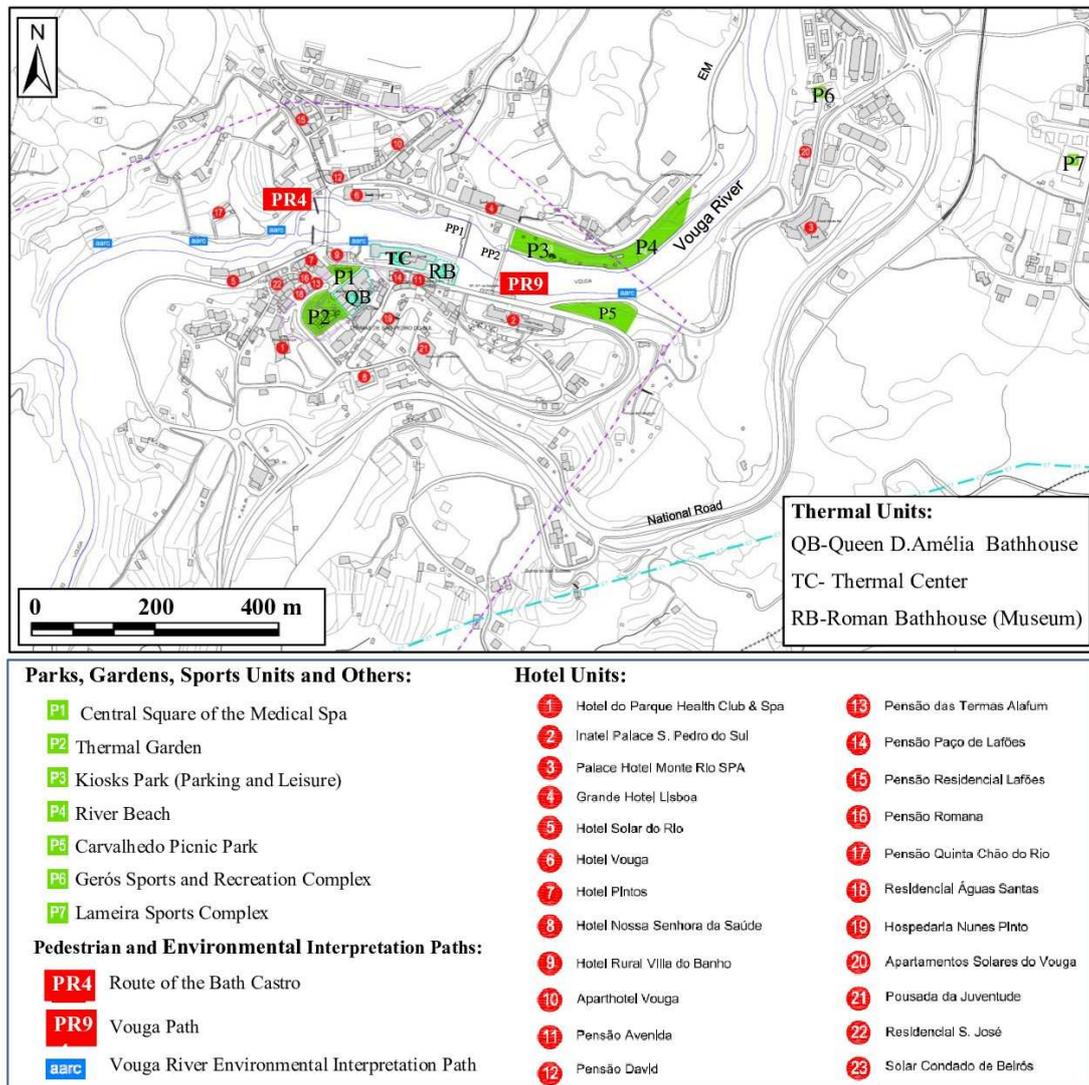


Figure 8. Extract from the map of the area of the São Pedro do Sul medical spa, showing the location of the bathhouses, the main hotel units and various spaces for relaxation and leisure [16].

6. Final notes and future perspectives

São Pedro do Sul medical spa, harmonizes three fundamental vectors: i) the health aspect, ii) the tourism aspect, iii) and the environmental aspect, due to the use of geothermal energy, which minimizes the consumption of fossil fuels, allowing purer air in the territory of the medical spa. Thus, Health Tourism is especially the key, because the waters used in the bathhouses are medicinal, which leads to there being about 12 doctors in the bathhouses for medical support, especially for rheumatic diseases and respiratory tract diseases. Nowadays, the bathhouses are also used for wellness in the aqua-ludic areas, with the use of swimming pools, baths of different types, including steam rooms and saunas. In fact, Health Tourism, with all the surrounding hotel facilities, will continue to grow over the next few years. In order for this to happen, the medicinal water, officially designated in Portugal as natural mineral water [1], cannot, in any way, lose quality in its origin, that is, in the abstractions and in the aquifer system, because if that happens, the DGEG (Directorate-General for Energy and Geology), under the tutelage of the Portuguese state, will close the medical spa, and “everything around it can die”. Thus, in the future, one should try to occupy areas as far as possible, the furthest away from natural springs, and the other mineral water abstractions, and stay away from other places that have a direct hydraulic connection with the mineral aquifer system, as is the case, in places of

intersection of extensive geological fractures. For the future, taking into account the global, historical, geomorphological, geological and hydrogeological situation, one of the paths for the future of the medical spa will be to create a large Green Park, on the right bank of the Vouga River, between the two Poles, with the inclusion of pedestrian paths, including some sports trails, associated with relaxation spaces, with landscaped gardens and small lakes. There should be a connection to the place of the old Bath Castro, which should be located within the park. Attention should also be paid to the Roman path that is still visible today, on the left bank of the Vouga River, close to the Vau spring (Fig. 1) and that should stay connected to the park. Finally, because there is excellent hydrogeological and geothermal potential, as has been attested in several works [3,4,5], and soon in the area of the Vau Pole, making a new abstraction of hot mineral water (Borehole with a depth greater than 1000m), a new health spa complex should be planned, involving medicinal spaces, aqua-leisure spaces, the hotel sector, among other services, so that the user of the future can enjoy all sectors, without having to travel outdoors.

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