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Application of a Decision-Making Tool for Ranking Wellness Tourism Destinations

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Abstract: One of the tourism industry's segments with the strongest growth rates today is health tourism. Health tourism includes two subgroups: medical tourism (traveling outside one's country of residence for the purpose of receiving medical care, such as surgery and health services) and wellness tourism (travel to specific locations for health promotion in a preventive way). The economic strength and sustainable growth of nations can both benefit from health tourism. This study applies a methodology to quantify the potential of Portuguese wellness tourism (thermal spas in Northern Portugal) using a multi-criteria decision making (MCDM) tool, namely the preference ranking organization method for enrichment evaluations (PROMETHEE) and geometrical analysis for interactive aid (GAIA), to achieve a robust evaluation and ranking the alternatives. Therefore, in this study, the aim is to rank ten thermal spas in Northern Portugal in terms of fifteen indicators, mostly related to digital services, containing the tourism data obtained between 2020 and 2022. The suggested approach offers trustworthy and reliable outcomes for any qualitative or quantitative criteria to assess thermal spas, which is crucial for consumers, businesses, and even governments. The results showed that PROMETHEE and GAIA can be implemented as an effective method in wellness tourism destinations evaluation.

Keywords: multiple criteria analysis; health tourism; digital services; wellness tourism; medical tourism; PROMETHEE-GAIA; decision making

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1. Introduction

In recent decades, tourism has transformed to be one of the major industries in the world. Individuals are spending more on travel and tourism itineraries as a result of the recent increase in tourism development and the growth in disposable income [1]. Tourism plays an important role in economic growth, particularly in developing countries, as it serves as a source of foreign earnings and an important component of export diversification [2–5]. The competitiveness of the tourism industry affects the success of tourist destinations [6–12]; in fact, it has proven to be a requirement for the long-term growth of tourism in a region or nation in a very competitive market [13,14]. A tourist destination is no longer considered to be a distinct and singular natural, cultural, artistic, or environmental resource, but rather an appealing product with extremely detailed services that offer travellers memorable holidays [15].

Tourism (and travel) is an activity that can contribute to the creation or improvement of wellbeing [16]. The practice of travelling to other countries for medical treatment has a long history, especially when medical care was not available locally; patients would have to travel abroad to receive it. Since the 17th century, the terms "health tourism" and "medical tourism" have been used [17]. Medical tourism and health tourism are frequently seen as synonymous. Nevertheless, a distinct difference between these two terms helps outline their basic features. This is essential to understanding the key meaning of both of these tourism types, as we will see next.

The World Tourism Organization (UNWTO) [16], defines:

- **Health Tourism**—a type of tourism which has the contribution to physical, mental and/or spiritual health through medical and wellness-based activities as a primary motivation, which increase the capacity of individuals to satisfy their own needs and function better as individuals in their environment and society. Health tourism is the umbrella term for the following subtypes: wellness tourism and medical tourism.
- **Medical Tourism**—a kind of tourism activity which involves the use of evidence-based medical healing resources and services (both invasive and non-invasive). This may include diagnosis, treatment, cure, prevention, and rehabilitation.
- **Wellness Tourism**—a type of tourism activity that aims to improve and balance all of the main domains of human life, including the physical, mental, emotional, occupational, intellectual, and spiritual domains. The primary motivation for the wellness tourist is to engage in preventive, proactive, lifestyle-enhancing activities such as fitness, healthy eating, relaxation, pampering, and healing treatments.

Health tourism in Portugal is also about peace of mind and security. A high-quality hotel, spa, and wellness experience ensure it. Choosing Portugal means choosing a country with a long history on Europe's furthest Atlantic coast, with an expanding tourism industry and a health system that is advancing towards excellence [18]. The standard of Portuguese health is the highest possible. Medical tourism in Portugal means you can rely on what is on offer, including diagnosis, therapy, the skills of health technicians, and the care provided in a modern network of hospitals and clinics that spans the entire country.

Nothing beats a tried-and-true recipe made with natural components to take care of your health and break up your routine, such as good weather, sunshine, clean air, clear waters, and plants and algae with medicinal characteristics. These aspects may be found in a spa or a thermal resort, along the ocean, or in the mountains. At a thermal spa, using traditional techniques, one can delight in the therapeutic properties and mineral richness of the waters, benefitting from the big coastline and the Atlantic waters for thalassotherapy, or through relaxation sessions based on the regenerating effects of wine, chocolate, or hot stones which one will find at spas and resorts as a complement to a holiday taken in style. With opportunities all over the country, Portugal offers true havens to shake off the "diseases of modern life" and find peace and inner serenity, as well as restore your energy [19]. The Porto and Northern Regions have a particularly large abundance of spas, with waters gushing from the Earth at high temperatures and with well-known therapeutic properties. Their benefits have, in some situations, been well-known since ancient times, such as in the Caldelas, São Vicente, Taipas, and Chaves Spas. In fact, the latter was originally named "Aquae Flaviae" after the Roman Emperor Flavius Vespasianus who, with his legions, used these natural wellbeing springs 2000 years ago. Other waters have been known since the Middle Ages, such as the Caldas da Saúde and Caldas de Aregos. Today's thermal baths offer complementary health and wellbeing programmes for a variety of objectives while still basing their programmes on the mineral and medicinal characteristics of the waters. Using showers, baths, massages, and many other modern techniques, tourists will discover relaxation programmes, revitalizing and aesthetic treatments, and many others, of shorter or longer duration alike, aimed at restoring balance to the body and mind in these up-to-date facilities [20].

Multiple criteria decision making (MCDM) was developed by Zimmerman in 1985 [21]. According to Huang and Tzeng [22], MCDM can be used to evaluate many characteristics or quantities in a decision problem. The main benefit of using decision-making methods is because the alternatives and criteria are predetermined, and the decision is made only once. The most well-known multi-criteria methods are evaluation models, the analytic hierarchy process (AHP), the analytic network process (ANP), the technique for order preference by similarity to ideal solution (TOPSIS), and the preference ranking organization method for enrichment of evaluations (PROMETHEE). Due to its simplicity and ability to provide results under conditions and criteria that are contrary to those of the other methods, this last method offers a lot of advantages over the others.

Documentary research in the area of health tourism in Portugal demonstrates that, despite wellness tourism being a long-standing draw for international tourists, its management has only begun in recent years, facing various challenges that have arisen in the wake of economic crises and the COVID-19 pandemic. Some of these challenges are:

- Lack of infrastructure in areas such as communication, professional health tourism training, medical equipment and facilities, wellness services, and tourist accommodation.
- Problems in managing procedures and creating standard service packages that can be offered to wellness tourists, including the foggy cost of services, which is sometimes not tabulated, especially in the private sector, and the absence of insurance in this area, since there is no medical tourism insurance coverage.
- The absence of marketing organizations, the absence of international marketing research, the absence of an international advertising system, an inadequate understanding of target markets, and unsatisfactory marketing initiatives.

This study was structured around six hypotheses, which provided a solid framework for a systematic and orderly approach. The following hypotheses are presented:

- Which sustainable criteria are the best for wellness tourism destination competitiveness purposes is important to define.
- The diversification of the offer and cross-selling with other tourist products are currently important trends in the management of thermal spas.
- The therapeutic quality of the thermal water is an important distinguishing element for the choice of health and wellness tourism destinations.
- Satisfaction and overcoming visitors' issues with the results of treatments carried out by thermal spas promotes customer loyalty.
- The reorganization and diversification of the offer, as well as the requalification of equipment, are investment priorities for thermal spas to become competitive in the tourist sector.
- Which tourist thermal spa presents a weak or strong performance in terms of the defined criteria is important to define.

Therefore, the main purpose of this research study is to select and rank the wellness tourism destinations in Northern Portugal by using a multi-criteria decision making (MCDM) tool, namely the preference ranking organization method for enrichment evaluations (PROMETHEE) and geometrical analysis for interactive aid (GAIA), to aid tourism experts and society planners in formulating and selecting the best wellness tourism destination. This analysis was done for 10 thermal spas in the northern region of Portugal, a region where tourism has grown exponentially in the last decades and which is drawing more and more tourists, boosting economic output. A PROMETHEE II approach was used to develop the outranking relation and provide a complete list of the 10 considered thermal spas with regard to their performance in tourism. Based on the descending values of their net outranking flows, a list of thermal spas was created. The GAIA approach, on the other hand, was used for visual realization and sensitivity analysis of the obtained solutions. In the developed GAIA plane, the positions of the 10 thermal spas, as well as the contributions of various evaluation criteria, can be visualized. The effects of the considered criteria on the performance of each alternative can also be studied. Identifying the thermal spa with the best performance in tourism may motivate the state, central governments, and companies to implement even better promotion and strategic decisions to attract more tourists. The analysis based on the GAIA plane can also help to identify the reasons why some of the thermal spas perform poorly in tourism, thus allowing them to seek special support so that they can improve and succeed.

2. Literature Review

2.1. Health, Medical and Wellness Tourism

Ancient civilizations recognized the therapeutic effects of thermal medicine, hot springs, and temple baths [23].

Health tourism is a subset of general tourism in which tourists travel with the intention of receiving specific treatments or improving their mental, physical, or spiritual wellbeing [24].

Medical tourism is a type of tourism that occurs in order to keep, improve, and recover an individual's physical and mental health in less than a year and more than 24 h [25]. Connell [26] defined medical tourism as a vacation that involves traveling into foreign countries to access a wide range of health services. According to Zarei et al. [27], medical tourism can be considered as an individual's travel for treatment (whether through the application of natural resources or medical assistance), rest, and maintenance of physical health.

Wellness tourism is one of the oldest types of tourism, given the concern shown by the Greeks and Romans with their wellbeing. Visits to mineral and hot springs are included in this earliest type of tourism, which is directly connected to today's health and wellness [28].

According to Hall [29], there are some connections between various branches of health and medical travel, such as wellness and wellbeing travel, dental travel, stem cell travel, transplant travel, and abortion travel. However, since there is no clear definition for health tourism, medical tourism, and wellness tourism, it is challenging to include all of these in tourism statistics. As a result, evaluating the significance, development, and effects of health tourism on the wider tourism sector and economy is challenging.

When it comes to healthcare, Portugal inspires trust and is increasingly in demand.

For many people, Portuguese healthcare is an excellent value-for-money option, with medical and rehabilitation care, kindness, climate, direct contact with nature, and Portuguese hospitality all contributing to a rewarding experience [18].

In terms of wellness tourism, there are several things to consider and various forms of health promotion in a preventive manner. One such aspect is thermal, with a long history in Portugal. Many thermal baths are located in reputable hotel complexes, some of which are centuries old but have been magnificently refurbished and some of which are modern spas associated with major names in world architecture (such as Siza Vieira), as in the case of the Pedras Salgadas Thermal Baths and the Vidago Spa. Many are situated along rivers, which add a picturesque feel and enhance their enjoyment (such as the Douro, which is the setting of a UNESCO World Heritage landscape). Others are near historic cities worth visiting (such as Guimarães and Porto, both of which are World Heritage sites [20]).

Thus, health tourism can contribute to sustainable development first by identifying lifestyle habits, forms of comfort, and modernization avenues, and then advancing toward sustainability and addressing different types of consumer behaviour [30]. According to several authors, offering high quality services is the key to maintaining a competitive advantage [31]. Strong social effects may result from the need to pay attention to the sustainable growth of health tourism, its favourable economic effects on the host town and its surroundings, and the availability of a range of affordable medical services to millions of people [32].

2.2. PROMETHEE-GAIA Approach

The methodologies used to develop performance evaluation models for evaluating diverse tourist destinations are the subject of a limited amount of research that is currently available. According to the literature review, there have been a few attempts by prior scholars to evaluate the performance of tourism and health tourism destinations using several MCDM models. In order to assist the tourism industry in making managerial decisions, Enright and Newton [33] designed a model that would provide a quantitative and theoretically-based empirical study. Akincilar and Dağdeviren [34] developed a robust and reliable model which evaluates the quality of hospitality websites (more specifically

hotel websites) by using a hybrid model that includes two multi-criteria decision-making approaches, namely the analytic hierarchy process (AHP) and the preference ranking organisation method for enrichment evaluations (PROMETHEE). Medical tourism destination preferences in Batu City were ranked by Arif et al. [35] using the six criteria that reflect successful medical tourism destinations (6AsTD) method combined with a technique for order performance by similarity to ideal solution (TOPSIS). Ghasemi et al. [36], employed an integrated approach using fuzzy SWARA-PROMETHEE for the ranking of sustainable medical tourism destinations in Iran. The SWARA acronym stands for step-wise weight assessment ratio analysis. Didascalou et al. [37] adopted the analytic hierarchy process (AHP) method to identify the various factors that decision-makers must take into account when ranking destinations for placing a spa resort/hotel in the thriving health and wellness industry in the region of Peloponnese.

PROMETHEE is one of the many MCDM methods, and it is growing in popularity since it can handle multi-criteria situations with differences between criteria while also being simple to understand and calculate [38].

PROMETHEE has been successfully used in a number of interesting applications, including the selection of airport location [39,40], nature-based tourism [41,42], tourism competitiveness [43–46], supplier selection [47–49], medical tourism [36,50], transportation planning [51–53], renewable energy sources [54–56], aerospace industry [57–59], logistics [60–63], equipment selection [64–67], nanotechnology [68–70], medicine [71–73], and maritime transport [74–77], among other issues.

The PROMETHEE method was first proposed by Brans [78] and was further developed by Vincke and Brans [79]. The principal feature of PROMETHEE, an outranking-based MCDM technique, is that the most desired option is the one that performs better than the alternatives in the majority of the criteria while not showing lower performance in others [79,80]. According to decision-maker preferences, actions are first compared pairwise on each criterion in the PROMETHEE approach, yielding local scores. Then, these local scores are combined to create global scores, from which PROMETHEE I or PROMETHEE II, a partial or full pre-order rank, is obtained [47].

The problem under consideration can be expressed mathematically as an evaluation matrix (Table 1) where the cells display the scores of the alternatives $\{a_1, a_2, \ldots, a_n\}$, which are evaluated on a set of k criteria $\{f_1, f_2, \ldots, f_k\}$.

Table 1. Evaluation Table.

	f_1	f_2	...	f_j	...	f_k
a_1	$f_1(a_1)$	$f_2(a_1)$	...	$f_j(a_1)$	...	$f_k(a_1)$
a_2	$f_1(a_2)$	$f_2(a_2)$	...	$f_j(a_2)$	...	$f_k(a_2)$
...	...	...	...	...	...	...
a_i	$f_1(a_i)$	$f_2(a_i)$	...	$f_j(a_i)$	...	$f_k(a_i)$
...	...	...	...	...	...	...
a_n	$f_1(a_n)$	$f_2(a_n)$	...	$f_j(a_n)$	...	$f_k(a_n)$

$f_j(a_i)$ shows the performance of the i^{th} alternative on the j^{th} criterion; $\{a_1, a_2, \ldots, a_n\}$ are the alternatives and $\{f_1, f_2, \ldots, f_k\}$ are the criteria.

The preference function Pj transforms the difference between each alternative's scores into a preference degree that ranges from 0 to 1. The usual function, U-Shape function, V-Shape function, level function, linear function, and Gaussian function are six fundamental forms of preference functions that can be applied [79,80]. Some parameters may be necessary depending on the decision-maker's choice of preference function [47], such as:

- Indifference threshold (q_j)—two alternatives are indifferent when the difference between evaluations is smaller than the indifference threshold.
- Strict preference threshold (p_j)—the second alternative is preferred to the first one if the difference between their evaluations is bigger than the preference threshold (p_j).

An alternative is better than another if it is at least as excellent as the other on all criteria, which is how the natural dominance relation is defined. If an alternative is better on a criterion C_1 but worse on a criterion C_2, both alternatives are incomparable [80]. Naturally, the decision-maker clearly brings the benefits and characteristics of the PROMETHEE approach into play when choosing the preference functions and their parameters. To describe how much one action is preferable to another when compared to all other criteria, the aggregate preference index is calculated using a weighted sum of the preference values. The proportional relevance of each criterion is represented by the weights; the lower the weight, the less significant the criterion is. Therefore, for an alternative a, the PROMETHEE II approach determines a net outranking flow ($\phi(a)$) as the difference between the global preference of a (positive outranking flow, $\phi^+(a)$) and the global weakness of a (negative outranking flow, $\phi^-(a)$) [46]. The net outranking flow ($\phi(a)$) is better the higher the value of $\phi^+(a)$ and the smaller the value of $\phi^-(a)$. So, the smaller the value of $\phi^-(a)$, the better the alternative. Thus, the net outranking flow is utilized when decision-makers demand a complete classification that considers all weaknesses and strengths of all of the alternatives and, as a result, all of the alternatives are comparable.

In addition to PROMETHEE ranking, geometrical analysis for interactive aid (GAIA) plane can also be visualized. The basis of the GAIA-plane is the net outranking flows [81]. The location of the alternatives is represented by the GAIA plane, allowing us to compare them and identify those that perform similarly or differently from each other [46]. In the GAIA plane, criteria are represented by axes, while alternatives are represented by dots. The length of the axes in the GAIA plane corresponds to the strength of the criteria to distinguish between alternatives: the longer the axes, the more discriminating the criterion. The same orientation of the axes indicates the similarity of the preference pattern for the different criteria; these are in conflict when the direction is opposite. In the GAIA plane, the placements of the alternatives and the criteria do not change when the weights are adjusted. The decision-maker can adjust the weight vector to favour various criteria in accordance with their preferences by moving it around in the form of a decision stick. The PROMETHEE decision stick and the decision axis move in such a way when a sensitivity analysis is conducted by changing the weights that the effects on decision making are clearly visible in the GAIA plane.

The amount of information that the GAIA plane considered is indicated by the Delta-parameter (δ). Values of (δ) over 70% can be taken into consideration as suitable, meaning that little information was lost and that the GAIA plane provides a reliable and accurate description of the decision problem. This indicates that, as shown in the following case study, PROMETHEE-GAIA's features are well suited to tourists' decision-making processes.

3. Methodology

Portugal is located in Southwestern Europe on the Iberian Peninsula, and its territory includes the Atlantic archipelagos of the Azores and Madeira. It has the westernmost point in continental Europe, and its Iberian portion is bounded by the Atlantic Ocean to the west and south, and Spain to the north and east (Spain is the only country with a land border with Portugal). Portugal has, in its territory, around 52 thermal natural hot springs to enjoy. The history of thermal bathing is long in this country, and the first-ever King of Portugal, Afonso Henriques, even lauded the benefits of mineral baths. The vast majority of thermal establishments in operation are in the central and northern regions of the country. In Portugal's northern region alone, there are 18 thermal spas! As a result of the tectonic faults that span the area, these wellbeing hotspots are evenly spread throughout the area, not overcrowded, and located in tranquil communities with great quality of life. There are many different thermal spas, including those in cities, mountains, and thermal resorts, so you can pick the one that appeals to you the most. Therefore, the north of Portugal developed several thermal spas in response to the enthusiasm of Portuguese and foreigners alike for Portuguese thermal waters and the use of healthy holidays, thus maintaining an ancient tradition that dates back to the period of Roman occupation. More than ever,

thermal baths resorts are sought after by people of all ages, not only for the numerous therapeutic benefits of their waters but also for their wellbeing programmes, whether for relaxation, weight loss, or just rest, in the midst of nature, surrounded by history or with refinements of charm.

The major goal of this research project is to choose and rate the wellness tourism locations in Northern Portugal using the MCDM tools PROMETHEE and GAIA in order to get an answer to the formulated hypotheses and help tourism professionals and society planners come up with and choose the best wellness tourism location and to attract more and more visitors.

This investigation was carried out on ten thermal spas in Portugal's northern region, where tourism has risen rapidly over the past few decades, namely the Amarante Thermal Spa, the Monção Thermal Spa, the Melgaço Thermal Spa, the Gerês Thermal Spa, the Chaves Thermal Spa, the Pedras Salgadas Thermal Spa, the S. Vicente Thermal Spa, the Caldelas Thermal Spa, the Vidago Palace Thermal Spa, and the Vizela Thermal Spa. According to the research Baths, Spas and Thalassotherapy, from the Visit Portugal website [82]:

- **Amarante Thermal Spa** (Website: https://www.termasdeamarante.pt—accessed on 8 September 2022)

In January 2019, in the right bank of the river Tâmega, a few hundred meters from the city center, the Amarante Thermal Facilities opened their doors to the public. This new thermal complex includes a variety of baths, showers, and hydromassages as well as specialized treatments for respiratory and musculoskeletal diseases. It is outfitted with the most recent technological advancements. Additionally, you'll discover ideal circumstances for appreciating priceless moments of solitude or pleasant companionship. The market for thermalism is undoubtedly expanding, particularly when it is combined with ecotourism, cuisine, and wellbeing.

- **Caldelas Thermal Spa** (Website: http://www.termasdecaldelas.com—accessed on 8 September 2022)

One of Portugal's most prominent spas and thermal baths is the thermal town of Caldelas. Caldelas Spa is situated in a stunning setting in the center of the Minho area, near are the Peneda-Gerês National Park and the city of Braga, in a territory that was the scene of significant wars that shaped the formation of the Portuguese nation. It is a great spot for rehabilitation and rest due to its notably warm environment.

The significant archaeological relics found there demonstrate that the hot springs were being used in Roman times. Mineral and medicinal waters flow along a porphyritic granitic strain, in multiple squeezed springs.

The digestive system, rheumatism, respiratory system, and several chronic dermatoses are the principal therapeutic targets of these thermal baths. Whether or not they have a special therapeutic purpose, frequenting the spa offers advantages due to the general active resting, good eating, and relaxing spa.

- **Chaves Thermal Spa** (Website: http://www.termasdechaves.com—accessed on 6 September 2022)

The Chaves Thermal Springs are situated in Campo do Tabolado, on the Tâmega River's right bank. The town's name, Aquae Flaviae, indicates that the thermal springs played a significant role in the area's importance during the Roman era. After the Romans, the Thermal Springs were ignored for many years until the seventeenth century, when thermalism had a resurgence of interest. Today, the Thermal Spa, also known as the SPA of the Emperor, now contains a clinical area with physician and nursing offices, as well as two buildings, Flávia and Vespasiano, with services for balneotherapy, the treatment of rectum and colon disorders, and the treatment of respiratory illnesses, among other things. In the Iberian Peninsula, only the thermal waters of Chaves are hyperthermal (73 °C), soda-bicarbonate, meso-mineralized, and carbonated. They are employed in the treatment of digestive and respiratory tract diseases, muscle-skeletal and cardio-circulatory

problems, posttraumatic recovery, as well as the prevention or treatment of stress, anxiety and depression.

– **Gerês Thermal Spa** (Website: www.aguasdogeres.pt—accessed on 6 September 2022)

Gerês Thermal Spa enjoys a privileged location in the middle of the World Biosphere Reserve, directly in the middle of the Peneda-Gerês National Park, one of the seven "Wonders of Portugal."

The combination of nature, fresh mountain air, and the waters of Gerês make this destination the perfect setting for: getting your strength back, recharging batteries and restoring balance. Studies on the effectiveness of the waters of Gerês in treating disorders of the hepato-biliary, digestive, and circulatory systems, as well as metabolic and endocrine issues, are numerous. The remarkable qualities of these waters were widely publicized. The latest thermal innovations have been installed in the recently remodeled thermal facility. Due to major investments made in the thermal establishment and ongoing attention to its improvement, counting on the continued leadership of the industry in Portugal, Termas do Gerês is now one of the most significant, most popular, and frequented Portuguese spas.

– **Melgaço Thermal Spa** (Website: www.termasdemelgaco.pt—accessed on 4 September 2022)

The Thermal Spa of Melgaço is situated in Peso, between Monção and Melgaço, in one of the most stunning regions in Northern Portugal. The thermal properties of the water are recognized and are indicated for the treatment of diabetes and hypercholesterolemia. After a lengthy rehabilitation and renovation procedure, the location is currently furnished with rooms and high-quality equipment that properly complement each other for the application of integrated treatments for the indications made possible by the water of Melgaço.

– **Monção Thermal Spa** (Website: http://www.termasdemoncao.com—accessed on 6 September 2022)

The spa is situated in a stunning natural setting 700 m from the actual town of Monção, in the center of the designated Vinho Verde region, where Alvarinho, one of the genuinely unique wines in the world, is made. This wellness resort is surrounded by some of the most up-to-date services, making it tough to resist the urge to stroll among the hundreds of years-old trees that can be found there. It has the perfect location to unwind and take some much-needed rest. Respiratory tract infections, rheumatic diseases, and musculoskeletal and skin problems are all susceptible of recovery.

– **Pedras Salgadas Thermal Spa** (Website: www.pedrassalgadaspark.com—accessed on 8 September 2022)

There are five natural mineral springs located inside the park where the "Água das Pedras" is produced. These springs have unique therapeutic properties that have been recognized by the most prestigious national and international scientific communities for decades. Therapeutic indications: digestive tract, difficult digestion, heartburn, asthma and chronic bronchitis, Osteoarticular diseases (rheumatism) and osteoporosis.

– **S. Vicente Thermal Spa** (Website: www.termasdesaovicente.pt—accessed on 7 September 2022)

São Vicente's Thermal Baths are a haven for treatments, leisure, and relaxation. This Spa, located 3 km from Entre-os-Rios, offers a variety of treatments to help you feel rejuvenated and in perfect harmony with nature. The origins of these Thermal Baths can be traced back to a Roman bathhouse, the ruins of which can still be seen today.

– **Vizela Thermal Spa** (Website: www.hotelbienestarvizela.com—accessed on 2 September 2022)

Since Roman times, the sulphurous waters of Vizela have been known internationally for their beneficial and therapeutic properties, and the Spa of Vizela is the city's main tourist attraction. The current structure is a magnificent example of architecture, surrounded by

gardens that provide general relaxation and inspire feelings of tranquillity and appeasement in visitors.

– **Vidago Palace Thermal Spa** (Website: www.balneariopedagogicovidago.com—accessed on 3 September 2022)

Thermal waters were discovered at Vidago Park as early as 1836. Their restorative and healing characteristics served as the idea for today's spectacular, ultra-clean-lined spa. Given that the waters used here are directly extracted from below granite bedrock, the treatments naturally have a water motif. However, there are more options on the menu than water healing and restoration. The spa offers a wide variety of specialty services and treatment combinations, all of which highlight Portuguese wellness and aesthetic secrets.

According to the travel & tourism competitiveness report (TTCR) [83], the travel & tourism development index framework 2021 (TTDI) indicators are divided into five subindexes: enabling environment, travel and tourism policy and enabling conditions, infrastructure, travel and tourism demand drivers and travel and tourism sustainability. Then, the five subindexes are put in detail into 17 pillars and 112 individual indicators, distributed among the different pillars, as shown in Figure 1. The enabling environment subindex, which has five pillars (business environment, safety and security, health and hygiene, human resources and labour market, and ICT readiness), incorporates the general requirements for doing business in a country. the travel and tourism policy and enabling conditions subindex consists of three pillars (prioritization of travel and tourism, international openness, and price competitiveness) and captures particular policies or strategic features that more directly impact the T&T sector. The infrastructure subindex, which includes three pillars (air transport infrastructure, ground and port infrastructure, and tourist service infrastructure), measures the availability and quality of physical infrastructure in each economy. The main "reasons to travel" are represented by the three pillars (natural resources, cultural resources, and non-leisure resources) of the travel and tourism demand drivers subindex. The travel and tourism sustainability subindex includes three pillars (environmental sustainability, socioeconomic resilience and conditions, and travel and tourism demand pressure and impact) that capture current or potential T&T sustainability challenges and risks.

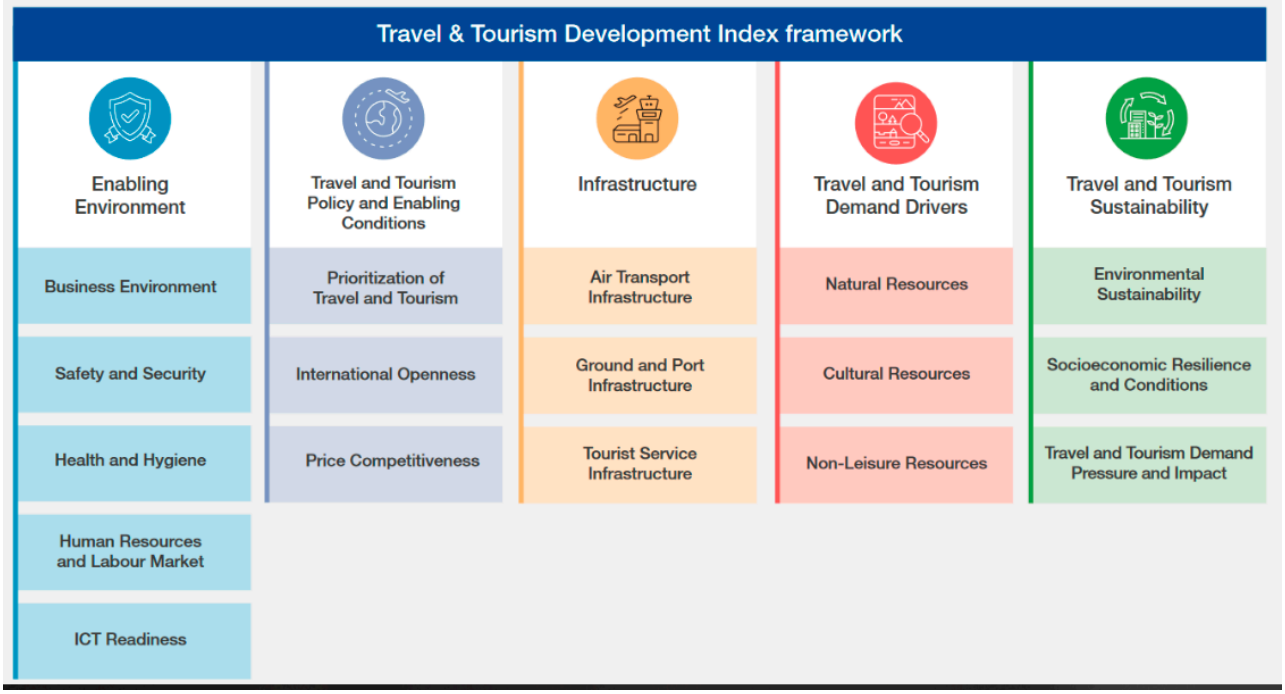

Figure 1. The travel & tourism development index framework 2021. Source: [83].

Based on the travel & tourism development index framework 2021, we suggest a multidimensional assessment, which includes the PROMETHEE approach and GAIA plane, to evaluate the competitiveness of wellness tourism destinations. The TTDI has been slightly modified to include only the criteria relevant to the regional level. To this purpose, we discussed the criteria with experts and academicians. The experts were gathered from professionals in charge of local tourism industries and academicians from a variety of subjects such as tourism and business management.

As a result of this discussion, pillar 1 (business environment), pillar 6 (prioritization of travel and tourism), pillar 7 (international openness), pillar 9 (air transport infrastructure), pillar 10 (ground and port infrastructure), and pillar 16 (socioeconomic resilience and conditions) were dropped because some of them do not make sense for a regional analysis. In addition, adding too many criteria would result in over dimensionality problem. The remaining sub-indices and pillars were kept. Table 2 includes the updated index's 15 sub-criteria.

According to Quivy and Campenhoudt [84], in the social sciences, there are four methods of data collection: surveys by questionnaire, interview surveys, direct observation, and collection of pre-existing data (secondary data and documentary data). There are no better methods than others, as the usefulness of each depends on the objectives, the model, and the characteristics of the field of analysis. In this study, we opted for questionnaire surveys and the collection of pre-existing data (secondary data and documentary data).

In the first quarter of 2022, we conducted fieldwork in several districts in Northern Portugal. The survey was conducted in ten thermal spas in Northern Portugal using a questionnaire survey, which refers to the index indicators of the travel & tourism competitiveness index 2021. A total of 460 people responded, including 342 Portuguese, 42 Spanish, 34 English, 24 German, and 18 French. Thus, the weights of the criteria and sub-criteria were obtained using these 460 proper questionnaires. Since the procedure is a group decision making, the weights were calculated via arithmetic mean of the collected proper questionnaires. We also worked with official or widely-recognized sources that periodically publish their data and that allow us to work at the level of each region (INE, UNESCO, and Google maps).

Table 2. Wellness tourism destination competitiveness criteria used.

Evaluation Framework						
Subindex	**Pillar**		**Subindex-Pillar**		**Tourism and Travel Competitiveness Index Sub Index-Pillar**	**Preference**
Enabling Environment	P2	Safety and Security	SP2	Safety walking alone at night	2.03	Max
	P3	Health and Hygiene	SP3	Accessibility of healthcare services	3.05	Max
	P4	Human Resources and Labour Market	SP4	Ease of finding skilled employees in local labour market	4.06	Max
	P5	ICT Readiness	SP5	Use of digital platform for providing hotels, restaurants and leisure activities services	5.07	Max
Travel and Tourism Policy and Enabling Conditions	P8	Price Competitiveness	SP8	Hotel price index	8.02	Min
Infrastructure	P11	Tourist Service Infrastructure	SP11A	Hotel rooms density	11.01	Max
			SP11B	Presence of major car rental companies	11.03	Max
			SP11C	Automated teller machines density	11.04	Max
Travel and Tourism Demand Drivers	P12	Natural Resources	SP12A	Total protected areas	12.03	Max
			SP12B	Natural tourism Digital Demand	12.04	Max
	P13	Cultural Resources	SP13	Cultural and entertainment tourism Digital Demand	13.04	Max
	P14	Non-Leisure Resources	SP14	Non-leisure tourism Digital Demand	14.04	Max
Travel and Tourism Sustainability	P15	Environmental Sustainability	SP15A	Renewable energy	15.02	Max
			SP15B	Adequate protection for nature	15.12	Max
	P17	Travel and Tourism Demand Pressure and Impact	SP17	Concentration of interest in nature attractions	17.05	Max

Source: Own elaboration.

4. Results and Discussion

In this section, we rate 10 thermal spas in Northern Portugal, discuss the PROMETHEE I and II order, and examine the impact of each criterion on the "flow" of each thermal spa and analyse the GAIA plane.

Based on net flows (or the difference between the destination's strengths and weaknesses), the PROMETHEE flow table ranked the actions, in this case the thermal spa destinations, according to the PROMETHEE II complete ranking, where the Phi, Phi+, and Phi− scores are displayed (Table 3).

Table 3. PROMETHEE flow table of thermal spas destinations in Northern Portugal.

Rank	Action (Thermal Spa Destination)	Net flow (Phi)	Positive Flow (Phi+)	Negative Flow (Phi−)
1	Gerês	0.4503	0.4814	0.0311
2	Vidago	0.0196	0.2506	0.2310
3	Pedras Salgadas	0.0140	0.1420	0.1280
4	Chaves	−0.0160	0.1997	0.2157
5	Melgaço	−0.0190	0.1221	0.1411
6	Monção	−0.0271	0.1312	0.1583
7	Caldelas	−0.0350	0.1167	0.1517
8	Amarante	−0.1191	0.1555	0.2745
9	Vizela	−0.1266	0.1031	0.2297
10	S. Vicente	−0.1411	0.0641	0.2052

Source: Own elaboration.

The Gerês Thermal Spa is ranked first. Therefore, it can be concluded that the Gerês Thermal Spa is the most competitive travel destination and that it also enjoys a very strong competitive position (showing a net flow 22 times higher than that of the second destination). The Vidago Thermal Spa is the second wellness tourism destination, followed by the Pedras Salgadas Thermal Spa, both of which also demonstrate a positive net flow. The next three places in the ranking are occupied by the Chaves Thermal Spa, the Melgaço Thermal Spa, the Monção Thermal Spa, and the Caldelas Thermal Spa, all having a negative flow (but near to zero), a sign of a weak competitive position in the market. The three thermal spas destinations at the bottom of the ranking—Amarante, Vizela, and S. Vicente—clearly have an advantage over nearby regions due to their comparatively high negative net flows.

The PROMETHEE Network (Figure 2) is a representation of the PROMETHEE I partial ranking, where actions are represented by nodes and arrows are drawn to indicate preferences. Incomparabilities are, therefore, very easy to detect.

The Gerês Thermal Spa, which is the top wellness tourism destination, is followed by the Vidago Thermal Spa, which performs better than the others, as can be seen in Figure 2.

Through the PROMETHEE network (Figure 2) we can observe that the Vidago, Chaves and Pedras Salgadas thermal spas have variables that are not comparable. It is impossible to determine which is more attractive than the other. This is due to the distinct structures of their strengths and weaknesses. Next, there are two different sub-rankings. Although the Pedras Salgadas thermal spa is ranked above the Monção and Vizela thermal spas, we cannot conclude that these two destinations are superior or inferior. The weakest position is held by the S. Vicente thermal spa, which is outranked by all destinations.

A disaggregated perspective of the strengths and weaknesses of an action is provided by action profiles. The action profile window shows a graphical representation of the unicriterion net flow scores for the selected action. Positive scores (upward bars) correspond to good features, while negative scores (downward bars) correspond to bad ones.

Figure 3, below, provides information showing that almost all aspects of the preference criteria index value for the Gerês Thermal Spa tourism destination are positive. Only the criteria SP4 (ease of finding skilled employees in the local labour market) and SP11C

(automated teller machines density) have negative values, which means that politicians, enterprises, and individuals in charge of tourism in Gerês should support regional strategies for skills development and consequently intensify investments in this area. In addition, the number of automated teller machines must be increased. On the other hand, the design of policies to improve the competitiveness of wellness tourism in Gerês can also be conducted in order to improve criteria related to renewable energy, such as investing in green infrastructure and reducing greenhouse gas emissions. It could also be a good initiative to try to reduce hotel rates in the Gerês region.

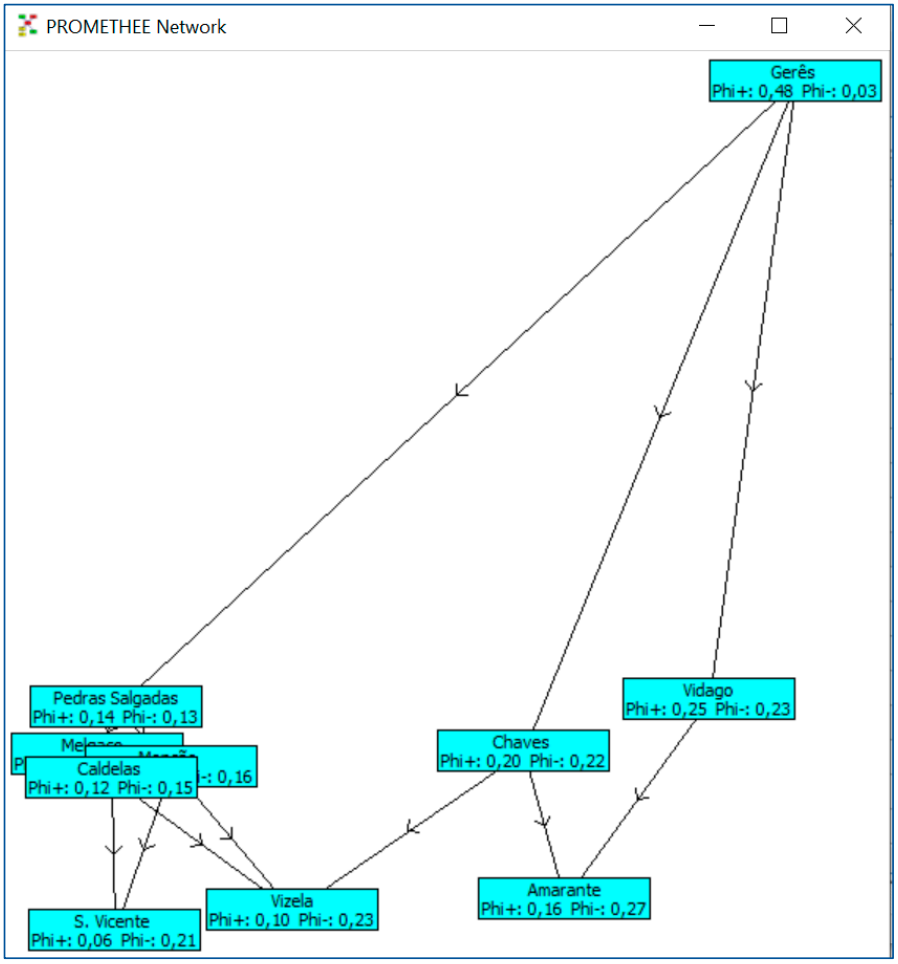

Figure 2. PROMETHEE Network. Source: Own elaboration.

In addition to the strongest criterion (SP13 (digital demand for cultural and entertainment tourism)), the criteria SP11A (density of hotel rooms) and SP17 (concentration of interest in nature attractions) are also prevalent in the data.

The competitiveness of S. Vicente Thermal Spa wellness tourism destination is in last place. All criteria that were sampled still had a total preference index (phi) of −0.1411 with a positive preference index (phi+) of 0.0641 and a negative preference index (phi−) of 0.2052, so the preference index (phi−) is greater than the positive preference index. This has resulted in lower competitiveness compared to other wellness tourism destinations in Northern Portugal. Figure 4, below, provides information showing that almost all aspects of the preference criteria index value for S. Vicente Thermal Spa tourism destination are negative; only the criteria SP2 (safety walking alone at night), SP3 (accessibility of healthcare services), and SP8 (hotel price index) have low positive values, which explains the fact that S. Vicente is in last place for the ranking. The criterion with the lowest value is natural tourism digital demand. This is driven largely by the small number of recognized

UNESCO World Heritage natural sites and protected areas, such as national parks. Policies that increase the natural tourism digital demand index should be considered. Therefore, when tourists search online for topics such as natural wonders, outdoor activities, and rural accommodation, they will find a wide variety of results to match their expectations. These results may be useful as a guide to both policy makers and tour operators of the S. Vicente region to take better measures so that this tourist destination becomes more attractive and competitive in the future.

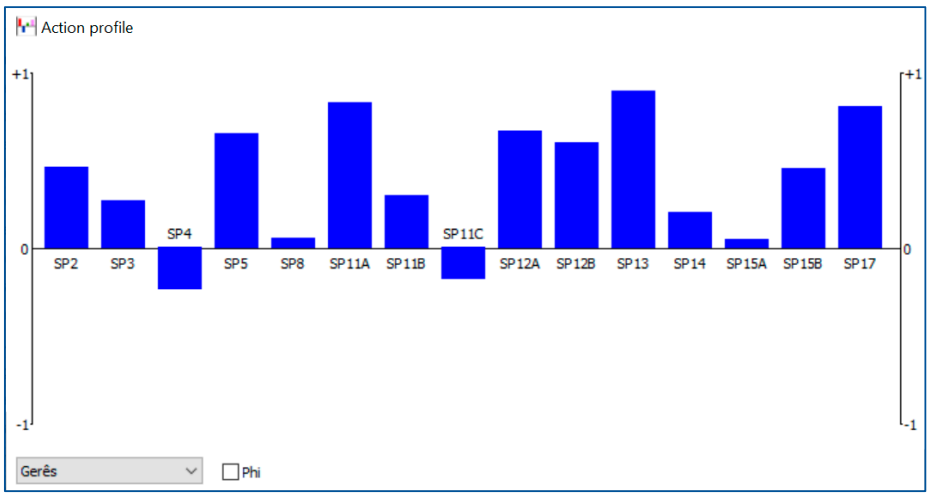

Figure 3. Action Profile of the Gerês Thermal Spa. Source: Own elaboration.

The main goal of the GAIA plane is to graphically express the key characteristics of decision-making problems, as it is the output of the visual PROMETHEE software. The best two-dimensional representation of the multicriteria problem is the GAIA plane. It keeps the greatest quantity of information possible from the k-dimensional representation. This amount of information can be measured and is commonly referred to as Delta, and it appears under the name "Quality" in the GAIA window. In the GAIA plane, actions are represented by blue squares, criteria are represented by axes drawn from the centre of the plane, and the weights of the criteria are represented by the decision axis. The red axis (π—axis) is called the decision brain and shows the preferences of the decision-makers. When the quality level is above or close to 70%, the 2D GAIA analysis is reliable. In this case, the quantity of information contained in the plane is equal to 82.7% (as shown in Figure 5).

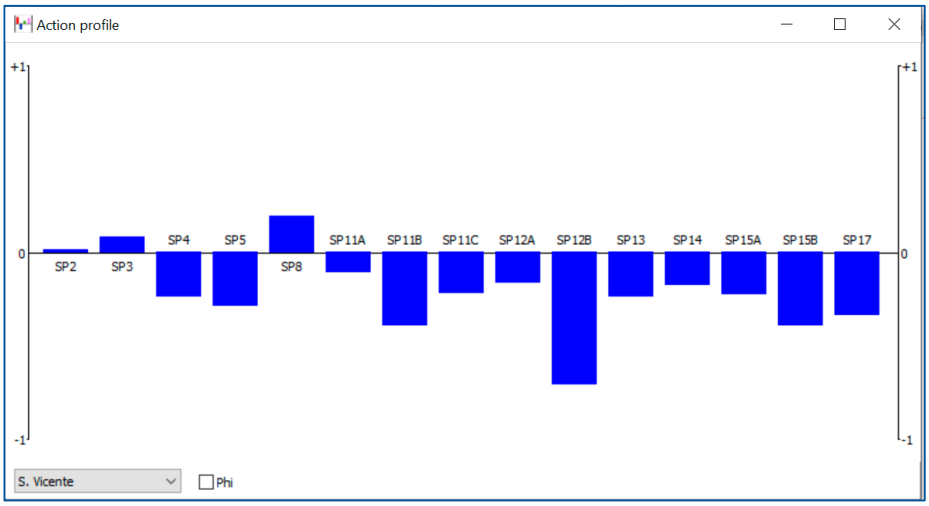

Figure 4. Action profile of the S. Vicente Thermal Spa. Source: Own elaboration.

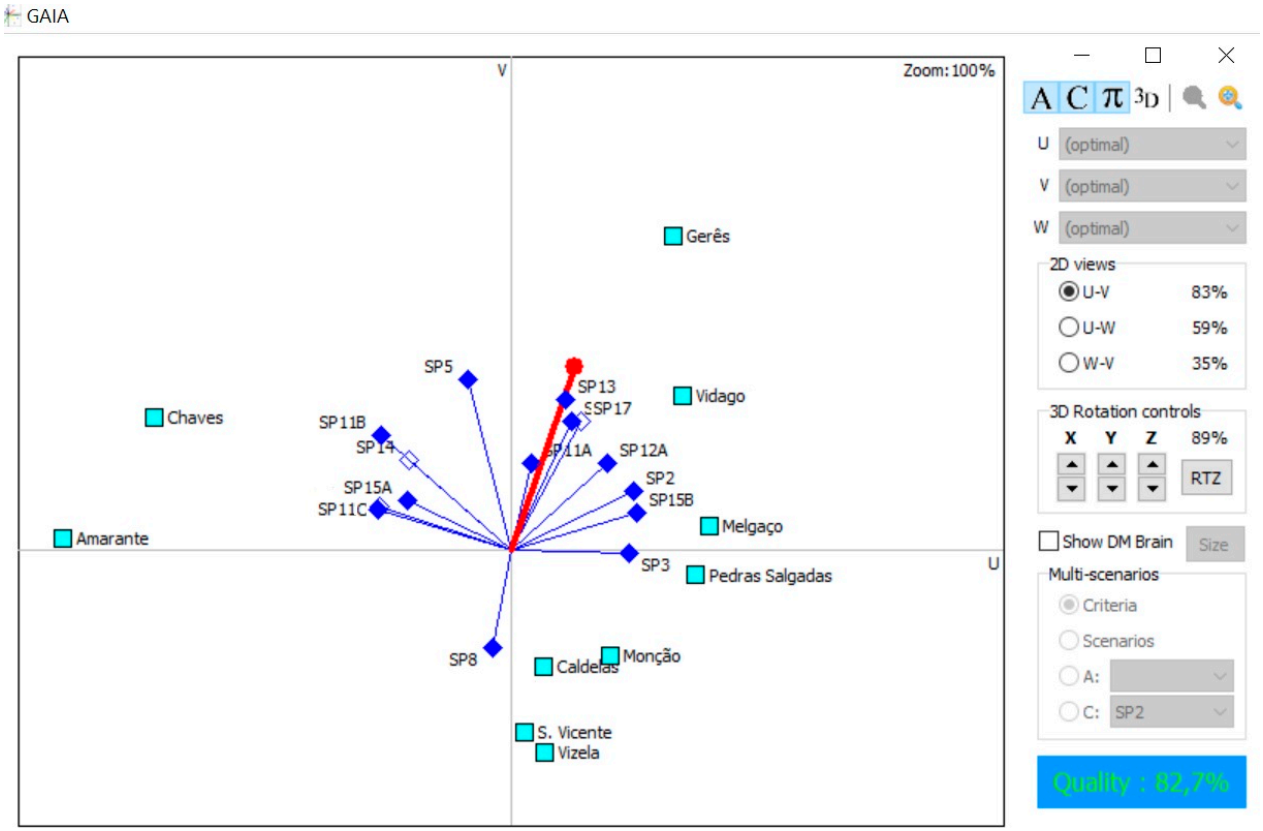

Figure 5. GAIA plane analysis. Source: Own elaboration.

Criteria expressing similar preferences are represented by axes oriented in similar directions. That is the case, for example, in the first quadrant of SP17 (concentration of interest in nature attractions), S12A (total protected areas), and SP15B (adequate protection for nature), and in the second quadrant of SP14 (non-leisure tourism digital demand) and SP5 (use of digital platform for providing hotels, restaurants, and leisure activities services). Criteria expressing conflicting (opposite) preferences are represented by axes oriented in opposite directions. That is the case for SP8 (hotel price index) and SP17 (concentration of interest in nature attractions). The relative discriminating power of a criterion is represented by its length; the longer the axis, the more discriminating the criterion. In our study, in general, all criteria axes are approximately the same length.

The Gerês and Vidago thermal spas have the farthest distances from the origin in the same direction of red axis, indicating the superiority of these wellness tourism destinations over the others. Furthermore, the position of the Gerês Thermal Spa as an alternative is the farthest from the origin in the red axis direction, which identifies it as the best performing wellness tourism destination.

5. Conclusions

When one considers the Greeks and Romans' meticulous attention to wellbeing, wellness tourism is one of the most ancient forms of tourism. This earliest form of health tourism, which includes visits to mineral and hot springs, is directly related to modern health and wellness [37].

For all decision-makers and tourism planners, performance evaluation and the rating of tourist sites is a key issue. Nevertheless, choosing the best wellness tourism destination can be challenging because of the presence of a wide range of variables in the evaluation process, as well as being occasionally due to a lack of or insufficient knowledge in this area.

This study uses the PROMETHEE-GAIA method to evaluate the performance of 10 thermal spas in Northern Portugal using an integrated MCDM methodology, as in the

studies carried out by [37,44]. The main focus of the authors was the suggestion of a decision support system that takes into account different criteria in the decision-making process about different destinations. The results suggest that it can be used successfully for decision-making optimization in tourism destination selection. This paper also reaches the conclusion that infrastructures plays a significant role in a traveller's decision regarding where to go. Therefore, the findings of this article can be useful as a reference for policy makers as well as for individual travellers and tour operators. It is expected that the proposed methodology can be used to evaluate other sectors effectively as well.

The high amount of information that this methodology provides is one of its benefits. Therefore, PROMETHEE I enables us to identify both the group leaders and the non-comparable realities in addition to the typical ranking that PROMETHEE II offers, displaying results comparable to those achieved when employing a synthetic indicator [81]. A manager identifying and being motivated by more competitive destinations when they are essentially incomparable could be a serious mistake [46]. A comparative research that, in a highly graphic way, aids in the identification of comparable actions and the analysis of destination positioning can also be used to round out the valuation. Additionally, the broad range of decision-making data enables us to identify the most advantageous alternatives.

The results indicate that it can be efficaciously used for decision-making optimization in the choice of a tourism destination. It can also aid in strengthening the shortcomings of policy makers and tourist industry professionals. Additionally, developing sustainable criteria for wellness tourism destinations and prioritizing destinations might assist travellers in selecting locations that are appropriate for their needs.

Like other research, this one has some restrictions. The absence of access to larger statistical datasets is one of this study paper's drawbacks.

To standardize the rating, future research could create a more comprehensive hierarchy for all types of wellness tourist destinations. Furthermore, the criteria and perhaps the hierarchy of the suggested model can be changed to create the requested form for various sectors. Another very popular MCDM method may be employed instead of the PROMETHEE-GAIA method, such as: the technique for order preference by similarity to ideal solution (TOPSIS) under fuzzy environment, namely fuzzy-TOPSIS [85], the analytic hierarchy Process (AHP) [86], elimination and choice expressing reality (ELECTRE) [87], or stepwise weight assessment ratio analysis (SWARA) [36], among others.

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