

## The Importance of Natural Geothermal Resources in Tourism

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**Keywords:** Balneology, Geothermal Resources, Geoparks, Geotourism, Hot Spring Spas, Health and Wellness Spa Tourism, Natural Hot and Mineral Springs, Thermalism

### ABSTRACT

The use of geothermal or hot springs dates back several thousands of years. Thermal bathing facilities exist in many countries and have a significant and longstanding reputation for successful health and wellness treatments based on the use of geothermal waters sourced from natural hot springs. Over time hot spring spas and resorts have come and gone, but since the wellness movement has taken a firm hold in the late 20<sup>th</sup> Century, many hot spring spas, some after years of decline, have undergone modernisation and redevelopment of their facilities. Today health and wellness spa tourism is one of the fastest growing sectors of world tourism. The recreational use of geothermal springs in resorts and water parks combined with access to medical thermalism significantly adds to the standard attractions offered by many holiday destinations. Associated geothermal phenomena such as boiling lakes, mud ponds, and erupting geysers have also fascinated people wherever they occur and many have been developed into unique tourist destinations with a high visual impact.

### 1. INTRODUCTION

Geothermal resources such as natural hot springs have for a long time played a significant role in human societies worldwide. Looking back - not just a few decades or centuries, but several millennia - geothermal springs were often classed as 'sacred sites', with patron saints indicating a possible divine connection. In many countries this connection still plays a major role in the appreciation of natural water resources, especially in relation to the curative value of geothermal and mineral springs. Over time countless hot springs have become cultural icons on every continent, even Antarctica, and have gained significance as destinations for tourism as this industry developed. For example, in countries such as Iceland, Greece, Japan, England, the Americas and New Zealand natural hot springs are used by large numbers of people for their beneficial mineral content, their relaxing and usually pleasant temperatures, and their visual attraction.

The growth of the tourism industry and the increasing desire of people to remain well as they grow older have recently created a renewed interest in the use of geothermal springs on a global scale. This health and wellness trend has caused the redevelopment of many existing hot spring destinations as well as new developments. In several regions developers of health and wellness spas and resorts are investigating the possibility of tapping into geothermal water to enhance their business prospects, and it does not matter whether the geothermal resource is derived from artesian groundwater basins, from volcanic activity nearby or from water heated by cooling magma bodies deep inside the Earth.

### 2. HISTORY OF GEOTHERMAL SPRINGS AND THEIR USE

The history of geothermal spas and hot spring use has worldwide origins which date back to the earliest civilisations. Individual regions and peoples developed and used their geothermal bathing facilities in a range of ways suitable to their individual needs. Countries like Japan, New Zealand, France, Spain, Portugal, Greece, Tunisia, Italy, Germany and Iceland have a significant and longstanding reputation for health and wellness treatments such as balneology and hydrotherapy (thermalism) based on the use of geothermal water sourced from hot springs. In every country that has been investigated natural hot springs have historically been attributed with therapeutic benefits due to their individual mineral compositions.

Many countries show similarities in the traditional and contemporary use of hot springs, although the first human contact with geothermal resources cannot absolutely be documented due to a lack of reliable written records, but is assumed to date back to the earliest human settlements. The maximum historical timeframe backed up by acceptable records reaches back to approximately 3,000 BC. Even this proves to be challenging, because of conflicting dates and the absence of consistent and dependable data. Careful evaluation of the most reliable historical information including available existing chronologies has led to the following 'early users' of geothermal springs listed in the Table 1.

Tracing back the use of hot springs to pre-prehistory is largely dominated by speculation and guesswork. In many countries indirect proof of the use of geothermal resources by ancient peoples is suggested by the location of sites in areas with geothermal manifestations. It can be therefore argued within reason that native peoples used natural hot springs and their geothermal by-products (Calderón, 1999). However, anything beyond written records and reliable oral transmission is only supported by the logical preference of humans to settle near natural hot springs for their various benefits. Despite the lack of concrete evidence in some cases it can safely be assumed that wherever people came across natural warm water they would have made use of it, either for cooking, bathing or for healing. Extensive research of hydro-geological data from Pakistan for example has led to the conclusion that the presence of clusters of thermal springs in the Indus Valley should be taken into serious consideration when analysing the history of the Indus Valley civilisations such as Mohenjo Daro and Harappa (Erfurt-Cooper, 2006, 2008). By applying a more global view it therefore becomes obvious that the origins of hot spring use do not lead straight to Europe and the Romans at all as is commonly believed.

**Table 1: Early users of natural hot and mineral springs according to the most reliable records (Erfurt-Cooper & Cooper, 2009)**

<b>3000 BC - 1700 BC</b>	<b>Indus Valley, Pakistan</b>	The Indus Valley civilisations (e.g. Mohenjo Daro and Harappa) are likely to have used geothermal springs, as the Indus Valley includes areas abundant with geothermal springs, which are still utilised for various purposes (Erfurt-Cooper & Cooper, 2009)
<b>1680 - 1193 BC</b>	<b>Anatolia, Turkey</b>	The Hittite Empires are said to have used hot springs for recreation and therapeutic treatments (Özgüler and Kasap, 1999)
<b>1430 BC</b>	<b>Lipari - Sicily, Italy</b>	Stone-lined ponds with geothermal spring water channelled into them were probably used for therapeutic thermal bathing (Cataldi <i>et al</i> 1999)
<b>1050 – 771 BC</b>	<b>Huaqing, China</b>	Huaqing Hot Spring was the favourite thermal spa of Emperors of various dynasties (Schafer, 1956) and appears to have been reliably documented
<b>1000 BC</b>	<b>Mesoamerica</b>	The Maya Empire dates back to about 1000 BC and included Mexico in the Yucatán Peninsula, Guatemala and parts of Belize and Honduras. Due to the many hot springs in these countries it is assumed that they were used by the Mayas for various purposes as they were a highly advanced people
<b>1000 BC (app.)</b>	<b>Western Europe</b>	West European tradition based on worshipping of sacred and healing springs
<b>8<sup>th</sup> Century BC</b>	<b>Italy</b>	Pompeii was founded around this time and geothermal water was used to heat buildings and baths within the city
<b>8<sup>th</sup> Century BC</b>	<b>Loutraki, Greece</b>	The thermal waters of Thermae (Loutraki today) were 'revitalised' around this time for athletic games held at Corinth (Fytikas <i>et al</i> , 1999)
<b>7<sup>th</sup> Century BC</b>	<b>Greece</b>	Homer mentions thermal waters as do several classical authors later, e.g. Hippocrates (460-377BC), Plato (427-347 BC), Aristotle (384-322 BC), Pliny the Elder (23-79AD) (Cataldi <i>et al</i> , 1999)
<b>863 BC</b>	<b>Bath, England</b>	The Legend of the founding of Bath tells that Bladud, father of King Lear, was cured of disease by immersion in the warm springs found there
<b>750 to 500 BC</b>	<b>Italy</b>	North of Rome the Etruscans used thermal bathing and other hydrothermal by-products (Cataldi & Burgassi, 1999)
<b>700 BC (app.)</b>	<b>Japan</b>	Dōgo Onsen in Ehime Prefecture on the island of Shikoku is one of the oldest and best known <i>onsen</i> hot springs in Japan and <b>may</b> have been used approximately 3000 years ago or even as early as during the Jomon and Yayoi periods as per the following websites (JNTO, 2009)

## 2.1 Geothermal Tourism in History

Large parts of geothermal spa history and the cultural use of hot and mineral springs in Europe is usually attributed to the Romans during the times of the 'Roman Empire' as some of the following examples show.

The City of Bath in England represents a long tradition relating to the use of natural hot springs including times during the Roman occupation when the local hot springs were used to cater for the battle weary legions. However, the legend of the original founding of Bath tells that Bladud, father of King Lear, had contracted leprosy during his travels and banned from the court he spent his time herding

pigs, watching them wallow in a steaming swamp. Bladud followed their example and was cured by immersion in the warm springs which allowed him to return to his father's court and later to become king (Green, 2004). The hot springs of Bath, now called Bath Spa Thermae, have only recently undergone a major redevelopment after being closed down for 28 years while the Roman Baths of Bath are for viewing only.

Other classic European-Roman examples are Aix-les-Bains in France and Budapest in Hungary. Spa towns with hot springs like Budapest or Aachen (Germany) were also made popular by visiting emperors and kings in later times who declared the thermal waters as beneficial and set up their summer residences nearby, thus promoting thermal bathing culture for centuries to come. The Belgian town of Spa is commonly accepted as the origin of the word 'spa', but only developed after its natural hot springs started to attract large numbers of visitors during the 17<sup>th</sup> century.

On the Asian continent the Chinese have been on the forefront in utilising geothermal springs for several thousand years. The Huaqing Pools near the city of Xian, according to historical records and archaeological documents, claim a history spanning approximately 6,000 years. However, according to Schafer (1956), reliable documents point towards 1050 – 771 BC. Today the Huaqing hot springs have the status of a National Cultural Relic Protection Unit and a National Key Scenic Area (Huaqing Hot Springs, n.d.) in China.

The native Indians of the Americas have long considered hot springs as sacred places and believed in healing powers of geothermal and mineral waters (Lund 2005). This was also the belief of the Indigenous people of Australia, who used geothermal springs such as the Helidon hot springs for thousands of years and regarded them as sacred sites (Pearn & Little, 1998). The natural sources of hot and mineral water were usually linked with the divinities of the Earth, and as in Greece the temples dedicated to Asclepius (Melillo, 1995), also had thermal baths.

As can be seen from this brief review, over time hot spring spas and resorts have been developed in many countries, although not all of them have lasted to this day and many of them have went into decline. The wellness movement which started in the 1990s has given ailing hot spring spas a new lease of life and encouraged many of them to renovate and modernise in order to compete with the new generation of wellness spas and resorts (Erfurt-Cooper & Cooper, 2009). Today health and wellness spa tourism is one of the fastest growing segments of world tourism.

## 3. TYPES OF GEOTHERMAL SPRINGS USED FOR SPA TOURISM

Geothermal resources such as hot springs and geothermal features as visual attractions play a significant role in several tourism sectors. Recreational activities for example in national parks as well as health and wellness spas depend on natural resources that are sustainable and renewable. Hot springs for human use such as treatment for health conditions depend on factors like access, temperature, mineral content and a sustainable quality of the water. The following is a list of the range of springs that may be used:

**Geothermal Springs or Hot Springs** - commonly known for their curative powers and their therapeutic benefits – worldwide occurrence.

**Mineral Springs** - can be cold or warm water, with curative powers and they can be taken internally as well. Natural mineral and geothermal waters are used in balneology, balneotherapy, hydrotherapy and crenotherapy, which can be combined under the umbrella of thermalism.

**Saline Springs** - in some countries (e.g. Germany) geothermal water with a very high salt content is also used for many health spa facilities. Saline spring water spas have their own place in health and wellness treatments and are useful for treating skin conditions and joint problems and they are widely used for physical water therapies.

**Extreme Hot Springs** – can be used for hot spring spas if cooled or mixed to reach a safe temperature for human use. Other associated features are geothermal attractions such as geysers, boiling lakes, hot rivers, and hot waterfalls.

#### 4. TOURISM SECTORS USING GEOTHERMAL RESOURCES

Hot springs are a geothermal resource which can be used widely to add value to tourist destinations in order to attract visitors. The main tourism sectors (see Figure 1) using hot springs are:

- Spa and Wellness Tourism (Leisure and Recreation);
- Health and Medical Tourism (Thermalism, Balneology, Hydrotherapy);
- Geotourism and Ecotourism (Geothermal Features as Visual Attractions);
- Adventure Tourism (Extreme Geothermal Environments); and
- Nature-based Tourism.



**Figure 1: This diagram shows the different tourism sectors that benefit from the presence of geothermal springs worldwide. By Author.**

The emerging worldwide consumer focus in health and wellness is 'back to nature' and a wholesome lifestyle, which looks at prevention instead of cure. This has created a renewed demand for 'old fashioned' geothermal and mineral water therapies, whereby natural and renewable resources are preferred. There is also a trend towards natural looking environments and settings which is evident in many spa hotels and resorts, where rock pools and waterfall features are typical designs in an attempt to imitate natural landscapes including hot spring.

#### 4.1 Locations and Settings of Geothermal Tourism

Geothermal features such as natural hot springs generally appear within close proximity to active volcanic environments, and are quite often co-located with mountainous and/or difficult terrain. For tourists with an interest in adventure tourism and extreme environments these features represent considerable attractions – thus

catering for a rapidly growing market in mainstream tourism.

Geothermal tourism can take place anywhere where thermal features such as hot springs or geysers are accessible. A number of particularly interesting geothermal environments have been World Heritage listed (e.g. Yellowstone National Park, USA; Pamukkale, Turkey). Others have been designated as National Heritage Sites, National Parks, Conservation Parks and regionally protected areas. National and Global Geoparks have recently become another option to preserve geothermal heritage with a gradual increase of these facilities. Many hot springs and other geothermal attractions are located on private properties with varying degrees of access for the public.

#### 4.2 Main Criteria of the 'Hot Spring' Phenomenon

The physical and cultural appeal of geothermal environments includes hot springs for leisure, recreation and health purposes as well as different social and cultural settings used as major tourist attractions. Apart from the traditional characteristics of hot spring use within a variety of cultural, religious and health related contexts the educational aspect of learning about the natural and geological background of geothermal phenomena and their occurrence is a further drawcard for many tourists. While most people may seek the therapeutic value of hot springs through various forms of applications in the health sector there is a very significant hot spring use in a socio-cultural context such as *Onsen* bathing in Japan. Within the tourism sector, especially in the field of health and wellness, future trends and developments are aimed at increasing the business potential by adding either new or additional geothermal resources to existing facilities (e.g. Glacier Hot Pools, New Zealand; Peninsula Hot Springs, Australia).

#### 4.3 Benefits of Geothermal Spring Water Use

The main benefits of geothermal springs lie in their therapeutic and curative value. Scientists worldwide have long researched the connection between beneficial minerals and other trace elements and the potential health benefits of geothermal springs (Ghersttich & Lotti, 1996; Jorden, 1631; Parish & Lotti, 1996) and many illnesses can be treated with good rates of success using various types of hot springs. A bath in a natural hot spring can also be mentally uplifting due to a relaxing time spent in a pleasant environment, often with natural scenery causing an increased feeling of wellbeing. Skin conditions like Psoriasis are treated successfully at hot spring health spas, for example in Kangal (Turkey), at the Blue Lagoon (Iceland), and at geothermal health spas near the Dead Sea (Jordan, Israel) although with quite contrasting methods. Health benefits from thermalism (balneology, hydrotherapy) also depend on the medical qualifications of adequately trained staff (Erfurt-Cooper & Cooper, 2009). However, some hot springs seem to work for some people, but not for all, which may depend, according to Clark (1999) on every individual's personal biochemical makeup.

#### 5. ACTIVE AND EXTREME GEOTHERMAL ENVIRONMENTS

While the main community perception of hot springs may place them into a Health and Wellness Spa conceptual environment there are many more varieties of these geothermal phenomena providing attractive (and occasionally dangerous) tourist destinations worldwide. Hot springs which are not suitable for health and wellness spa tourism due to their extreme temperatures can have an enormous visual impact and are very popular in their own

right as must-see attractions in many countries. The principal attractions of active geothermal environments are therefore geological and naturalistic and include the following popular features with some locations as examples for their occurrence:

- Extreme hot springs and Geysers (Iceland, New Zealand, Japan, USA);
- Boiling ponds, lakes and mud pools (Japan, Iceland, New Zealand, China, Indonesia);
- Hot rivers and streams (New Zealand, USA, Iceland, Japan);
- Sinter Terraces (Turkey, China, New Zealand, USA);
- Steam vents (fumarolic activity – common occurrence in active geothermal and volcanic environments).

Some of these natural attractions are related to volcanic environments, either active or dormant, and are frequently included in general sightseeing tours. Due to an increased interest of geotourists in geodiversity and unique landforms, some tour operators offer special study tours to active geothermal areas, often combined with volcanic landscapes, to cater for groups who want to study these environments in more detail and close up.

### 5.1 Visitor Expectations - What Are Tourists Looking For?

One of the main reasons for visiting geothermal environments seems to be a desire to experience untouched natural areas, which is demonstrated by the difficulties which tourists are prepared to overcome when embarking on excursions to places like the Valley of Geysers (Kamchatka in the far East of Russia). Often the most spectacular sights are only possible from a distance due to lack of access or due to potential dangerous activity. Reasons for visiting highly active geothermal environments can include a number of motives such as:

- Sightseeing as part of a trip agenda;
- Unique photo opportunities;
- Scientific or educational study interest; and
- Curiosity and the ambition to see something unusual.

Some of the key factors in utilising extreme hot springs as tourist destinations are the long-term sustainability of a renewable geothermal resource (clean and cost effective), their occurrence in many areas (worldwide), the surrounding natural environment, and their economic significance (commercial and industrial), as hot spring tourism represents a substantial part of the economic value of tourism in a number of countries. It is however difficult to find data that separates visitor numbers from hot spring spa destinations, spa destinations without hot springs, and extreme hot springs used as visual attractions for tourism. Some destinations are listed below, including examples of health spas, *Onsen* and *Hammams* as well as geothermal manifestations such as geysers and boiling lakes etc. in national parks.

Hot Springs Spas	Visitor Numbers
Germany	6,476,794 visitors (2006)
Japan	151 million visitors p/a
Tunisia	2.5 million visitors p/a

Geothermal Attractions (USA)	Visitor Numbers
Yellowstone NP	3,066,580 (2008)
Hot Springs NP	1,238,147 (2008)
Mt Lassen Volcanic NP	377,361 (2008)
Mt Rainier NP	1,163,227 (2008)

Apart from their importance for recreation and leisure, visitor expectations for hot spring tourist destinations include their natural environment and their unusual landscape features, as well as the 'value adding' of education about geological phenomena at local visitor information centres or interpretive centres. Hot springs of different types (see Figure 2) have in fact been tourist attractions for many centuries as has been well documented in the literature (Hróarsson and Jónsson 1992).

### 5.2 Risks and Hazards of Geothermal Environments

Exploring geothermal environments is not always completely safe, as there are a number of problems that can occur, some of them rather unexpectedly. Apart from the risk of thermal burns from extreme hot springs such as erupting geysers, active steam vents can release extremely hot gas or vapour, which can lead to severe burns. In 2001 a mud pool in Kuirau Park (in Rotorua, New Zealand) generated a large hydrothermal eruption with a steam vent ejecting a cloud of vapour, mud and large ballistic blocks (GeoNet, 2001), burning the surrounding vegetation and covering nearby roads with mud and debris, causing their short-term closure for traffic. Several eruptions have happened in Kuirau Park since then (2003, 2006), so far without accidents, despite the fact that these eruptions are usually attracting greater numbers of visitors.



**Figure 2: Geothermal tourism in Iceland. The left picture shows the original Geysir erupting c150 years ago, while the picture on the right shows the same location during recent times. The fascination of the spectators with this geothermal phenomenon is obvious.**

Unexpected hydrothermal eruptions can happen in every active geothermal field; mud eruptions, steam flashes and geyser eruptions do not always occur with prior warning signs. Since geothermal fields are usually located in regions with seismic and/or volcanic activity, sudden earthquakes are another possible hazard that should be included in every personal risk assessment before venturing out into the unique geothermal landscapes. In extreme cases, where geothermal attractions are close to volcanic activity, mudslides (lahars) can be an additional risk factor, occasionally affecting skiing areas (e.g. Mt. Ruapehu, New Zealand in 2007), where tourism includes a variety of outdoor activities combined with volcanoes and hot springs. Other geothermal hazards include gas emissions such as Hydrogen Sulphide ( $H_2S$ ) which can pose a serious threat, as this gas is potentially lethal within moments at higher concentrations.  $H_2S$  is known to occur near some hot springs and has been the cause of fatal accidents in the past. In the year 2005 a whole family in Japan died when they encountered  $H_2S$  that is thought to have accumulated in a hollow under a thick snow layer. Unfortunately this gas,

which smells like rotten eggs in lower concentrations, is impossible to detect at higher concentrations until it is too late. Other types of toxic fumes are often found in combination with volcanic activity; for example the development of LAZE (lava haze) at eruption sites in the Hawaii Volcanoes National Park. LAZE contains hydrochloric acid (HCl) which can form when lava enters the ocean and produces steam plumes of hydrochloric acid, often mistaken for water vapour. The eruption site in this national park has seen several fatalities over the years, due to the fact that people want to be as close as possible to geothermal activity without being aware of the possible consequences for their personal health.

### 5.3 Examples of Geothermal Destinations

Travel and recreation are often linked to national parks with geothermal areas, which are developed as tourist destinations. Most countries with active geothermal fields will use these geological 'power points' and 'hot spots' as tourist attractions. Japan, Iceland, and New Zealand are only some examples for geothermal tourism on a larger scale.

For tourists in Japan, who visit areas with high geothermal activity like Beppu City on the island of Kyushu, the extreme hot springs called *Jigoku* (Japanese for 'hell') are very popular tourist attractions. These *Jigoku* (see Figures 3, 4, 11 and 12) are 10 small geoparks with boiling, bubbling and steaming attractions, including geysers, mud pools and hot springs for foot baths, which are very popular on cold days. Eggs, vegetables and dumplings are cooked over hissing steam vents or in the boiling ponds and are a culinary experience not to be missed.



**Figure 3: The Risk Factor in Hot Springs Tourism – looking at boiling ponds in Japan comes with a clear warning.**

The *Jigoku Meguri* (recommended tour or pilgrimage of the 'hells') is a special tour including most *Jigoku* from a group of ten, although one or two of them don't seem to be recognised by the majority of the group. One of the unique aspects of these *Jigoku*, apart from their geothermal origin, is their location in the middle of a city of 130,000 people. The following list names all the *Jigoku* in Beppu city with the first 5 located close together:

1. Umi Jigoku (Sea Hell)
2. Kamado Jigoku (Oven Hell)
3. Yama Jigoku (Mountain Hell)
4. Oniishibozu Jigoku (Shaven Head Monks Hell)
5. Oniyama Jigoku (Monster Mountain Hell)
6. Shiraike Jigoku (White Pond Hell)

7. Chinoike Jigoku (Blood Pond Hell)
8. Kinryu Jigoku (Golden Dragon Hell)
9. Tatsumaki Jigoku (Geyser Spout Hell)
10. Bozo Jigoku (Monks Hell, located along Route 500)



**Figure 4: Umi Jigoku in Beppu, Kyushu, offers unique geothermal features combined with *Onsen Tamago*, eggs boiled in hot springs or over steam vents.**

The annual visitor numbers to the city of Beppu are on average 12 million, mainly domestic tourists. And most of these will at least visit one of the *Jigoku* at a relatively low cost of 400 Yen each or 2000 Yen for eight *jigoku* plus many of the city's 2600 hot spring spas (*Onsen*), which are a favourite of the Japanese and greatly appreciated as a geothermal by-product of the 100+ active volcanoes in the country.

In Iceland, where geothermal activity is nearly everywhere 'underfoot', tourism organisations and private operators offer visitors to tour their 'hellish' landscapes. Due to the country's geologic features, in a short time sensational volcanic and geothermal landscapes can be explored, including spouting geysers and boiling mud ponds; all that against the ever present backdrop of layers of ancient lava flows. In the case of Iceland it can be safely assumed that every visitor sooner or later will be participating in some form of geothermal tourism, even if they only visit the famous Blue Lagoon' or the Nature Baths in Mývatn (see Figure 5) in the middle of endless lava fields with geothermal power stations in the background or nearby.



**Figure 5: Myvatn's Nature Baths opened in 2005 and attract many visitors from all over the world with its unusual location and relaxing facilities. Photo by Author.**

Not far from the Mývatn Nature Baths are high temperature areas that attract visitors with their geothermal features, e.g. Námafjall (see Figure 6), where boiling mud ponds and hissing steam vents invite for a walk through a bizarre landscape. Guest accommodation all over Iceland usually includes access to 'hot pots' fed by local hot springs for rest and relaxation after a day of hiking. One of the most popular hot spring locations 'in the middle of nowhere' is Landmannalaugur in the south of Iceland. People gather here

at all times to discover the unique volcanic landscape and relax afterwards in the outdoor hot springs, rain or shine. Like in some other countries (New Zealand) Iceland also offers visits to geothermal power stations, which are educational and informative.



**Figure 6: Geothermal areas with boiling mud ponds such as Námafjall are of great interest for tourists. However, according to some internet sites great care must be taken and all warnings observed as there have been many accidents (EnjoyIceland, 2009).**

New Zealand's City of Rotorua is well-known for its geothermal manifestations and the complementary sulphur smell. Surrounding areas offer high temperature geothermal attractions which include hot creeks, geysers, sinter terraces, mud pools and geothermal power stations. These geothermal attractions are contained in national parks or private parks and are open to visitors; however the entrance fees can be quite high compared to Iceland, where geothermal features are generally accessible at no extra charge. Some free geothermal places around Rotorua like Kerosene Creek (see Figure 7) are located in rather hidden locations, but are very popular with tourists who prefer to use hot springs in a natural bushland setting. Throughout Rotorua hot spring water from geothermal activity is available to domestic and commercial buildings, including the many hotels and motels who offer genuine mineral pools to their guests. But the major tourist attractions are the numerous geothermal parks located in and around Rotorua. Some examples with comments from the internet are listed below:

- Waiotapu Thermal Wonderland - stunning geothermal activity;
- Waimangu Volcanic & Thermal Valley - a 'must do' eco-experience;
- Waikite Valley Thermal Pools - a unique place to experience the 'living waters';
- Whakarewarewa - Maori cultural experiences in 'The Thermal Village';
- Hells Gate Wai Ora Spa - Thermal Park - Maori culture, hot springs and mud pools;
- Wai-O-Tapu - Silica Sinter Terraces.

Sinter terraces form down slope of hot springs and geysers and are one of the most distinctive features of some geothermal areas. Their fragile and unique beauty has attracted visitors to New Zealand from the 1840s. The most well known sinter terraces were the Pink and White Terraces of Lake Rotomahana, a geothermal treasure, which were buried completely when the nearby Mount Tarawera erupted

in 1886. Until their destruction people were travelling from as far as Europe to see the special hot spring fed terraces (Figure 8).



**Figure 7: Kerosene Creek not far from Rotorua, New Zealand. This hot waterfall is in an attractive natural area and is gaining in popularity. Photo by Author.**



**Figure 8: Tourists bathing at the White Terraces early 1870s (Te Ara, 2008).**

In Turkey the sinter terraces of Pammukkale have been famous tourist attractions for centuries and still attract visitors to the site of the ancient city of Hierapolis built there in the 2<sup>nd</sup> century BC. Today the area is mainly visited by health, wellness and leisure tourists who travel to the hot spring areas for rest and recreation, but also include sightseeing of the old cultural and architectural remains and the volcanic landscapes in their itineraries. A large volume of tourism in Turkey is directly related to volcanic and geothermal environments which include approximately 1300-1500 natural hot springs although numbers differ depending on information sources (Erfurt-Cooper & Cooper, 2009).

Yellowstone National Park is probably one of the best known destinations for geothermal tourism and contains the largest concentration of geothermal features in the world (Rhinehart, 1980), with around 100 different hot springs groups totalling over 10,000 individual thermal features (Bryan, 1986). The terraced Mammoth Hot Springs with over 100 hot springs cascading over a number of travertine terraces (Bargar et al, 1975) are one of the most popular tourist attractions in Yellowstone (Figure 9). However, there are many other active geothermal areas with extreme hot springs, geysers and boiling lakes not only on both American continents, but can also be found in many countries along the 'Ring of Fire' including Indonesia and the Philippines as well as in China's geoparks and national parks. Many of those attract tourists who enjoy activities

such as hiking and trekking, as well as climbing and skiing on or around often close by active or dormant volcanoes.



**Figure 9: Mammoth Hot Springs are part of the Yellowstone National Park complex (Showcaves.com, 2007).**

Many geothermal landscapes worldwide offer such unique features that they are either protected by environmental laws and regulations, have been declared cultural or national geological heritage to stop development in their vicinity, or are designated as a World Heritage site (e.g. Pamukkale, Turkey; Yellowstone, USA).

## 6. THE ROLE OF HOT SPRINGS IN HEALTH AND WELLNESS SPA TOURISM

Geothermal springs represent a natural option for health and wellness spa tourism with a wide range of spa types using hot springs where these are available. From balneology and 'taking the cure' for rehabilitation purposes to hot spring resorts for indulgence and relaxation most geothermal spas market their potential as destinations for leisure, recreation and better health through the prevention of illness.

### 6.1 Hot Spring Characteristics

The main aspects of hot springs include their natural, often volcanic origin, and their curative properties related to their individual mineral contents. Hot springs occur worldwide; in fact there are very few countries without direct access to natural geothermal springs with Denmark and Sweden some of the rare examples. As long as geothermal springs are not over-exploited, which has happened in the past (e.g. Rotorua, New Zealand), they may be classed as a renewable and sustainable resource. Their natural environment and the unique geothermal landforms are an important part of the 'hot spring experience' and are some of the major attractions of these destinations.

### 6.2 Visitor Expectations and Attractions of Geothermal Spas

The physical and cultural appeal of hot springs includes social settings which can be a unique experience for visitors from different cultural backgrounds. Visitor preferences and expectations differ according to personal preferences although the main reasons for visiting hot springs generally include the following elements:

- Benefits for health and wellbeing;
- Health improvements possibly resulting in the prevention of illness;
- Traditional thermalism therapies including balneology and hydrotherapy;

- Unpolluted and pure spring water at pleasant temperatures;
- Relaxation in a peaceful environment with friendly socializing while enjoying a change of scenery.

### 6.3 Hot Spring Spa Types

Health and wellness spas may not always offer genuine hot springs, but all spas use water as a key element either for treatment or as decorative and landscaping features. Natural hot and mineral springs can be components of any type of spa including holistic spas, medical spas, wellness spas, day spas, destination spas, spa resorts/hotels, club spas, adventure spas, eco spas, family spas etc. As the health and wellness industry is still growing there will be more spa types combining with geothermal resources if these are available.

### 6.4 Geothermal Byproducts - Big Business

Hot springs and their related natural products such as geothermal mud and minerals are used for a range of purposes in the cosmetics industry. Cosmetic products such as mineral bath powders, geothermal mud packs and mineral enriched crèmes and lotions have a large business potential and are readily available, these days frequently via the Internet, but mostly come with a price tag due to what is generally advertised as containing only pure and natural ingredients. Many hot spring spas offer their own signature range of cosmetic products; e.g. Peninsula Hot Springs in Australia, Polynesian Spa in New Zealand, and the Blue Lagoon in Iceland (see Figure 10) to name just a few.



**Figure 10: Geothermal by-products in the form of cosmetics, shampoos, soaps, mineral bath powders, mud packs and many others. Photo by Author.**

Other by-products are large aquatic entertainment parks (e.g. Tatralandia, Slovakia; Acuamania, Uruguay; Zakopane Aqua Park, Poland; Spa Hawaiians, Japan). These water parks use their abundant geothermal water resources for their facilities; however, generally without providing a distinctive health and wellness environment although spa facilities may be included in some parks.

## 7. CASE STUDY JAPAN

Japan has an abundance of geothermal springs due to the large number of active volcanoes throughout the country. The main use of hot springs is for *onsen* bathing, which is a traditional favourite of the Japanese people who have appreciated these natural geothermal resources for many centuries. Historically Japanese *onsen* have been featured in ancient poetry and novels and were always used for their curative potential as well as for relaxing and socializing. Used in the past by Emperors, warlords and Buddhist priests, *onsen* were popular places where political strategies and intrigues were planned. The oldest *onsen* in Japan is said to be the *Dogo Onsen* in *Ehime* Prefecture, with claims of

the first opening dating back over 3,000 years (JNTO, 2009), although no written records have been made public.



**Figure 11: Hot steam for inhalation at the Kamado Jigoku in Beppu. Photo by Author.**

### 7.1 Geothermal Tourism Infrastructure

A large number of national parks in Japan include geothermal areas, usually with close links to volcanic activity. Annual visitor numbers are considerable, but consist mainly of domestic travellers who visit the geothermal centres on their 'hot spring pilgrimage'. Many Japanese 'collect' onsen and travel extensively to discover and experience as many hot springs in their country as possible. Statistics from 2001 reveal a total number of active hot springs in Japan as high as 26,796 (Nipponia, 2003) and in the year 2005 the total visitor numbers to hot spring destinations in Japan was 151 million people (Beppu International Tourist Office, 2007).



**Figure 12: Jigoku Meguri (Hot Spring Pilgrimage) early last century in Beppu. Photo taken by the author at an exhibition of historic pictures at one of the Jigoku.**

### 7.2 Geothermal Tourism Infrastructure in Japan

In order to cater for the large numbers of hot spring tourists most national parks and other areas with geothermal attractions have excellent access roads, information centres, traditional onsen *Ryokan* (Japanese hot spring resorts), mountain lodges and lakeside inns, historical and cultural sites with shrines and tombs as well as museums and cultural exhibitions themed around the onsen experience. A large service industry with ample retail opportunities for hot spring tourists is the backbone of many local economies in Japan (e.g. Yufuin, Kyushu; Matsuyama, Shikoku; Kusatsu, Honshu; Toya, Hokkaido). The following list contains some Japanese national parks on the islands of Hokkaido, Honshu and Kyushu, which feature geothermal and volcanic activity with vast numbers of developed hot springs as well as other geothermal phenomena like geysers and Jigoku:

- Daisetsuzan National Park (Hokkaido)
- *2006 Visitor Numbers: 6,1 million;*
- Shikotsu-Toya National Park (Hokkaido)
- *2005 Visitor Numbers: 14,6 million;*
- Akan National Park (Hokkaido);
- Saikai National Park (Kyushu);
- Unzen-Amakusa National Park (Kyushu);
- Aso-Kuju National Park (Kyushu);
- Kirishima-Yaku National Park (Kyushu);
- Towada-Hachimantai National Park (Honshu);
- Joshin'etsu Kogen National Park (Honshu);
- Fuji-Hakone-Izu National Park (Honshu)
- *Annual Visitor Numbers: 103-105 million.*

## 8. CONCLUSIONS

This paper presents research in progress on the role and significance of natural hot and mineral springs to a contrasting group of tourism sectors such as health and wellness tourism, medical tourism, geotourism, adventure tourism and ecotourism. Although no country can be identified beyond any reasonable doubt to have been the first to use hot springs, because of the lack of reliable records, it is assumed that people would have made use of geothermal resources for bathing, healing or cooking wherever these were available. Archaeological findings have revealed in several cases the preference of humans to settle near natural hot springs for their various benefits.

While many health and wellness spas rely on hot springs and their mineral content for health and wellness tourism, it is the extreme hot springs such as geysers, bubbling mud ponds, and colourful mineral deposits in boiling pools that draw visitors to geothermal National Parks like Yellowstone (USA) or the Valley of Geysers in the Kamchatka (Russia). National Parks, Geoparks and even World Heritage listed sites include geothermal environments of unique beauty and remarkable activity. The geodiversity of active geothermal sites offers an opportunity for the tourism industry to promote extreme geothermal springs alongside hot spring spa resorts as is done in Japan, Iceland and New Zealand. These three countries are examples of having successfully based a large part of their tourism industry on this combination of hot springs for human use as well as geothermal springs at extreme temperatures for their visual effect. Icelanders enjoy their hot tubs and the Japanese love their onsen while New Zealand offers a variety of natural hot spring spas adopted from different cultural backgrounds. All add extreme geothermal events to the range of attractions for visitors.

### 8.1 Common Patterns in Hot Spring Use

Common patterns of hot spring use include their utilisation for medicinal purposes due to their curative value and therapeutic benefits. The overall concept of hot spring use is similar in most countries where hot springs commonly occur in geologically active areas as well as in artesian groundwater basins (e.g. the Great Artesian Basin (GAB) in Australia and the Guarani Aquifer which is located under parts of Argentina, Brazil, Paraguay and Uruguay). Most countries have historical links to the religious, spiritual and mythological use of hot springs while the development of hot spring facilities has happened over time, alternating with



decline and redevelopment. Hot spring resorts and spa resorts are increasing worldwide with existing facilities expanding and active hot springs are utilised for new developments where they are available. In many countries, especially on the European continent, the use of hot springs is medically respected and health treatments are carried out by highly qualified medical staff under strict supervision.

Other main benefits of hot springs are their occurrence in natural environments, where modern comfort, luxury and safety associated with the use of geothermal resources for tourism is becoming increasingly important. Hot spring spa sites of historical significance for example such as Bath, Aachen, Budapest, Huaqing, Rotorua, Kusatsu, Saratoga or Banff have retained their traditional atmosphere and ambience, and their architectural heritage. Authentic hot spring water is generally expected, although in Japan this is a must and the addition of chemicals is rejected by Onsen users. Many countries also use hot springs for domestic and commercial purposes which are not health related, e.g. power generation, space heating, agriculture, aquaculture, drying facilities, and snow melting.

## 8.2 The Current Situation of Geothermal Tourism

The trend towards wellness and overall health improvement through lifestyle choices has caused the unexpected revival of hot spring spas in a number of locations with existing hot spring facilities undergoing modernisation and redevelopment of their facilities after years of decline. New spa developments are looking for geothermal spring resources to enhance their treatment offers, with an increasingly strong competition for these resources by tourist destinations worldwide. This paper is a review of the use of geothermal springs in a variety of tourism sectors with brief examples including the historical and cultural backgrounds.

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