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# Role of Tourism in Promoting Geothermal Energy: Public Interest and Motivation for Geothermal Energy Tourism in Slovenia

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**Abstract:** From household geothermal heat pumps to industrial geothermal heating and electricity production, geothermal energy is one of the most promising future climate change mitigation areas. This paper aims to analyse the potential role that the tourism industry has in the promotion of geothermal energy. Although general knowledge and understanding of geothermal energy is often relatively low, geothermal energy tourism has the potential to encourage the public to use and learn about geothermal energy and its applications. The paper first provides a theoretical conceptualisation of geothermal energy tourism at the energy production level and energy usage level. Empirical results from an online survey amongst a sample of the Slovenian population show that there is a reasonably strong interest in geothermal energy tourism, correlating with the public image of geothermal energy. The study furthermore identified three main motivational factors for energy tourism: the first is "Knowledge," followed by "Having fun," with the lowest level on the motivational factor being "Self-recognition." The paper finally provides future recommendations on geothermal energy tourism as a tool for wider public acceptance but also knowledge on the potential risks of geothermal energy as a sustainable energy source.

**Keywords:** climate change mitigation; geothermal energy; industrial tourism; energy tourism; public interest; social acceptance



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## 1. Introduction

Geothermal energy production and usage are set to increase in the future, as well as the number of countries that use this kind of energy, especially with the global push towards climate change mitigation. There is an estimated growth of the installed thermal power for direct utilisation in TJ/yr and MWt at a compound rate of 11.5% and 8.73% annually, respectively [1]. As geothermal energy production and utilisation are gaining greater recognition in renewables, academic institutions and other geothermal organisations are offering an increasing number of geothermally related courses and vocational training programs as well as undergraduate, graduate, certification, and Erasmus+ programs related to geothermal [2,3].

However, studies have shown that although there is general support for renewable energy, knowledge and understanding of the potential of geothermal is remarkably low [4]. Public acceptance of geothermal energy is a combination of interrelated socio-political acceptance, market acceptance, and community acceptance [5]. In this research, we focus on the general public, that is, community-level acceptance. The importance of education and public outreach in the local and broader community is especially recognised at new drilling sites [6]. Hanson and Richter's [7] study presented a low rate of hashtag usage on social media for geothermal compared to solar and wind. The public's first associations with geothermal are volcanos and hot springs [8], but also high investment, and drilling and seismic risks [9]. Even though geothermal energy often has a positive public perception, it can easily shift and often lags behind when compared to other types of energy [4,10,11].

We argue here that geothermal energy tourism is an important direction for building public awareness and social acceptance of geothermal energy together with education on potential risks involved. Geothermal energy and tourism have long been intertwined in the case of swimming, bathing, and balneology tourism products [12,13]. These products take second place in global geothermal energy usage [1]. However, although balneology may serve an important function in connecting the public image of geothermal energy with the positive sides of thermal water, we argue that there is still much more that tourism can do for the public image of geothermal energy. We turn here to the area of industrial tourism, which is still highly overlooked, although it provides an important potential for future direction in raising broader public knowledge on geothermal energy.

In this paper, we first interconnect previous literature on industrial tourism with recent works on so-called "energy tourism" in order to provide the first conceptualisation of geothermal energy tourism. We identify three main forms of geothermal energy tourism: (a) the energy production level, (b) the level of energy usage for tourism-nonspecific industries, and (c) at the level of energy usage for tourism-specific industries.

## 2. Conceptualising Geothermal Energy Tourism

Industrial tourism is defined as visits to organisations or companies where production activity is happening and visitors witness production processes in motion, learn about the company's history, or taste/experience the products [14,15]. This type of industrial tourism can be described as active industrial tourism [16]. On the other hand, visits to inoperative and abandoned industrial heritage sites can be defined as industrial heritage tourism [17].

The origins of industrial tourism go back to the late 19th/early 20th centuries [18,19], but nowadays, it is attaining greater importance. A growing number of destinations are offering industrial tourism products since it represents a unique on-site experience. The concept of the experience could be regarded as an essence of the industrial tourism program design. At the same time, this is a practical approach to create a memorable and exciting tourism experience to satisfy tourists' sensory and mental needs [20]. Therefore, industrial tourism is primarily an experience that a visitor gains during a visit to an industrial site. According to Pine and Gilmore [21,22], we have moved from a service economy to an experience economy. Modern customers are willing to pay more for experiences rather than a bare product or service. Offering experiences becomes a significant competitive advantage since they allude to tourists' rational and especially emotional decisions and can generate emotional value [23,24].

Industrial tourism has been hailed as one of the ways to increase the sustainability of tourism. For example, we can conserve industrial heritage through industrial tourism, provide new jobs in the local community, or expand the business to the tourism realm. This attracts new inhabitants and helps potentially abandoned areas to revitalise since old buildings can be reused, and new services for visitors and locals can emerge [25–27]. Industrial tourism can also help overcome seasonality effects, thus providing a yearlong tourism offer that will attract tourists throughout the year and secure more stable working positions [28]. Finally, at the time of COVID-19, tourism resilience has come into sharp focus. One solution is found in diversifying tourism value chains and making destinations less tourism-dependent [29]. Active industrial tourism is potentially a direction for further strategic development and differentiation of local offers. The argument is that industrial tourism development might cause a decrease in local dependence on tourism by interconnecting tourism with other forms of industry, reducing the risks exposed by the pandemic, and allowing the local communities dependent on tourism to "weather the storms." Before COVID-19, adding industrial tourism to other industries was primarily perceived as enhancing the original non-tourism industry's marketing activities while tapping into tourism as a potentially lucrative new revenue source—therefore increasing the resilience of the original industry, such as food production. After COVID-19, however, the tourism industry, or rather, local destination development, is looking for differentiation and resilience in interconnecting tourism with other industries.

Among the most recognised and historical forms of industrial tourism are visits to mines and quarries [30,31]. The presentation of a mine illustrates industrial sites' transformation into industrial heritage tourist attractions. It serves to protect and preserve the mining-industrial heritage and the tourist use of buildings, machines, and landscapes [32–34]. Another typical fossil fuel-based industrial tourism offer is visiting oil and natural gas resources sites [35,36]. There, industrial tourism has also been used as a form of public relations, where companies address perceived public concerns through visits and interpretation [37]. In a study by Price and Ronck [37], six discursive themes were identified that were presented at the majority of oil and natural gas sites (contemporary industry, products, technology, workers and recruitment, and industry impacts).

With the need for the world to replace fossil fuels and the growing usage of sustainable energy sources, we need to explore further how interpretation and industrial tourism can be built around sustainable energy sources such as geothermal energy. The industry in question can be the industry of geothermal energy production or the various ways of geothermal energy usage in other industries, either tourism non-specific (e.g., geothermal food production) or tourism specific (e.g., geothermal balneology). In the sections below, we discuss these three most common forms.

### *2.1. Geothermal Energy Tourism at the Energy Production Level*

Industrial tourism can be applied to geothermal energy both at the energy production level and at the level of energy use. The level of energy production was termed by Jiricka et al. [38] as "energy tourism" and has been recognised as having tourism potential for more than a decade [38–40]. Energy tourism is defined as niche tourism, which involves tourists visiting former, retired, or regenerated sites and still operational energy sites where some facilities, services, or activities have been explicitly provided for tourists' use [41]. Frantal and Urbankova [41] also argue that energy tourism is not only a type of special interest tourism or a segment of industrial tourism since it overlaps with other types of special interest tourism, including cultural, heritage, adventure, and agricultural tourism.

Energy sources can be considered an attractive element within industrial tourism and, in some cases, can increase the number of visitors to the area, mainly due to its modern design, proportions, eco-image, and, in certain regions, due to its uniqueness [39]. Energy-based tourist attractions combine technical fascination, emotion, sustainability (if renewable), education, leisure, fun, and nature, and are thus attractive for an extensive range of visitors [40]. Liu et al. [42] proposed six motivation aspects that affect tourist engagement in an energy tourism experience: (1) aesthetics, (2) education, (3) socialisation, (4) sustainability energy factors, (5) ecological impacts, and (6) policy and planning.

There are two target groups that are defined as interested in energy tourism. The first is the interested public—mainly city councils and policymakers and the specialised private sector (generating expert-oriented tourism). The second is the general public or vacationers (generating experience-oriented tourism) [38]. Although the former has been long recognised as essential visitors to energy sites, the experience-oriented tourism potential has not yet been realised. This potential combines environmental education and novel product experience to improve people's energy literacy and motivate them to change their energy use behaviour towards more sustainable "energy citizenship" [38,41].

Energy sources can interact with tourism in different ways [39]—first, there is the change of driving routes to travel through the area with energy sources. Second is the emergence of educational (hiking) trails, cycling paths, and info points near power plants. Next is opening visitor centres that promote the energy source's image and knowledge of used technologies, as well as founding educational centres related to energy and sustainable development. Alternatively, observation points, energy-related amusement parks, or architecturally valuable buildings can be located to attract the attention of the media and tourists. Frantal and Urbankova [41] also highlighted the emergence of environmental education centres, observation towers, or nature trails, and the world's first energy tourism travel guidebook from Germany published a decade ago.

Energy tourism is nowadays on the rise in renewable energy sites. Wind farms and turbines are regarded as attractive due to the educational interest in wind energy technology, appreciation of natural surroundings, social affiliations, and engagement in recreational activities, hence leading to increased wind farm visitations [43,44]. There is also an interest in geothermal energy sites, reported especially from Iceland. In Iceland, over 100,000 people visit geothermal power plants and related constructions every year [45]. In a study of tourists' attitudes towards Icelandic energy plants, it was found that geothermal power stations were considered acceptable by 36% of respondents, 24% regarded them as rather desirable, and 9% found them very desirable [46]. As Frantal and Urbankova [41] wrote, there are specialised tours in Iceland offering a mixture of nature and spa tourism with energy and environmental education (a visit to a geothermal power plant and greenhouse cultivation centre). The authors noted that such tour packages, where visits to energy sites are "mixed" with other tourism activities, could have more significant development potential.

### *2.2. Geothermal Energy Tourism at the Energy Usage Level: Tourism-NonSpecific Industries*

As written in the 2020 report (see Figure 1), geothermal energy was mainly used for heat pumps (58.8%), followed by bathing, swimming, and balneology (18%); space/district heating (16%); greenhouse heating (3.5%); industrial applications (1.6%); aquaculture pond and raceway heating (1.3%); agricultural drying (0.4%); snow melting and cooling (0.2%); and 0.2% for other applications [1]. In all these areas, there is a potential for the creation of industrial tourism products.

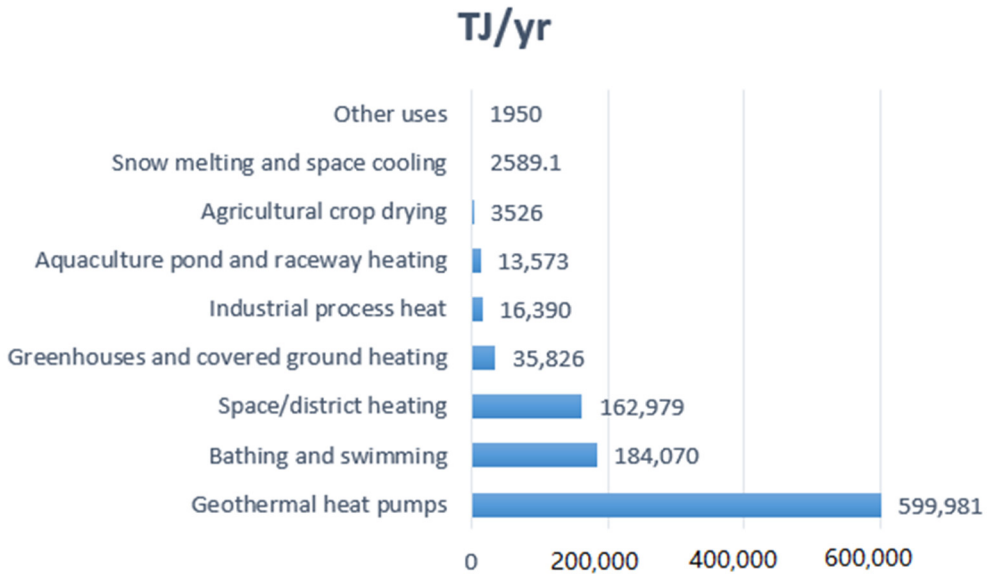


**Figure 1.** Worldwide direct use of geothermal energy in TJ/yr from 2020. Based on [1].

Here we illustratively focus on the industries in fourth place in global geothermal energy use. Greenhouse heating occurs in over 30 countries, and the most prominent producers are Turkey, China, the Netherlands, Russia, and Hungary [47] (Rajver et al., 2016). These are the countries where most vegetables and flowers are grown. Greenhouse industries are demonstrating a new business model intertwined with tourism. Their innovative business model is grounded in experiential tourism and transformed into industrial tourism [28,48]. Pavlakovič and Turnšek [28] saw the shift towards combining geothermal food production and tourism as a potentially significant and innovative new trend in finding other forms of geothermal use and thus extending the sustainability of geothermal energy use, and as including industrial tourism to serve the educational or even transformational role in educating visitors regarding geothermal usage and extending public support to this type of sustainable energy.

Visiting greenhouses is an experience that offers a new perspective on growing plants, enables visitors to taste the produce, and educates not only about growing specifics but

also about the technologies used to run the business. Some producers, like the tomato producer Paradajz Ltd. and geothermal orchid producer Ocean Orchids Ltd., both from Slovenia, have invested in building extra greenhouses specifically for visitors. In the case of tomato production, the visitors can touch and taste the numerous varieties of geothermally produced tomatoes, combined with relaxing at the greenhouse bar. In the case of orchid production, the visitors can enjoy the specifically designed botanical garden aimed at showcasing various global types of orchids. As geothermal resources can be considered renewable [49] and geothermal energy usage is set to increase in the future, the educational prospects of visiting greenhouses are high. Hence, the combined relaxed tourism visits with education about geothermal energy, sustainability, and ecological impacts can build greenhouses' experience-oriented industrial tourism potential [42].

Another pull factor of greenhouse industrial tourism is technology. Energy-based tourist attractions evoke technical fascination [40], and geothermal greenhouses have drilling wells, pipes and boilers, screens, automatic irrigation systems, and more. Thus, geothermal food production is highly industrialised due to high investment costs and a focus on economies of scale. Therefore, when combining experiences in greenhouses, we are talking about industrial tourism and not the traditional forms of agritourism.

### *2.3. Geothermal Energy Tourism at the Energy Usage Level: Tourism-Specific Industries*

Balneology and recreational purposes were historically the most well-known ways of geothermal energy usage. Geothermal bathing areas are recognised for their relaxation and health benefits. As Shortall and Kharrazi [50] noted, the most paid-for domestic recreational trips taken by Icelanders were trips to spas and nature baths, whereas in Japan, millions of tourists stay at onsen resorts each year. This is also visible in Figure 1, where the second most common usage of geothermal energy is bathing and swimming [1]. When balneology is combined with industrial tourism, we can see products whereby the spas and wellness centres inform their visitors regarding the benefits of geothermal energy and showcase their generally hidden "industrial" side to the visitors. Specifically, spas could also take advantage of their geothermal wells and present them to visitors. In this manner, the "backstage" of swimming pools could be explained, and visitors could enjoy an additional engaging and informative experience.

There are also other possibilities for integrating geothermal energy into tourism. In New Zealand, there is a geothermal tourist park and several geothermal walks [51,52], and in Slovenia, there is a geothermal educational trail [53]. The educational trail is characterised as an attempt at building a learning process encompassing three approaches to environmental education: education in the environment, education about the environment, and education for the environment [54]. In tourism, educational trails, with the help of information boards, become a source of new knowledge about the landscape, cultural and historical monuments, nature protection, environment, and human activities [55]. Especially in learning about sustainable functioning, educational trails are a welcome way to better understand relationships in nature, the importance of natural resources, and nature conservation. The tourists will act more sustainably when they find themselves in such a situation. This is of particular importance in the education of children and adolescents since they will be better able to develop and contribute to their environmentally conscious behaviour in the future [56].

Finally, visitor centres can be regarded as a form of (mainly) interactive museums intended to disseminate knowledge and experience [57]. Educational (also named interpretative) centres can attract and educate visitors, serve as a substitute for direct experience, channel visitors to reduce environmental disturbance, and provide local employment and income [58]. A geothermal energy visitor centre could be an option for geothermal energy users to design new offers for tourists.

We have thus far conceptualised and presented past research on various forms of geothermal energy tourism. Although knowledge of good practice in this area is slowly starting to grow, there is still a lack of research regarding the interests and motives for this

kind of product and how they correlate with the geothermal public image. Interest and motivation could be regarded as the driving forces for human behaviour, and understanding tourism motivations helps predict future travel patterns [59]. Frantal and Urbankova [41] found that motivation for visiting energy attractions is an interest in technology, energy in general, environmental and landscape impacts, and spending time out of usual places. Other studies showed that motivation for and interest in museum-like geothermal tourism are based on learning about technology, activities, special events, innovation, and collection objects' uniqueness [57,60]. These studies, however, have analysed only one of these forms of geothermal energy separately, and to our knowledge, no study exists that comparatively analyses interests in different forms of geothermal energy tourism, nor do they analyse their correlation with the public image of geothermal energy. As the aim of this study is to analyse the role that the tourism industry has in the promotion of geothermal energy, four research questions thus guided the empirical study of this research:

RQ1: What is the level of interest in geothermal energy tourism products amongst the sample of Slovenian respondents?
RQ2: Does the interest in geothermal energy tourism products correlate with the public image of geothermal energy?
RQ3: What are the main motives for visiting a power plant amongst the sample of Slovenian respondents?
RQ4: Do the motives for visiting a power plant correlate with the public image of geothermal energy?

## 3. Materials and Methods

### *3.1. Questionnaire*

We used an online questionnaire (open from 4 May to 28 June 2021) that addressed variables of interest in geothermal energy tourism offer, the public image of geothermal energy, and participants' motivation for visiting power plants.

The items measuring interest in geothermal energy tourism were composed by authors according to the conceptualisation presented in the theoretical introduction of this paper, including interest in the five most typical forms of geothermal energy tourism. For variables measuring the public image of geothermal energy, we applied the items measuring social benefit perception of nuclear energy and general attitudes towards nuclear energy from Lee [61]—we applied both scales to geothermal energy.

We applied Pearce and Lee's [62] tourist motivation items to analyse participants' motivation for visiting power plants. These 14 factors are (1) novelty, (2) escape/relax, (3) relationship (strengthen), (4) autonomy, (5) nature, (6) self-development (host-site involvement), (7) stimulation, (8) self-development (personal development), (9) relationship (security), (10) self-actualise, (11) isolation, (12) nostalgia, (13) romance, and (14) recognition. Their classification was also used as a reference in other studies like Liu et al. [63]; however, it is also reflected in other research instruments used by Özdemir and Çelebi [59], Terzidou et al. [64], and Bayih and Singh [65]. For our study, we used only the following factors: novelty, recognition, escape, stimulation, relationship (strengthen), relationship (security), autonomy, nature, and self-development (host-site involvement). We focused more on the cognitive experience and the safety aspect; hence, other factors were left out. The items were measured on a 5-point Likert scale from strongly disagree to strongly agree.

### *3.2. Population, Sample, and Source of Data*

Geothermal energy in Slovenia has traditionally been recognised within health tourism. Recently the state started to recognise and better support other forms of its usage with a public debate focusing primarily on geothermal energy for food production. However, geothermal energy plays only a minor role in the national energy strategy. There is currently no geothermal power plant in the country, yet the Ministry of Infrastructure recently expressed support for building the first geothermal power plant in the near future.

Health tourism (wellness and medical) is one form of tourism with the longest tradition of "real" tourism development in Slovenia. Slovenian natural health resorts are the fastest growing and most profitable branch of Slovenian tourism. The entire market of health tourism providers in Slovenia consists of all Slovenian natural health resorts [66]. Looking at the share of tourist overnight stays by types of municipalities in Slovenia, spa municipalities have always been in first or second place in recent years. For example, in 2020, this share was 24%. However, if we look only at domestic guests, spa municipalities are always in first place regarding the share of overnight stays, which in 2020 amounted to 31.2% [67]. Therefore, the study was conducted among residents of Slovenia as a population with high importance for geothermal-related tourism. The data were collected from a convenience sample of respondents using snowball sampling via social media ($n$ = 362). Details about the sample can be seen in Table 1.

**Table 1.** Profile of the sample.

| | Frequency ($n$) | Percentage (%) |
|---|---|---|
| **Age** | | |
| Born 1960 or before | 34 | 9.5% |
| Born between 1961 and 1970 | 48 | 13.4% |
| Born between 1971 and 1980 | 82 | 23.0% |
| Born between 1981 and 1990 | 107 | 30.0% |
| Born between 1991 and 2000 | 67 | 18.8% |
| Born 2001 or after | 19 | 5.3% |
| **Gender** | | |
| Male | 110 | 30.4% |
| Female | 252 | 69.6% |
| **Education level** | | |
| Secondary or high school | 64 | 18.2% |
| Undergraduate | 220 | 62.5% |
| Postgraduate | 68 | 19.3% |

Table 1 represents the sample we collected. Not all participants answered socio-demographic questions; however, of the 362 valid answers, 69.6% were female. The majority (62.5%) had an undergraduate degree. Most participants were 40–31 years old (30%) or 50–41 years old (23%). Next to the information in Table 1, we also calculated the respondents' average age, which was 41 years old, 2.7 years younger than the Slovene national average in 2021. The respondents were also quite familiar with energy tourism since 62.1% of respondents had already visited a power plant in the past. Furthermore, only 17.2% had never visited a spa in the past.

### *3.3. Data Acquisition and Analyses*

We processed the acquired data in Microsoft Excel 2013 and IBM SPSS v. 23. We used Excel's built-in functions for simple data analysis, such as counting individual responses, calculating percentages, and calculating mean values. IBM SPSS version 23 was used for statistical analyses. The threshold for rejecting a null hypothesis was set at $\alpha = 0.05$. Since distribution is not parametric based on the Shapiro–Wilk test ($p < 0005$), we treated the variables as non-parametric and using adequate statistical tests. The correlations between dependent and independent variables were calculated using Spearman's Rho. However, to verify the results, we also used linear regression analyses.

## 4. Results

First, we tested the reliability of the collected data measuring the main variables by calculating the value of Cronbach's alpha. The value was 0.92, which represents acceptable reliability [68], suggesting that the "measures were free from random error, and thus reliability coefficients estimate the amount of systematic variance" [69] (p. 4).

### *4.1. Interest in Geothermal Energy Tourism*

When asked about the first association with geothermal energy, over 44% of respondents mentioned hot water from the ground in different forms (geysers, springs, and spas) and others mentioned heat from the Earth. Hence, public awareness of geothermal is quite general; therefore, we tested public interest in other forms of geothermal use. Geothermal energy tourism as a form of energy tourism can offer a variety of tourism products. The questionnaire offered a comprehensive list of the most typical forms of geothermal energy tourism. As presented in Table 2, respondents expressed an interest in all measured forms; however, the most appealing were visiting geothermal wells and greenhouses (mean = 4.03/4.01). These are also the most innovative and less known geothermal products. Factor analyses suggested that one factor covered all five variables, with relatively high factor loadings on all items.

**Table 2.** Interest in industrial energy tourism offer ($n$ = 372).

| How Interested Would You Be in Following an Energy-Related Tourism Offer? | Factor Loading | Mean | Std. Deviation | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|
| | | | | Statistic | Std. Error | Statistic | Std. Error |
| Visiting a geothermal well when visiting a thermal spa | 0.807 | 4.03 | 0.932 | −1.233 | 0.126 | 1.801 | 0.252 |
| Visiting geothermal food production in greenhouses | 0.744 | 4.01 | 0.932 | −1.08 | 0.126 | 1.272 | 0.252 |
| Educational visitor centre | 0.767 | 3.74 | 0.967 | −1.005 | 0.126 | 1.019 | 0.252 |
| Educational trail | 0.786 | 3.70 | 0.967 | −0.898 | 0.126 | 0.621 | 0.252 |
| Power plant tour | 0.735 | 3.55 | 1.106 | −0.83 | 0.126 | −0.016 | 0.252 |
| Index: Geothermal energy tourism offer | | 3.80 | 0.757 | −0.0967 | 0.127 | 1.400 | 0.254 |

### *4.2. Public Image of Geothermal Energy*

We measured the public image of geothermal energy with two separate scales, both applied from nuclear energy perceptions by Lee [61]. The first was the social benefit perception of geothermal energy (Table 3). Factor analysis showed, similar to results by Lee [61], that the items measuring social benefit perception of geothermal energy all fell within one factor, with the highest factor loading values on items measuring economic/development perceptions of geothermal energy. For further analysis, we calculated an index for this variable as the average of the four items. The results showed that geothermal energy was relatively positively perceived with a high mean on all items. However, the most positive perception was for the item measuring the environmental benefits of geothermal energy, where the mean was 4.16 on a 5-point scale.

**Table 3.** Social benefit perception of geothermal energy ($n$ = 394).

| Factor 1: Social Benefit Perception of Geothermal Energy (63.67% Variability Explained) | Factor Loading | Mean | Std. Deviation | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|
| | | | | Statistic | Std. Error | Statistic | Std. Error |
| Geothermal energy means a reduction of emissions and green energy transition. | 0.68 | 4.16 | 0.757 | −0.844 | 0.123 | 1.166 | 0.245 |
| Geothermal energy holds the key to our brighter high-tech future. | 0.832 | 3.69 | 0.892 | −0.721 | 0.123 | 0.522 | 0.245 |
| By using geothermal energy, states can generate electricity with a better return on investment. | 0.843 | 3.56 | 0.83 | −0.592 | 0.123 | 0.536 | 0.245 |
| Geothermal energy creates new jobs and adds millions to our economy. | 0.826 | 3.4 | 0.895 | −0.353 | 0.123 | −0.078 | 0.246 |
| Index: Average social benefit perception of geothermal energy | | 3.7 | 0.673 | −0.589 | 0.124 | 0.897 | 0.247 |

The second measure for the public image of geothermal was the general attitude toward geothermal energy (Table 4). Here again, the results showed one factor with relatively high factor loadings on all items. On average, the respondents had very positive attitudes towards geothermal energy, perceiving it primarily as clean, safe, and effective energy, with a perception of reliability lacking partly behind, although still relatively high. The results for Table 3; Table 4 are in line with research in other countries where geothermal energy was relatively positively perceived [4,9].

**Table 4.** The general attitude towards geothermal energy ($n$ = 436).

| Factor 1: General Attitude towards Geothermal Energy (61.91% Variability Explained) | Factor Loading | Mean | Std. Deviation | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|
| | | | | Statistic | Std. Error | Statistic | Std. Error |
| Clean | 0.833 | 4.27 | 0.713 | −0.823 | 0.117 | 0.92 | 0.233 |
| Safe | 0.831 | 4.27 | 0.696 | −0.948 | 0.117 | 1.946 | 0.233 |
| Effective | 0.732 | 4.21 | 0.69 | −0.466 | 0.117 | −0.2 | 0.233 |
| Reliable | 0.746 | 3.97 | 0.797 | −0.447 | 0.117 | −0.238 | 0.233 |
| Index: Average attitude towards geothermal energy | | 4.18 | 0.568 | −0.337 | 0.117 | −0.175 | 0.233 |

The items were measured on a 5-point Likert scale, from strongly disagree to strongly agree. Factor extraction method: principal component analysis.

In further analysis, we calculated Spearman correlation coefficients between interests in the five various types of geothermal energy tourism offers and the two measures of geothermal public image. There was a positive correlation with interest for all the five types of geothermal energy tourism offers regarding the general attitude towards geothermal energy (Table 5). The social benefit perception of geothermal energy, however, showed a more nuanced picture. There was a correlation only for the two types of offers evaluated with the highest interest—visiting geothermal wells and visiting geothermal food production—whereas for the other three types, there was no correlation.

**Table 5.** Spearman correlation coefficients between interest in industrial energy tourism offer and indexes of two variables of the public image of geothermal energy.

| Energy Tourism Offer | | Index: Social Benefit Perception of Geothermal Energy | Index: General Attitude towards Geothermal Energy |
|---|---|---|---|
| Visiting a geothermal well when visiting a spa | Spearman's rho correlation | 0.223 ** | 0.271 ** |
| | Sig. (two-tailed) | 0.000 | 0.000 |
| | $n$ | 365 | 371 |
| Visiting geothermal food production in greenhouses | Spearman's rho correlation | 0.227 ** | 0.351 ** |
| | Sig. (two-tailed) | 0.000 | 0.000 |
| | $n$ | 365 | 371 |
| Educational visitor centre | Spearman's rho correlation | 0.093 | 0.203 ** |
| | Sig. (two-tailed) | 0.077 | 0.000 |
| | $n$ | 365 | 371 |
| Educational trail | Spearman's rho correlation | 0.094 | 0.201 ** |
| | Sig. (two-tailed) | 0.072 | 0.000 |
| | $n$ | 364 | 370 |
| Power plant tour | Spearman's rho correlation | 0.077 | 0.236 ** |
| | Sig. (two-tailed) | 0.142 | 0.000 |
| | $n$ | 363 | 369 |

** Correlation is significant at the 0.01 level (two-tailed).

Further linear regression analysis confirmed the positive correlation between interest in all five types of geothermal energy tourism offers and the general attitude towards geothermal energy (Table 6). However, there was no correlation with demographic factors. These results warrant further research, for example, by analysing the segments of visitors to industrial tourism in real-life cases. For now, we can only conclude that demographic factors did not help find the segments interested in energy tourism offer in Slovenia. The

interests seemed to be much more based on the image of geothermal energy a person already holds. The results thus partially confirm the overview of Pellizzone et al. [4] that public views on uses and developments of geothermal energy are highly differentiated, and that attitudes evolve over time and are highly place-based. For example, we found strong differences in age between those who knew more about geothermal energy in some locations versus others [4]. In line with Pellizzone et al.'s research, we conclude here that interest in geothermal energy tourism is rather age-based, gender- or education-based, and place-based in the sense that it reflects the social context that affects the public image of geothermal energy—for example, via previous geothermal projects and their potential negative consequences, related policy, and media reports.

**Table 6.** Linear regression correlation coefficients between interest in industrial energy tourism offer, demographic variables, and indexes of two variables of the public image of geothermal energy.

| Energy Tourism Offer | | Gender | Age | Education Level | Index: Social Benefit Perception of Geothermal Energy | Index: General Attitude towards Geothermal Energy |
|---|---|---|---|---|---|---|
| Visiting a geothermal well when visiting a spa | Beta | 0.074 | −0.028 | −0.020 | 0.156 | 0.201 |
| | Sig. | 0.166 | 0.612 | 0.717 | 0.011 ** | 0.001 ** |
| Visiting geothermal food production in greenhouses | Beta | 0.094 | −0.079 | 0.011 | 0.098 | 0.251 |
| | Sig. | 0.074 | 0.141 | 0.845 | 0.103 | 0.000 ** |
| Educational visitor centre | Beta | 0.004 | 0.056 | −0.017 | 0.007 | 0.201 |
| | Sig. | 0.949 | 0.996 | 0.759 | 0.914 | 0.002 ** |
| Educational trail | Beta | 0.056 | −0.043 | 0.107 | 0.034 | 0.187 |
| | Sig. | 0.298 | 0.437 | 0.055 | 0.580 | 0.003 ** |
| Power plant tour | Beta | −0.064 | −0.055 | 0.022 | 0.019 | 0.164 |
| | Sig. | 0.242 | 0.332 | 0.692 | 0.761 | 0.010 ** |

** Correlation is statistically significant at Sig. or $p < 0.05$.

### *4.3. Motives for Visiting a Power Plant*

The study showed (Table 7) that the strongest motivation items (according to Pearce and Lee's [62] tourist motivation items) while visiting power plants were novelty, self-development, and stimulation. Therefore, energy tourists express interest in something new and fun, learning new things, developing their knowledge, exploring the unknown, and feeling excited. On the other hand, there was weaker motivation for the recognition (being recognised by others and sharing skills), relationship (feeling personally safe and belonging there), escape (looking for relaxation), and autonomy (being independent) factors. However, the factor analysis indicated that our 18 variables measured three underlying factors (Eigenvalue is at least 1) when visiting power plants. Nevertheless, the "Knowledge" factor had the highest mean value compared to the other two, according to the general strength of individual motivational items.

Furthermore, as shown in Table 8, we analysed the correlation between motivational factors with social benefit perception of geothermal energy and general attitude towards geothermal energy. The data showed a statistically relevant correlation between the two measures of geothermal public image and motivation for visiting a power plant for almost all motivational factors. Spearman's rho correlation showed a significant correlation except between the "attitude" factor and the "Self-recognition (motivation)" factor.

The results were confirmed with linear regression analyses (Table 9), which also established a statistically relevant correlation between the two measures of geothermal public image and motivation factors for visiting a power plant. Here, a higher geothermal public image was associated with higher motivation for visiting a power plant. Regarding demographic variables, there was a statistically relevant correlation between age and the "Having fun" factor (this factor was less important for older participants) and between education level and the "Self-recognition" factor (this factor was less important for more educated respondents). As previous studies determined two main target groups of energy tourism [38], this could also be reflected in our results. Expert-oriented tourists are generally

older and tend to be more educated; hence, their motivation is mainly professional and not having fun or self-recognition. On the other hand, presumably, younger experience-oriented tourists seek more leisure and self-recognition.

**Table 7.** Motives for visiting a power plant ($n$ = 363).

| | Factor Loading | Mean | Std. Deviation | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|
| | | | | Statistic | Std. Error | Statistic | Std. Error |
| **Factor 1: Self-recognition** | | **2.44** | **0.864** | **0.120** | **0.139** | **−0.734** | **0.277** |
| Doing things my own way | 0.760 | 2.37 | 1.131 | 0.394 | 0.131 | −0.743 | 0.260 |
| Being independent | 0.706 | 2.22 | 1.074 | 0.455 | 0131 | −0.619 | 0261 |
| Being recognized by other people | 0.634 | 1.92 | 0.893 | 0.612 | 0.130 | −0.309 | 0.260 |
| Being harmonious with nature | 0.647 | 2.59 | 1.162 | 0.076 | 0.129 | −0.979 | 0.257 |
| Being with respectful people | 0.559 | 2.31 | 1.108 | 0.418 | 0.130 | −0.656 | 0.259 |
| Feeling that I belong | 0.603 | 2.60 | 1.152 | 0.210 | 0.129 | −0.885 | 0.257 |
| Sharing skills and knowledge with others | 0.497 | 2.74 | 1.204 | 0.123 | 0.129 | −0.846 | 0.257 |
| Being with others who enjoy the same things that I do | 0.544 | 3.09 | 1.150 | −0.381 | 0.129 | −0.667 | 0.257 |
| **Factor 2: Having fun** | | **3.13** | **0.802** | **−0.620** | **0.133** | **0.083** | **0.266** |
| Having fun | 0.643 | 3.54 | 1.017 | −0.614 | 0129 | −0.059 | 0257 |
| Resting and relaxing | 0.622 | 2.58 | 0.991 | −0.004 | 0129 | −0.699 | 0257 |
| Doing something with my family/friend(s) | 0.594 | 3.41 | 1.170 | −0.685 | 0128 | −0.327 | 0256 |
| Getting away from the usual demands of life | 0.489 | 2.88 | 1.181 | −0.048 | 0.128 | −0.818 | 0.256 |
| Feeling excitement | 0.466 | 3.22 | 1.174 | −0.508 | 0.129 | −0.655 | 0.257 |
| **Factor 3: Knowledge** | | **4.12** | **0.645** | **−1.154** | **0.132** | **2.418** | **0.263** |
| Learning new things | 0.744 | 4.38 | 0.701 | −1.472 | 0.130 | 4.159 | 0.259 |
| Experiencing something different | 0.647 | 3.92 | 0.932 | −1.268 | 0.128 | 1.933 | 0.256 |
| Developing my knowledge of the area | 0.559 | 4.31 | 0.702 | −1.197 | 0.129 | 2.865 | 0.256 |
| Having a daring/adventuresome experience | 0.649 | 3.84 | 1.008 | −1.111 | 0.128 | 1.259 | 0.255 |

**Table 8.** Spearman's rho correlation between motivational factors and indexes of two variables of the public image of geothermal energy.

| Motivation Factors | | Index: Social Benefit Perception of Geothermal Energy | Index: General Attitude towards Geothermal Energy |
|---|---|---|---|
| Self-recognition | Spearman's rho correlation | 0.226 ** | 0.108 |
| | Sig. (two-tailed) | 0.000 | 0.059 |
| | $n$ | 303 | 306 |
| Having fun | Spearman's rho correlation | 0.167 ** | 0.203 ** |
| | Sig. (two-tailed) | 0.002 | 0.000 |
| | $n$ | 330 | 332 |
| Knowledge | Spearman's rho correlation | 0.210 ** | 0.279 ** |
| | Sig. (two-tailed) | 0.000 | 0.000 |
| | $n$ | 336 | 341 |

** Correlation is significant at the 0.01 level (two-tailed).

**Table 9.** Linear regression correlation coefficients between motivational factors, demographic variables, and indexes of two variables of the public image of geothermal energy.

| Motivation Factors | | Gender | Age | Education level | Index: Social Benefit Perception of Geothermal Energy | Index: General Attitude towards Geothermal Energy |
|---|---|---|---|---|---|---|
| Self-recognition | Beta | −0.057 | −0.012 | −0.160 | 0.229 | 0.026 |
| | Sig. | 0.332 | 0.843 | 0.008 ** | 0.001 ** | 0.704 |
| Having fun | Beta | −0.065 | 0.162 | −0.068 | 0.127 | 0.183 |
| | Sig. | 0.244 | 0.005 ** | 0.235 | 0.048 ** | 0.004 ** |
| Knowledge | Beta | 0.041 | 0.060 | 0.069 | 0.144 | 0.193 |
| | Sig. | 0.460 | 0.289 | 0.223 | 0.024 ** | 0.003 ** |

** Correlation is statistically significant at Sig. or $p < 0.05$.

## 5. Discussion

Renewable energy sources are a reasonable solution for energy consumption in the era of climate change. One of these renewables is geothermal energy, which provides us

not only with electricity but also with other intended uses. Based on previous studies, the assumption that general knowledge and understanding of the geothermal potential is low [4,7,8,45] was also confirmed in the present study. Respondents referred mostly to hot water, springs, spas, and heat from the ground, whereas the potential for electricity and heating was rarely mentioned. Therefore, the endeavour to increase geothermal energy use should start with informing and educating the public about geothermal energy. This paper offers a new and appealing way of presenting the benefits of geothermal to the public but also of the risks involved. Geothermal energy tourism as a form of industrial tourism has the potential to spread knowledge, and entertain and motivate people to support and use geothermal energy. Here we identified three main forms of geothermal energy tourism: (a) at the energy production level, (b) at the level of energy usage for tourism-nonspecific industries, and (c) at the level of energy usage for tourism-specific industries.

Research demonstrated that there was a moderately high interest in geothermal energy tourism products amongst the sample of respondents (RQ1), among which they preferred visiting geothermal wells and geothermal food production in greenhouses (level b). However, they were also interested in educational visitor centres and educational trails (level c) and less in visiting power plants (level a). We assume the respondents chose a less-known industrial tourism offer since power plant tours are a relatively well-known form of industrial tourism, whereas tourism-nonspecific industries are still something new to explore. Compared to previous studies [39,41], we noticed that they measured interest in the broader spectre of energy tourism in terms of different energy sources. Since this study is focused only on geothermal, it is more challenging to make a comparison. However, although previous studies noted a high interest in visiting power plants, they also perceived a high interest in educational and visitors' centres, educational trails, and energy theme parks.

Furthermore, although respondents had a somewhat generalised picture of geothermal energy, their general attitude toward geothermal energy was positive, and they perceived its social benefits. Respondents regarded geothermal energy as clean, safe, effective, and reliable, and its most significant benefit as sustainability. The results mentioned are a promising start for geothermal project development, since many authors have noted that the public has a weak positive [4,10] or somewhat hostile attitude towards geothermal projects [70,71], especially in their region. However, we could not find any research about connecting attitude towards geothermal with expressed intention to visit geothermal tourism. As expected, there was a positive correlation between the general attitude towards geothermal energy and all five types of geothermal energy tourism offers (RQ2). Therefore, people who feel inclined toward geothermal energy are also more disposed to participate in geothermal energy tourism. On the other hand, people who perceive geothermal social benefits are only inclined to visit geothermal offer level b. Educational centres, trails, and power plant tours do not correlate with social benefit variables. A possible explanation is that tourism non-specific industries are a real-life example of the benefits, where visitors see for themselves and get living proof. Educational centres and trails are only an approximation of the reality, whereas power plants perhaps have a somewhat more negative image, even though electricity is vital for modern technology functioning.

Consequently, we studied motives for visiting power plants (RQ3). The strongest motivational items were experiencing something new and fun, learning new things, developing knowledge, exploring the unknown, and feeling excited, which is in accordance with previous studies [38,40,42]. Factor analysis suggested three underlying factors regarding a visit to power plants. These we named "Self-recognition," "Having fun," and "Knowledge" (the last factor had the highest mean value in comparison to the other two). We also tested the correlation between motivation factors and general attitude toward geothermal energy and perceived social benefits (RQ4). Spearman's rho correlation showed a general significant correlation except between the motivation factors of attitude and "Self-recognition." Therefore, respondents with a positive attitude towards geothermal may be motivated to visit power plants when applied to knowledge and fun but not self-recognition.

## 6. Conclusions

The study showed that in general, the motivation to visit geothermal tourism offers is relatively high and correlates with the positive image of geothermal energy. The participants showed the highest interest in tourism-nonspecific geothermal industries, as they offer new and exciting experiences where visitors can learn about new fields of knowledge. Even in other geothermal tourism offers, the main motivation factors could be knowledge, self-growth, and having fun. As a result, geothermal energy tourism is suggested as an appropriate manner to inform, educate, and motivate the public about geothermal energy.

On the other hand, the results show a high probability of the danger of "preaching to the converted." In the case of "the converted," the focus should be on providing in-depth knowledge, not only on the positive sides of geothermal energy but also on the potential risks involved and the ways these potential risks are avoided. As with the case of those who have a less positive image of geothermal energy, the most promising area to address them seems to be less general educative arenas and rather more vivid examples of the direct use of geothermal energy in real-life situations such as geothermal food production and geothermal wells used for balneology.

Furthermore, there are important limitations of the study that guide future research directions. The study was based only on Slovenian respondents' responses. In the future, a more diverse population should be included in similar studies. In addition, the convenience sample was collected using snowball sampling; therefore, some groups of people could not be reached with the questionnaire. The study only included expressed interest but not the actual behaviour. Future research should include comparative analyses of visits to the geothermal energy industry and the role other contextual factors play in visiting such products (e.g., spatial proximity, price, type of attraction). Finally, the study did not include analyses of the actual knowledge gain of visitors to these products but rather stayed at the level of expressed interest in the general population. Future research should also include analyses of the effects of these types of products on visitors' perception of geothermal energy, especially in light of in-depth knowledge about not only the potential but also the risks of geothermal energy.

If there is a chance for geothermal to play a vital role in the future energy transition, the public needs to be on board both as citizens and consumers. Public acceptance of geothermal energy is of primary importance because of the threat of potential public mobilisation against geothermal projects, for example, citizen initiatives against geothermal projects [11,71,72] and their consequent role in the future socio-political acceptance of geothermal energy. As such, the public can play an important role in the strict oversight of geothermal projects and preventing potential negative consequences of geothermal projects via either early abandonment of the projects or securing enough financing to prevent the less probable risks. Additionally, the public plays an important role in the market acceptance of geothermal energy: As consumers, it is expected that they will have more and more say in questions like which energy to choose, whether to support geothermal district heating projects, or whether to invest in geothermal heat pumps for their household. As Pellizzone et al. [4] showed, there is general support for renewable energy, but knowledge and understanding of the potential of geothermal are remarkably low. Lack of trust in politics and unsure public communication emerged as prominent themes where the common good and community developments are sharply contrasted with corporate and private interests. The public needs to be informed and involved, and geothermal energy tourism is a promising direction for this future. Thus, further research into the public acceptance of geothermal and other renewables is a foundation for the green transition. The connection of renewable energy sources to industrial tourism is a beneficial symbiosis that shows promise in the post-pandemic recovery of both tourism and climate change-related changes in our economy.

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