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An Update to Touristic Potential of Meshkinshahr Geothermal Resources, NW Iran

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ABSTRACT

Mehskinshahr city in Northwest of Iran is well known for its hot springs and geothermal manifestations. It has its own reputation for healthy and traditional hot springs and has been a tourist attraction for years. Natural mineral springs and geothermal hot springs have been source of gatherings and carry a nostalgic feeling for local people and visitors. These springs and water reserves present this area with a fantastic opportunity for further development as an international and national destination for natural spa tourism. Geothermal water and mineral springs have long been associated with improving mental and physical health through therapeutic bathing, relaxation and drinking enjoyment. This study describes the key characteristics of these geothermal water and mineral spring resources, providing an insight into the demand for services and the development potential of new and existing facilities in regional communities. The main aim of this paper is to determine the main tourism potential of natural geothermal resources in Meshkinshahr region, north of Sabalan mount, North-West of Iran.

1.INTRODUCTION

Geothermal heating has been used since Roman times for bathing, cooking and as a way of heating buildings and spas using sources of hot water and hot steam that exist near the earth's surface. Water from hot springs is now used worldwide in spas, for space heating, and for agricultural and industrial uses (Dickson and Fenelli, 2004).

Increasing demand and higher cost for energy and declining fossil fuels in near future, makes research and development on renewable energies feasible (Jalilinasrabady, 2004). Utilization of renewable energy sources are limited by their availability and efficiency (Jalilinasrabady, 2019). Among them geothermal energy has been developed and its reliability has been proven, the main problem with geothermal electricity production is its locally dependence, meanwhile there are low and medium temperature fields that electricity production in those fields are not possible with current technologies, in such fields direct utilization of geothermal resources is possible if there is any demand from local people (Jalilinasrabady et al., 2016). In this regard, utilization of geothermal resources and better understanding of conversion systems is becoming increasingly more important (Jalilinasrabady and Itoi, 2013).

Geothermal energy utilization is commonly divided into two categories, i.e., electric production and direct application. The utilization method depends on parameters such as local demand for heat or electricity, distance from potential market, resource temperature, and chemistry of the geothermal fluid. These parameters are important to the feasibility of exploitation. Utilization of geothermal fluid depends heavily on its thermodynamic characteristics and chemistry. These factors are determined by the geothermal system from which the fluid originates (Jalilinasrabady and Itoi, 2012).

Tourism is one of the world's largest industries and important for economies of many countries that are tourism destinations (Fennell, 2003). Tourism can be studied from various perspectives and disciplines such as geography, ecology, psychology, law, marketing, educational studies etc. (Cooper et al., 1997). Although tourism is widely researched and there are many papers that discuss the topic of tourism in areas affected by disasters, not much of the existing literature talks about the reasons why people choose destinations that include certain types of risks. That is the topic of this research. More specifically, it is concerned with tourism in volcanic areas and it is an attempt to explore the motivations that tourists have while taking certain risks and choose volcanic areas as their holiday destinations. There is a great amount of literature on the topic of tourism in disaster- prone areas and in volcanic and geothermal areas (Erfurt- Cooper, 2011) mainly discussing the preparedness measures to be taken by the managers of the destinations and the results of different disasters on tourism (Perry & Godchaux 2005, Murphy and Bayley. 1989), as well as risk perception and how it is related to tourism (Lepp & Gibson, 2003, Kozak, Crotts & Law, 2007).

With over 1,300 areas currently classed as active volcanoes worldwide and considerably more areas with dormant volcanic landforms, there is an abundance of volcanic destinations. Even if not all of them can be easily accessed; many areas are already developed for tourists. Volcano and geothermal tourism is an important segment of geotourism, which takes into account the geological heritage of unique landscape features (Dowling and New some 2006), but particularly the geo diversity of active volcanic and geothermal landforms. A growing number of tourists look for some form of adventure, and therefore, they plan their holidays close to active volcanoes (Erfurt-Cooper 2011).

The volcanic and geothermal activity of such areas has attracted tourists for several centuries, and visits to active volcanoes are commonplace in Europe. Geysers and other geothermal features based on volcanic activity have also traditionally been used widely to market destinations and to attract visitors to countries such as New Zealand, Italy, Turkey, USA, Japan and China, which all have a history of promoting their volcanic environments to increase visitor numbers. Destinations like North America's Yellowstone and Hawaii Volcanoes National Park for example attract millions of visitors every year; in New Zealand, the Tongariro National Park and in Japan, the Fuji-Hakone-Izu National Park represent major tourism destinations based on volcanic landforms and related

geothermal features. It is very common for countries with active volcanic areas to use these geological 'power points' as special tourist attractions for marketing purposes.

2. BACKGROUND

With considering primary authors paper (Mousavi and Jalilinasrabadi 2015), Meshkinshahr is one of Ardebil province's cities which located in hillside of mount Sabalan. The distance from this city to province center is 85 km and to the capital is 839 km. because of placing at a height of 1395 meters above sea level and near Sabalan with 4811 meters high, Meshkinshahr has a beautiful and pleasant nature as well as cool weather. Due to numerous spas, natural and historical promenades annually a lot of tourists are attracted from around the world to this city. So it can be called one of the poles of tourism in North West of Iran. Meshkinshahr ia adjacent to Republic of Azerbaijan from north and north east, to Moghan plains from north west, to Ardebil from south east, to Sarab from south west and to Ahar and Tabriz from west. This city consists of four districts and twelve municipalities and it's capital city is Meshginshahr. This city has an area of 8.3615 square kilometers and according to 1385 sensus (Statistical Center of Iran) the population of the city were 159242 people (68521 urban and 90721 rural people). It has been estimated that by1389 the number has reached 161161 people. Mount Savalan placed at a distance of 25 km from the city has created pristine and unmatched nature in landscape. Meshginshahr's natural health pathways can be outlined so: climbing, hiking, hill climbing and foremost mineral springs with various properties which annually welcome domestic and foreign travelers. But unfortunately most of these areas have not been introduced as it should have been fully introduced.

This paper provides a broad insight into the demand for services and facilities, location and characteristics of Meshginshahr,s geothermal and natural mineral water resources, the opportunities available to expand and establish new facilities and an indication of the success of overseas developments with the potential to be replicated in Meshginshahr.

3. TOURISM OPPORTUNITIES

There is significant potential for additional domestic spa customer growth. A potential spa tourist is classified as a person who has paid for personal services to increase their wellbeing and include health services (e.g. massages, naturopathy), grooming services (e.g. facials, manicures) and personal fitness training.

Due to economic difficulties, only 6 new geothermal project for bathing and swimming was completed during 2015-2019, and some existing district heating systems were developed. Unfortunately there is no reliable updated data available for the current status of the utilization of present thermal waters nationwide. In this paper, in addition to the data provided in the past (Saffarzadeh and Noorollahi, 2005), that only belongs to Ardebil province (NW of Iran), a rough estimation has also been provided in total for other geographic locations. Budget support from the government will be required to perform national assessment on Iran's geothermal resources. A wide variety of thermal manifestations with the surface temperature of about 25 to 85 °C are scattered in various regions. However the hottest springs are geographically located in the northwestern part of the country which also experience the coldest winters. The temperature of the urban and rural areas in this region varies between -15 to maximum 30°C annually that normally absorbs huge amount of energy sources of different categories. Because of the subsided sources of energy (oil, gas and electricity), the concepts of direct use of thermal waters have not yet been fully perceived. With regard to the chemical and physical characteristics of the thermal waters, they have been traditionally used for recreational and balneological purposes in the form of swimming and bathing pools as a fundamental version of direct-heat utilization of geothermal energy in the region.

4. CHEMISTRY OF MESHKINSHAHR GROUP GEOTHERMAL WATERS

The Meshkinshahr geothermal resources are varied both in temperature and chemical properties. The present study is based on a limited number of data obtained in 1977 – 1978, during the ENEL investigation in the Sabalan area, as no more recent data are available for this area. The original chemical analytical results for the spring waters are presented in different concentration units. The ionic balance for most of the samples is poor, the percentage difference between cations and anions exceeds 60% for some samples. These samples are not included in the interpretation. For this study the concentration of all chemical constituents are recalculated to ppm concentration units. The concentrations of HCO3- and CO3-2 are recalculated to CO2 as total carbonate content. The data for Meshkinshahr warm and hot springs plot in several fields. Samples 16 and 17 which are the hottest in the Sabalan area (84°C) are close to mature waters although a little high in sulfite (chloride water with a sulfate component). The other samples from the Meshkinshahr group are bicarbonate-sulfate waters and fall in the field of steam heated waters. Sample 12 is on the border between steam heated and volcanic waters, i.e. a sulfate water with a chloride component. It is interesting that the chemistry of samples 14 (49°C) and 15 (IIQC) is the same (bicarbonate waters with a sulfate component). The lower pH of sample 15 would suggest more steam effects even though its sulfate is a little lower. Sample 18 has all characteristics of steam heated waters. These samples are low in pH, with sample 12 being the lowest in pH of all spring water samples.

Table 1: Comparison of Meshkinshahr group hot springs with potential uses.

Potential use	**Meshkinshahr group characteristics**	**Acceptance:√ Rejection:×**	**Reasons for selection/ rejection**
Balneology and medicinal tourism	Thermal water	√	Curative water
Recreational tourism	Spa resort	×	Avoid competition
Fish farming	Water not toxic	√	High water quality
Spirulina	Thermal water	×	Low flow rate

Mushroom and Organic Citrus fruits greenhouse	Temperature: 84 °C	√	20-90°C needed
Electricity generation	Temperature: 84 °C	×	Temperature: Low
Mineral extraction	Temperature: 84 °C	×	250°C needed
Water bottling	Water quality good except for br which is 72.61 µg/l	√	Local people are drinking the water without adverse effect
Geothermal education	Thermal water	√	Thermal water available

5. POTENTIAL USES FOR MESHKINSHAHR GROUP HOT SPRINGS

Three potential development projects were selected for potential uses of the Meshkinshahr group. These are health spa tourism or medicinal use, aquaculture and geothermal education. This was done by comparing the physical and chemical characteristics of the Meshkinshahr group waters with the requirements of each use. This section only discusses health spa tourism or medicinal use. Table 1 gives the potential use, the Meshkinshahr group characteristics, acceptance or rejection and the reasons for rejection or acceptance.

In recent years, Meshkinshahr geothermal prospect has seen a sudden rise at geothermal direct utilization in forms of hot spring resort, spa and health centers. Near 3 million people have used these facilities within last 5 years. This is a considerable number compared to Meshkinshahr city's population of around 180,000 people. This contributes to sustainable development of the region and confirms the fact that geothermal direct utilization has a great potential in Meshkinshahr geothermal prospect. Table 2, shows the recent development for hot spring resorts connected to natural hot springs in Meshkinshahr geothermal area.

Table 2: Meshkinshahr hot springs connected to newly developed resorts.

Hot spring	**Temperature (°C)**	**Chemical Characteristics**
Yel souyi	31	Chloride sulfate
Shafa	37	Chloride sulfate with bicarbonate and iron
Ayghar	81	Chloride sulfate with bicarbonate
Axarbaxae dodo	47	Mineral water with chlorine, sulfate and hot bicarbonate
Shabil	48	Acidic bicarbonate
Negin dodo	45	
Valazir	24	Chloride sulfate water containing Ca bicarbonate
Malek Suiie	34	Bicarbonate chloride
Gotur Suiie	42	Sulfide water with high concentration of Ca and S
Geinarjeh	86	Chloride
Moeil	45	Chloride bicarbonate water containing Fe and Mg

6. DISCUSSION

The purpose of this research was to assess the role of natural hot and mineral springs in health, wellness and recreational tourism. The conceptual model of their role in health, wellness and recreational tourism is supported by the research findings. The results contribute to knowledge about natural hot and mineral springs as a tourism resource and will support and add value to the current discussions about health, wellness and medical tourism as an area of increasing importance in international tourism. Because the role of natural hot and mineral springs in health, wellness and recreational tourism is currently underreported and academic research in this field is still limited, the findings add to the theoretical knowledge base of this particular field of tourism. To collect data for the case studies, representative hot spring destinations were visited to observe and to gather information about individual facilities, cultural traditions, infrastructure and other components of hot spring tourism at these destinations.

The International Union of Official Travel Organizations (1973), defined health tourism as "the provision of health facilities utilizing the natural resources of the country, in particular of mineral water and climate". Kusen (2002:178) gave a broad definition of health tourism which can be paraphrased as follows: health tourism is a complex economic activity that aims to foster the skilled and controlled use of natural health remedies, as well as medicinal practices and physical activities for the purpose of maintaining and

improving the physical, psychological and spiritual health of tourists and thereby contributing to the quality of their lives. In his conclusion, Vajirakachorn (2004, p.45) defines health tourism as "a form of tourism which attempts to attract tourists who travel for health purposes by providing health facilities and activities that suit health tourists' needs". A spectrum of health tourism includes physical healing, beauty treatments, relaxation and rest, leisure and entertainment, life and work balance, psychological and spiritual activities (Smith & Puczko, 2009, p. 84). Some of these elements of the spectrum will be considered for the Meshkinshahr group hot springs.

In order to select the type of health tourism suitable for the Meshkinshahr group hot springs, the characteristics of the Meshkinshahr group hot springs were compared with the requirements of each type of health tourism. The characteristics of the Meshkinshahr group hot springs are: thermal spring, curative water, thermal pools, natural beauty, physical space, cultural art and accommodation. In this regard, health spa tourism meets all the characteristics of the Meshkinshahr group hot springs. The basic requirements of health spa tourism are: water, food or nutrition, exercise or movement, massage or body work, mind/body physical benefits, natural therapeutic agents, an environmentally suitable area, climate, cultural aspects, management and staff, beauty treatments, spa baths, hydrotherapy and relaxation techniques (Kusen, 2002). Treatments found in health spa tourism include: preventive health care, herbal remedy programs, fitness programs, balneotheraphy (underwater massage) hydrotherapy, destressing treatments, detoxification programs, vitamin complex treatments and dietary programs (Goodrich, 1993). Facilities found in health spa tourism include, accommodation, restaurants, hot and cold swimming pools, thermal spas and hydros, saunas and jacuzzis.

7. CONCLUSION

When considering these characters, the Meshkinshahr group hot springs has a near- ideal development for health spa tourism that describes favorable conditions for health spa tourism and indicate the potential for profit and sustainability. From the findings presented it becomes obvious that the role of natural hot and mineral springs in tourism is an important one. But the highest quality of accommodation facilities, the relaxation location and atmosphere, absence pollution activity, protected of environment, healthy food catering, availability of health improvement facilities and treatments include: individual small thermal pools at each chalet, hydrotherapy baths, indoor rheumatism baths and outdoor pools, jacuzzis and steam rooms, recommends near- ideal condition for the Meshkinshahr group hot springs. A process of stagnation of geothermal development in Iran is still the main characteristic of the recent 5 years. The Government continues to neglect good natural possibilities. If something starts to change with other renewable energy sources, like solar and wind energy, it is more organization of smaller development projects under pressure of political lobbies than a defined orientation, and there is no such a lobby for geothermal energy. According to the present atmosphere, when all the attention is orientated towards the "big" energetic due to the big gap of local production, it is not possible to expect important changes during the next 5 years.

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