

Geothermal Tourism Potential in Himachal Pradesh

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Abstract

Geothermal energy is mainly the product of decay of natural radio-isotopes in the interior of earth. The immense store of heat ($\sim 10^{13}$ J) alone would take over 10^9 years to exhaust. This source of energy is an huge and a self sustained gift of nature. There are selected sites worldwide where the energy is utilized both for electric power generation and direct domestic uses. Giving the enormous environmental advantage as the clean energy source, these sites also have a great potential of tourist attraction. Himachal has a number of hot-spring sites which can be developed for domestic and commercial uses, and power generation as well as attractive tourist destinations. The paper emphasises on changing nature of the tourist behaviour in the consumption pattern of the tourist products which in returns looks for new and different activities at the selected touristic spots. It has been tried to showcase the potential of geothermal sites for creating a unique tourism product for Himachal Pradesh. The role of public-private partnerships which help in increasing and improving overall economy of the region using local resources has also been assessed. Finally, we propose an effective model for the best utilisation of geothermal sites in the state for creating a niche for itself on the touristic map of the world.

Key words: - *Geothermal Energy, Hot Springs, Tourist Behaviour, Consumption Pattern, Tourism Product.*

1. INTRODUCTION

The earth is the most dynamic planet of the solar system. It was formed in about 4.6 Billion years ago as a fire ball proto-planet by the accretion of millions of smaller objects originated from the cosmic debris and till date the residual heat contributes about 20% and rest is produced through the radioactive decay.

Geothermal energy is the heat stored; bubbling and sputtering out of the interior of earth, continuously. This immense heat energy ($\sim 10^{13}$ J) alone would take over ten billion (10^9) years to exhaust. This source of energy is tremendously large, replenishing and self-sustained such that called as the renewable source of energy. Geothermal power is a popular source of domestic energy with cost reliability and has environmental benefits over conventional energy sources. It contributes to direct-heat uses as well as energy supply with electrical power generation. It has been estimated that the power rates of this energy are quite higher than the humanity's current energy consumption from all conventional primary sources. The heat inside the earth exerts enormous amount of pressure towards the surface, which leads to geo-dynamism and spectacular geothermal events like volcanoes, hotspots, hot-springs, hot dry-rocks and fumaroles etc... These natural events have a great potential of attraction for the tourists, adventurists and researchers.

The sputtering of the hot water and magma in the form of hot-springs and volcanoes, respectively coming from the interior of earth has been a fascinating occurrence to the human beings, since the time immemorial. In the past these sites have been only used as

religious, medical therapeutic and other day to day activities. Now in the current era when the shape of tourism industry and the consumption pattern of the individuals is changing, and demanding new destinations to see and explore, these sites along with energy generation are becoming one of the best touristic spot all over the world. These geothermal sites are playing a pivotal role in the socio-economic life of the public and private stakeholders, and local inhabitants.

The great change in the behaviour of tourists in the recent past has brought a dynamic change in the consumption pattern of tourism products for a destination like Himachal Pradesh. Tourism behaviour represents the behavioural change or pattern in the activities associated with the demand of the tourist product at the destination. Working on the demand pattern of the tourist an initiative by the public and the private bodies can allow Himachal to provide altogether a different experience to the tourists coming to see a variety of flora, fauna and natural sites in the state. Creating a unique tourism product from geothermal sites of Himachal allows us to cater a class of people ranging from students, academicians, researchers, and all together adventure lovers for a unique and fascinating product.

In light of the research activities carried out by the researcher and practical feasibilities based on ground realities, we have developed a unique geothermal tourism product model for Himachal, which can enhance the quality tourist inflow in the state; generating employment to the local population, helping in the best utilization of local resources for tourism wealth creation, developing responsible tourism and a community building approach.

In this paper the worldwide geothermal resources and harnessing status is presented in section 2. In section 3 the touristic potential of geothermal sites is explored. An effective geothermal touristic product model is proposed in section 4. The conclusions are drawn in the last section showing that Himachal Pradesh has a great geothermal touristic potential to cater a large inflow of the national and international tourists.

2. Geothermal Energy, Sites And Harnessing The Heat

The available scientific evidences show that the earth's crust and mantle are primarily composed of solid rocks. The outer core is fluid but dense, but can't be the source magma because it remains deep within earth. The major heat-producing isotopes in the Earth are potassium-40, uranium-238, uranium-235, and thorium-232. It is believed that the decay of radioactive elements in the solid rocks of the mantle and crust heat up the rocks and melt to form the magma. However, there is another work which shows that a natural fission reactor is active at the centre of earth. The observations show that it is the internal heat of earth that powers all geodynamic processes along with generation of geomagnetic field. The temperature may be up to 6,000 °C at the center of earth, however the pressure could reach 360 GPa.

The volcanic and tectonically active regions have high heat flow values on the continents, however in the ocean it has been found near the area of oceanic ridges. The surface observations and hotspot data show that the high temperature (220 °C - 350 °C) geothermal resources are located at plate boundaries, however the low to intermediate temperature (50 °C - 220 °C) resources are spread through out the plates [8]. It has been estimated that a global terrestrial heat of 4.42 Terawatts (TW) power at the rate of 87 mW / m² is being dissipated by the earth into atmosphere continually and is replenished by the heat released from the nuclear fission reactions. At present only a little fraction of this energy is being harnessed worldwide. As per the recent report of the International Geothermal Association (IGA) 10,715 Megawatts (MW) of geothermal power in 24 countries is online and out of which about 67,246 GWh of electricity is being generated.

Since the yore the thermal springs have been used for bathing, washing and cooking, healing and religious purposes. At the beginning of the last century, experiments started for piping the hot water for house heating and production of electricity. As per the data of year 1994, the electricity power of nearly 6300 MW was generated in 21

countries and 11400 MW thermal for direct utilization in about 40 countries. The direct-use has been on small scale traditionally by individuals, however, in the recent developments large-scale projects, such as district-heating, greenhouse complexes, industrial use, aquaculture pond heating, agricultural drying, cooling and snow melting etc... are being common. Moreover, the heat exchangers are also becoming popular, efficient and better adapted to geothermal projects. These machines allow use of lower temperature water and highly saline fluids. A further revolution has been triggered by the heat-pumps, which utilize very low-temperature fluids. These pumps have extended geothermal developments into traditionally non-geothermal countries such as Canada, Switzerland, Sweden and France, as well as areas of the mid-western and eastern U.S.

The installation capacity of direct geothermal utilization is increased from 27, 825 MW (2005) to 48493 MW (2010), a 74.3% increase over WGC2005, growing at an annual compound rate of 12.4%. This amount is estimated to be equivalent to energy produced by 37.5 million tonnes of fuel oil per year. The total annual energy harnessing is 423,830 TJ (117,740 GWh), indicating a 62.0% increase over WGC2005, and a compound growth rate of 10.3%. The largest energy uses are for geothermal heat pumps (47%), and swimming, bathing and balneology (26%) world-wide.

The science and technology of geothermic is progressing. It is estimated that at present there are about 11,765 MW of electricity generating capacity in geothermal resources in 24 countries world-wide. At present the USA, Philippines, Italy, Argentina, Australia, Ethiopia, France, Greece, Russia, Thailand, Mexico, Iceland Indonesia, Japan, Portugal

and New Zealand are the largest users of geothermal energy resources. The USA is the world's largest producer of geothermal electricity and the first geothermal plant was established in 1960 at 'The Big Geysers' in California, which is still continuing to operate successfully. The power generation capacity is 1800 MW and the California Energy Commission (CEC) is running this largest geothermal energy plant. It is interesting to note that this plant produces the electricity requirement of 10,00,000 house hold units of North California in an eco friendly manner .

As said before, this is the best domestic source of sustainable and renewable energy and an alternate to other energy sources, especially fossil fuels. This is an environmentally clean source as it emits a negligible amount of greenhouse gases as shown below in the Fig. 1. This energy is going to become the cheapest source of power generation in the years to come as the other conventional sources are going to diminish. Although initial investment is quite steep due to factors such as location and low production, yet in the long run it will be a huge cost saving and efficient source. It involves low running cost as it save 80% cost over fossil fuel as it require no fuel for power generation.

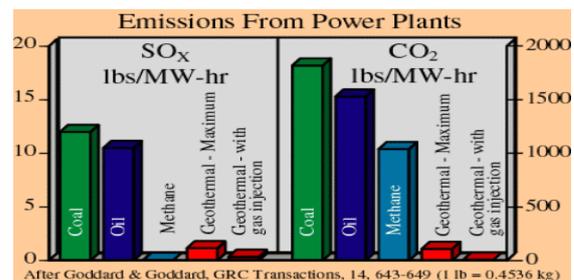


Fig. 1: A comparison of Greenhouse emission from power plants

Geothermal Sites in India and Himachal

India is progressing ahead towards generating eco-friendly energy sources like wind power, hydropower, biomass, solar power and geothermal power. Large financial incentives and capital subsidy are being granted by the Govt. of India to harness energy from the non-conventional energy sources. India has a great potential of geothermal sources. There are several geothermal provinces with 400 thermal springs having by quite high heat flow (78-468 mW/m²) with thermal gradients (47-100° C/km). Subsequently, detailed geological, geophysical and tectonic studies have been carried out by several groups, which have identified several sites in their investigations, which are suitable for direct use as well as power generations.

At present, the total installed capacity in India from renewable sources i.e. generating power from the non-conventional energy sources is just 1313 MW which is quite low i.e. < 2% of the total potential (60,600 MW). The utilization of direct use technologies is where geothermal heat is normally practiced and the water temperature less than 150° C, and at present, not much initiative has been taken to harness the heat for power generation.

In the Table 1, the temperatures and heat flows of the most promising five (05) provinces: Himalaya, Sohana, Cambay, Son-Narmada-Tapi (SONATA) and Godavari are shown.

Province	Surface (°C)	Reservoir (°C)	Heat Flow (mW/m ²)	Thermal gradient (°C/km)
Himalaya	>90	260	468	100
Cambay	40-90	150-175	80-93	70
West coast	46-72	102-137	75-129	47-59
SONATA	60 – 95	105-217	120-290	60-90
Godavari	50-60	175-215	93-104	60

Table 1: Power generating capacity of Indian geothermal provinces

Thus there are bright chances to exploit all the above thermal provinces with the help of available technology for power generation as well for direct use. It has been estimated that all these provinces are capable of generating 10,600 MW of power . The escalating energy needs are to be fulfilled with the open economic policies of the Govt., and large incentives to explore non-conventional energy sectors. Carrying such visionary plan the future of geothermal energy sector in India appears to be bright.

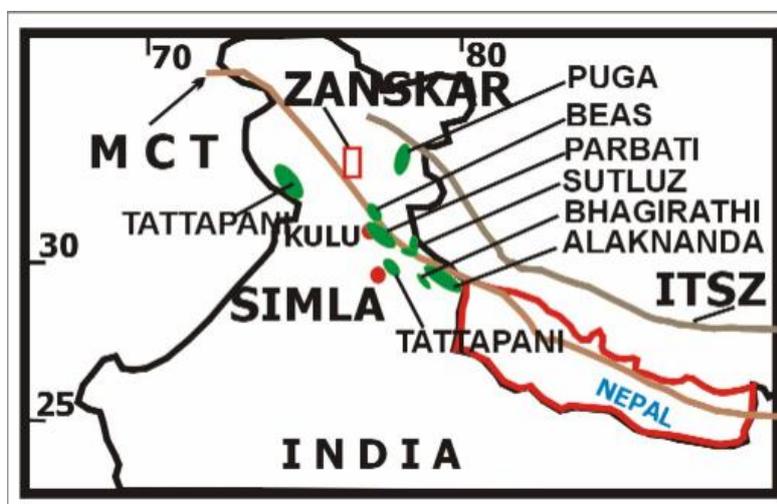


Fig 2: Geothermal energy sites in North West Himalayan Region.

In India, studies for identifying the geothermal sites were undertaken by the Geological Survey of India over the last three decades. The Tattapani geothermal field in Chhattisgarh is said to be the most promising geothermal resource. The National Thermal Power Corporation (NTPC) is installing the first geothermal power plant at Tattapani area of the Balrampur district. The Puga and Chhumathang in J&K, Cambay Graben in Gujarat, Surajkund in Jharkhand, and Manikaran in Himachal Pradesh are other promising sites.

Himachal Pradesh is a part of the western tail of the large Himalaya geothermal province. This is spread over an area of over 1500 sq km and more than 150 thermal manifestations with surface temperatures varying between 57 and 97°C are spectacular scenes to the tourist attraction. It has a quite high geothermal gradient ($>260^{\circ}\text{C}/\text{km}$) and large heat flow values ($>180 \text{ mW}/\text{m}^2$). In Himachal these thermal manifestations are at Tattapani, Manikaran, Manali etc... in the bank of Beas, Parvati and Satluj rivers. However, not all are having high heat flow value, but Manikaran does. Along with the wet geothermal systems, the region is endowed with hot dry rocks at shallow depths. The low to high geothermal gradients and heat flow a value in HP is well suited to commission geothermal based power projects and also to initiate feasibility study to tap the energy of hot dry rocks. Himachal Pradesh has a great potential to produce electricity and supplement its various power needs in house heating and cold stores etc...

3. Touristic Potential of Geothermal Sites

Tourism has fascinated human beings from times immemorial. From the days of the ancient explorers humans has travelled across thousands of miles to look for new lands with varied geographical terrains, flora, fauna and many other hidden treasures. With the passage of time and development of human brain these unnatural happenings under the earth crust were used by the local community fulfilling their basic needs.

The potential of the geothermal sites has been acclaimed by good number of researchers, academicians, energy conservationists and

geologists for different reasons. The efforts of all the people have made development of the various geothermal sites possible for a number of objectives. Promoters of tourism harnessed the geothermal sites for presenting a unique tourism product in the worldwide. In view of the assessment of the same it could be found out that a variety of activities with the participation of the local community can be carried out to make a benchmark for geothermal sites for tourism activities. A study of the activities to showcase geothermal sites as a tourism product is being practiced in different parts of the world; some of which are detailed below:

A) Yellowstone National Park

USA provides a thorough study of harnessing tourism potential from geothermal sites. In the year 1872, America started its first National Park with the name Yellowstone National Park. Located in the states of Wyoming, Montana and Idaho, it is home to a large variety of wildlife and to the world's greatest output of geothermal water. The park covers an area of nearly 9065km² in the north-west of Wyoming. The national park has more than 100 different hot springs group with a unique features providing to the people. The park was first established in 1872 no tourist services of any kind existed, but by 1910 five major hotels had been built. In the current times overnight accommodation is provided at six locations throughout the park.



Fig 3: Tourists enjoying hot water bath in the Yellowstone National Park

B) ENEL Green Power Village

ENEL Energy Italy and Government of Italy in the public private partnership started Museum of Geothermal Energy. The Museum of Geothermal Energy is located in the Enel Green Power Village of Larderello. This site has been nominated as the world capital of geothermal energy. The museum provides various high-tech and multimedia sources for the various individuals interested in learning of this renewable source of energy. The museum is open to school groups and researchers, as well as to all visitors interested in learning about geothermal energy in its numerous dimensions, from history to the activity in the chemical industry, from the power industry to the uses of heat.



Fig 4: Tourist enjoying geothermal site in Power Village of Larderello (Italy).

C) Calpine Corporation

The efforts of Calpine Corporation are worth noting in USA in the area of San Francisco. Calpine Corporation with their dedicated efforts is harnessing this energy providing clean, green and renewable energy to the homes and industry located in the region. The work of Calpine Corporation is really appreciable. The work in the field started with promotion of the hotel in the area with the name geysers which mainly attracted tourists to come, see and enjoy hot water in the area. In today's world when the demand for alternative sources of energy is increasing the efforts of Calpine Corporation is worth noting. The efforts of Calpine Corporation after two decades of its operation is recognized with the fact of social responsible initiative of social activity in the area with providing affordable and reliable electricity. Calpine is one of the main U.S Power company, providing more than 29,000 megawatts of cost effective and clean energy to the various users.



Fig 5: Calpine Corporation: The Geyser Hotel (1800's) before power generation [19]

Exploring Touristic Potential in Geothermal Sites in Himachal

Motivated by the case activities mentioned above, we see a bright future in geothermal tourism in India and in Himachal. As said above, the geothermal sites of Himachal like hot springs at Tattapani, Manikaran, Vasisht and many more have a been used from the times immemorial by the local population reasons to associate with the same are medical and religious. In Manikaran, the hot water is also used for cooking rice etc and hot dry rocks for physical therapeutic uses, also.



Fig 6: Rice Cooking at Manikaran

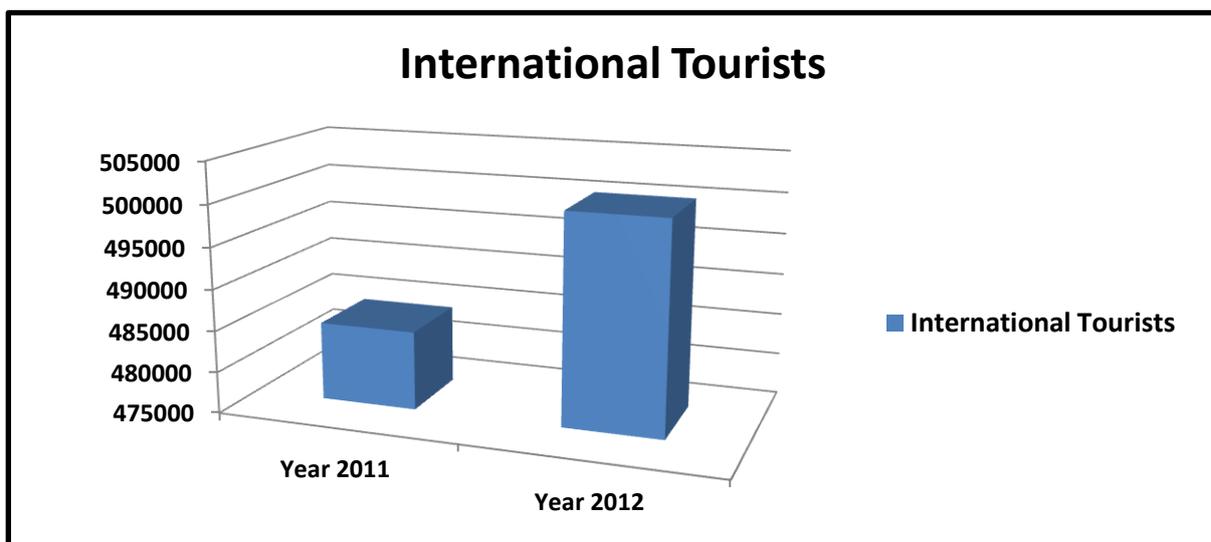
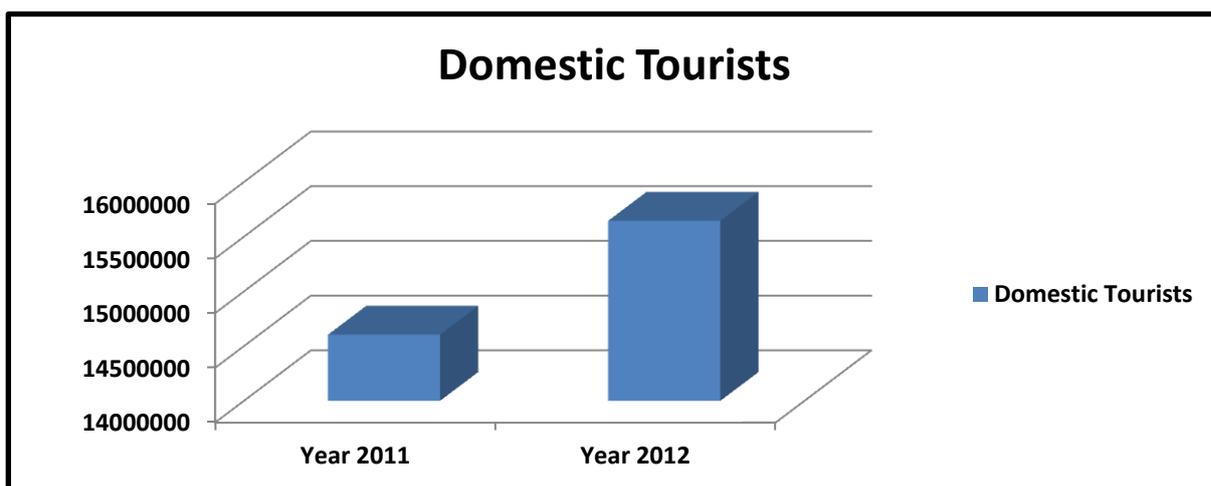
The benefits which these sites can provide are far more than the simple thought process of local human beings, using these resources in their day to day activities. At present the sites mainly attracts the domestic tourists which are mainly dependent on the local people for the services. Most of the local population is not well educated. Though with the rise in literacy rate in the state still there is unawareness among them to harness the potential of geothermal tourism to the fullest. This results in providing only basic amenities to the tourists at the destination. To move in a very

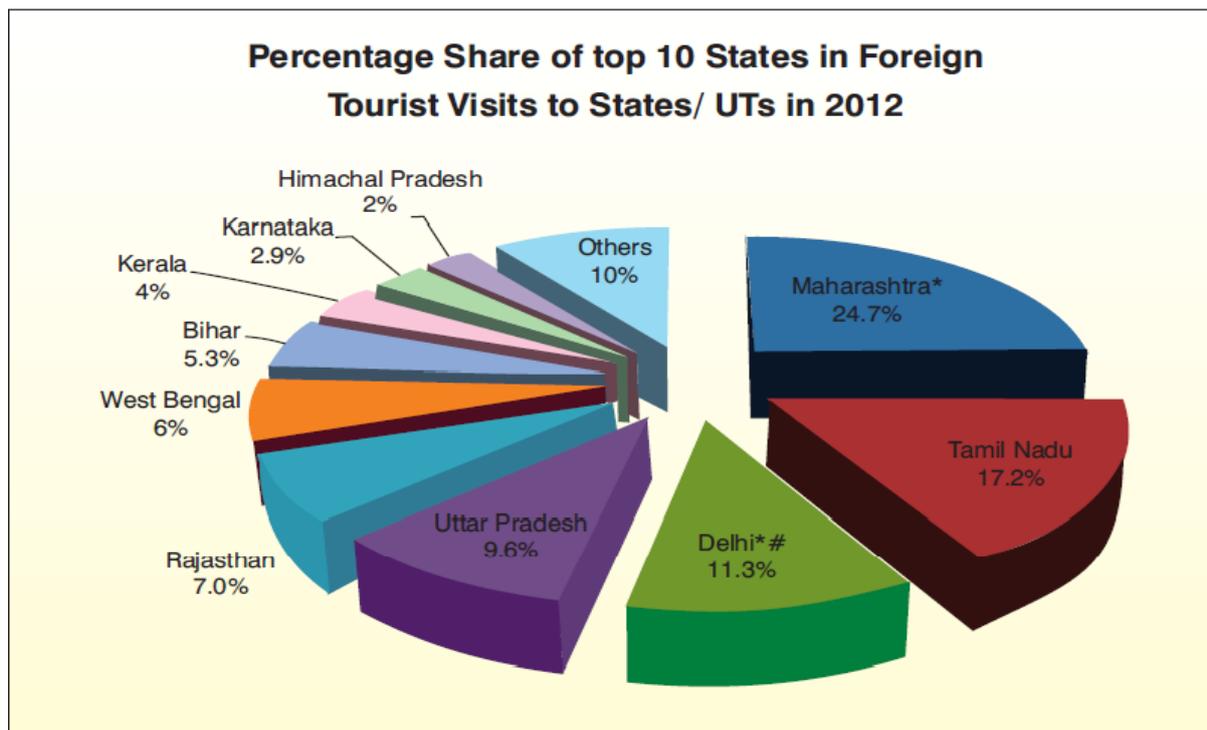
substantial way let us discuss the past and recent statistics of touristic inflow to the state.

Tourists Statistics

Himachal currently holds 15th rank with the parameters of tourist arrival statistics in the states to 15646048 (Nos.) domestic and 500284 (Nos.) international tourists visiting various parts of the state (Source: - Ministry of Tourism report, 2012) which indicates a growth pattern of tourists comparison to the

number of tourists visited in the past year 2011. There has been an increase of 7.13% of domestic tourists and 3.25% of international tourists in the state which shows a positive signs of growth of tourism in the state. In the year 2011 the number of tourist which arrived in the state was 14604888 (Nos.) domestic tourists and 484518 (Nos.) in international tourists.





Looking at the profile of tourists of the state and understanding their consumption pattern of tourism product it could be easily judged that most of the foreign tourists arriving in the state have a different demand pattern with respect to tourism product and look forward to explore the far flung areas rich in culture and heritage. Most of the foreign tourist coming like to stay and explore the living styles of the local community.

HPTDC Endeavours

Himachal Pradesh Tourism Development Corporation has put tremendous efforts to promote Himachal as a destination for all seasons and reasons. The hard work of academicians, researchers and policy makers has helped Himachal to be looked as a unique destination. Geothermal sites of Himachal hold a great opportunity for the state to promote them on the commercial platform of tourism trade along with the participation of the local community. Research in the field of geothermal energy brings out the fact that Jammu and Kashmir holds a good number of geothermal areas but the number of factors like requirement of inner line permits and not well connected with the other parts is a

hindrance which further leads to less movement of tourist traffic in the northern most state of the country. Opposite to the same the better infrastructure, well connected roads and all year round movement of the traffic to these sites in Himachal attract good number of tourists.

An out of box promotion and development of tourism site can attract quality tourists which could increase the number of room nights at a place, more revenue for locals, better understanding of local culture and community, helping in regional development of the area are the few reasons to be associated with the development of quality tourist destination.

However, the HPTDC has launched a variety of schemes to attract quality tourists which in return can help the local artisans, young population and entrepreneurs' to start something unique of their own. Hunaar Se Rozgaar Tak, Homestay Schemes, Har Gaon Ki Kahani and Financial Aid to Entrepreneurs etc... are few of the efforts of Tourism Corporation in the direction, which can help in reducing the migration of local people from villages to urban areas for employment. On the other hand nothing encouraging has been done to develop value tourist destination. In

addition, to our knowledge, no significant efforts have been taken up to develop the various geothermal sites of the state. In the line of geothermal tourism development activities worldwide, launching unique out of box schemes can prove to be a boon for a state like Himachal Pradesh in attracting quality tourists at quality destinations.

5. A Sustainable Geothermal Tourism Product

The exponential growth in the tourism and its best results to the economy could only be brought when a model for *sustainable geothermal sites* for tourism is developed with the key parameters to take care are community building approach, carrying capacity model, employment generation and responsible tourism. Himachal being the hill state has good number of herbal plants and development of geothermal tourism opens the doors for flourishing other type of tourism products also. The first and foremost issue behind the failure of efforts in developing any touristic spot could be effectively understood by the carrying capacity of the destination. Carrying capacity in general is the load which any destination can take; more pressure on the same will lead to depletion of resources, adverse effects in the last would be extinction of the resources. The better conservation can help the future generations to use these resources.

According to the Federation of National Parks of Europe (FNNPE, 1992), “carrying capacity is an ability of the ecosystem to self-sustain and trigger development of human activities in an unlimited scope, with no negative feedback effects”. The version of responsible tourism does not forbid the current generation to use resources, but preserve a part of the same for future generations’. We have tried to explain responsible tourism with the help of following equation:

Total Earning (Our Current Resources) = Expenditure (Use of Resources For Current Use) + Saving (Saving The Resources For The Future)

Understanding the same concept for our natural resources makes it clear that resources

are used for creation of more wealth and wealth helps in future prosperity. The 100% percent consumption of our resources today, generated in the past will leave us empty handed. As a responsible citizen of the country one should make the best use the resources given by the Mother Nature, at the same time save some resources for the future use. One needs to multiply the current resources creating a wealth for future use. In our day to day life also we don't consume in a single day what is earned but look to save something for the future or bad times in the same way our resources needs to be safeguarded.

The Model

Tourism of Himachal holds the potential which could be harnessed working on new models in promotion of tourism product. The geothermal tourism model proposed in this work can be a new experiment to bring the entire products of tourism under one umbrella. We have done a small effort to showcase the vision towards promotion of geothermal sites of Himachal Pradesh. The effective model of geothermal tourism in Himachal Pradesh can be provided with the amalgamation of various activities at geothermal site.

1. Power Generation:

The time has come when most of the countries are looking for alternative methods of power generation. Himachal is already a pioneer in generating hydro electric power from its huge resources of water. Harnessing of geothermal site for power generation could be feather in the cap for the state; the paper has already tried to showcase the potential in geothermal site for power generation. The power generation site at the location will open the doors for other activities at the destination. The first and foremost to associate with the same is tourism. These types of activities are being addressed by number of countries and associations all over the world. Geothermal site can become a self sustained economy meeting power needs of the area, providing employment to the locals, increasing public private partnership and last but not the least regional development of the state. Focussing Special time slots need to be fixed for the tourists to show how energy is being produced from this source.

2.3D Auditorium:

The model of geothermal tourism can start with creating a state of art facility. The auditorium will showcase the study of geothermal energy for the tourists. The help of videos, audios, and guided tours can be taken to make people aware about this form of unique energy under the crust of the earth. The animated movies in different forms for different age groups along with the nature of the tourist can be shown to highlight the origin and history of geothermal energy and earth. This type of work could attract more of researchers, students, adventurers' to the destination.

3. Research and Development Centre:

Geothermal energy has come up in the world and one of the new ways to generate electricity which has come to limelight in recent times in India. A construction of the research and development centre at the destination with a fully fledged laboratory can provide world class facilities for the scientists, scholars and other people to carry out their research activities. Carrying out this activity in the years to come can lead to new innovations, experiments for the use of geothermal energy. This type of work can help to carry out exchange programme from various research and development institutions all over the world. Regular conferences, seminars, workshops and symposia can be organized in these centres from time to time, involving tourists, academicians and researchers to discuss the issues related to promotion and development of geothermal sites.

4. Souvenir Shops:

The local artisans can be benefitted with the start of souvenir shops at the local area. Giving a different experience to the tourists, these shops will allow tourists to possess a souvenir and have a memory to be kept with them for a lifetime. A proper souvenir shops with number of products designed, developed and created by the local community can increase the level of income of local population and ultimately generating employment.

5. Arab Baths:

Himachal have a good variety of herbal plants which can be used to heal number of diseases

like joint pains, skin diseases, etc... A creation of the herbal massage centre like Arabian baths and Ayurvedic Spas of Kerala at the geothermal site can help in getting the best benefit from the basket of herbal plants in state along with the same it will provide employment to the local community. Various employment generating schemes can be started under Hunaar se Rozgaar Tak like local manufacturing of handmade herbal medicines using herbal resources along with the same local community can be well trained to own and operate government approved massage centres.

6. Home Stay Schemes:

Government of India with its "Incredible India Bed and Breakfast/ Home Stay Scheme" has sown the seedlings for the future. The same initiatives' at the geothermal sites can bring tourists closer to the local community, building on the local community approach for tourism and achieving the success of the product. This scheme could be popularized as tourists could be motivated towards understanding culture, cuisine and living style of local community.

7. Amusement Parks:

Hot-springs closer to the main water bodies like rivers (in Himachal Satluj, Beas, and Parvati) have abundance of water, which could be used for rafting and other water activities increasing avenues for tourism and trade.

8. Museums:

The Museums can provide people of all age groups knowledge about the history showcasing pictures, pieces of Magma, Various Types of rocks, folk-tales associated with the geothermal sites of Himachal Pradesh. The museum can also showcase the other destinations where this source of clean energy is present. The area of the museum can be devoted for the sale of books specially dedicated to this source of energy.

Proposed Itinerary:

Day 1.

Arrive at the destination. Get relax at the accommodation providing hot water directly sourced in the hotels from the source of geothermal energy. A half day guided sightseeing tour of the power house (Generating electricity using geothermal sites of the region), a tour of 3D Theatre showcasing the history of geothermal tourism in the world and development in the field and efforts carried out all over the world to use geothermal sites. Lunch in the afternoon and in the evening a refreshing bath in the Arab baths specially designed providing hot water facilities for bathing. The tourists can use rock therapy, herbal therapy with the help of qualified instructors in the specially designed Arab baths in the region.

Day 2.

Morning Breakfast and travel to the local village areas and communicate with the local people and understanding the problems faced in the mountainous regions and efforts carried out by the local community in earning their livelihood. Afternoon after lunch travellers can go to the Museum to see the various photographs from the past, pieces of Magma and other objects associated with geothermal energy. Enjoy the evening on their own. Overnight.

Day 3.

Morning Breakfast. Relax in the first half of the day. After lunch visit the local market for shopping. After enjoying herbal tea of Himachal in the evening visit the local artisans manufacturing handicrafts ranging from the different areas of the state like Chamba rumal, Kullu Shawls etc. Relax in the evening. Dinner in the local village prepared by the locals of the area like Kangri Dham, Kullu Dham, etc... Enjoy the moments with the local folklore of the region with dance performance by the local community. In the same travellers will be provided with the dresses of the region. This will allow them to take photographs in the local dresses of Himachal. Overnight. (If possible accommodation must be provided in the home stays bringing closer to the locals with the community based initiatives by the concept).

Day 4.

Morning breakfast and check out.

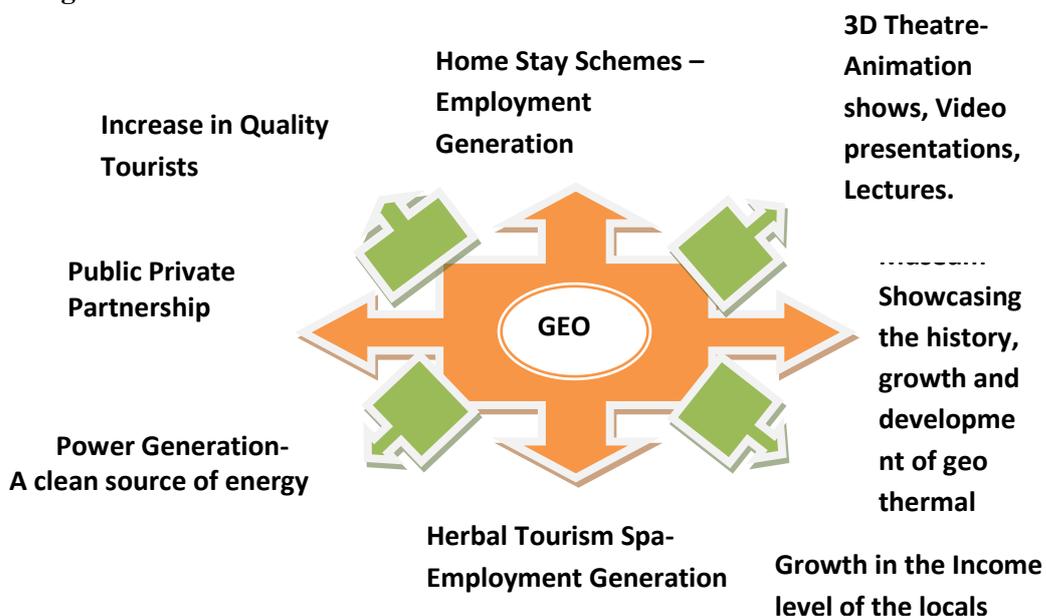


Fig. 7: Eight-Fold Geothermal Tourism Model

Caution:

The efforts to create a unique quality tourism product for geothermal energy sites can lead to the ill effects on the local environment. The journey in harnessing the geothermal energy for tourism also throws light on the point, to protect our diverse culture, nature and environment that cannot be neglected. Understanding the geographic pattern of the geothermal sites, lack of proper education to locals and tourists can lead to spoiling the atmosphere, and discharging the waste in these water bodies. The adverse affect of the same in the long run, that these destinations will also join the list of destinations which could not attract quality tourists. Result in the same will fail in of our efforts to create a unique tourism product for the state which will be a centre for learning and recreation for our future generations to come.

5. Conclusions

Ten advantages of geothermal energy over the other sources of energy have been recently identified by the Geothermal Energy Agency (GEA). In addition to the environmental friendliness, this energy is quite versatile, renewable, reliable and easily available, and promotes national security. The document further states that harnessing geothermal power uses humanly technology, creates jobs and spurs economic growth.

The advancement of technology has increased interest of people in geothermal heat pumps and the geothermal energy can now be developed anywhere. The binary cycle plants can be used to harness power from the low-to-moderate temperature geothermal resources. In such combined heat and power plants (CHP) the hot water with temperatures below 100 °C are first run through a binary power plant and then cascaded for space, swimming pool, greenhouse and aquaculture pond heating, before being injected back into the aquifer. The dwindling supply and roaring prices of oil, gas and electricity, and increasing environmental sensitivity will make geothermal energy more economically viable alternative source of energy.

India is a growing economy and power consumption is rising exponentially. Ultimately, she has to depend on clean, rural based, cheap energy sources and it would be the most unfortunate part to ignore the 10,600 MW geothermal potential. Although the efforts have been already initiated to generate electricity from the geothermal heat, yet more is to be done. However, the direct utilization in houses, pilgrims and hotels etc... of this energy source is in practice at Manikaran, Vashist, Tattapani in Himachal Pradesh and other provinces in India where thermal water is used for bathing and therapeutic purposes for centuries. The geothermal sources at Puga in J & K can generate power it has been proposed by the experts to generate power as well as establish greenhouse cultivation and space heating facilities for the Tibetan residential schools. The thermal discharges from other geothermal provinces in India like Godavari and Bakreswar are being used for bathing and religious purposes.

The study of potential in the geothermal sites with the research activities carried out all over the world could be well understood with the fact that geothermal sites are not only a place for the local population to use hot water to wash clothes or to be only associated with the religious activities of the people coming from the far of places to see and worship but far more can be achieved with the efforts of public and private partnerships.

Tourism can be described as an activity which is serviced by number of other industries such as hospitality and transport. This definition clearly defines the role of tourism in support of other industries. Looking at variety of tourism products and understanding the focus of various tourism bodies brings out the key fact that efforts of all the bodies from the DMO (Destination Management Organisation) to the commercial activities of DMC (Destination Management Company) helps to earn the reward with increase in the tourism growth and development of the region. Focussing on unique product for the development of region could be geothermal sites as a sustainable tourism product which

can bring a great change in the tourism product consumption of tourists.

The behaviour of tourists (leaving business tourists) is summed up with fact that consumer of the tourist products is not only influenced by the individual decision of the customer but it gets greatly motivated by the final decision of the consumers of the product. Looking at the behavioural pattern of tourists a geothermal tourism model has been proposed satisfying the individual and collective needs to a great extent.

A wholehearted support of all the stakeholders will be required to create a mark on the touristic map of the world for Himachal Pradesh. The journey in harnessing the geothermal energy for tourism also throws light on the point, to protect our diverse culture, nature and environment, educating the local community and tourists is of prime importance in protecting and maintaining our natural resources for the future use. These efforts will justify the roles of public and private partnership in the growth of tourism in the state.

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