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Use of an Indigenous Knowledge System (IKS) to Sustain Thermal Spring Development: A Case Study of Baleni and Sagole in Limpopo Province, South Africa

Azwindini E. Tshibalo

Department of Environmental Sciences, P.O. Box 392, University of South Africa, South Africa

tshibae@unisa.ac.za, tshibae@gmail.com

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ABSTRACT

In 2010, the Water Research Commission (WRC) of South Africa funded a research project to collect data on thermal springs in South Africa. Researchers from the Universities of Johannesburg, Pretoria and South Africa, and the Council for Geosciences in Pretoria, participated in the research project. Numerous field trips were undertaken to collect water samples from thermal springs throughout the country. Furthermore, a literature study was conducted to understand the uses of thermal springs globally. Interviews were held with selected managers and local people to investigate how thermal springs were used and managed. Findings revealed that a number of thermal springs, documented and mapped during the 1950s, have since dried up. The findings established that the Indigenous Knowledge System (IKS) used by the local people helped to sustain some of the thermal springs. This paper explains how the IKS was applied to sustain the use of the two thermal springs in the deep rural areas of Baleni and Sagole.

1. INTRODUCTION

South Africa is located in a geologically stable zone. Regardless of this, the county is well-endowed with natural hot springs. A hot/thermal spring is a spring produced by the emergence of geothermally heated groundwater that rises from the Earth's crust. Eighty-seven thermal springs, with temperatures ranging from 25ºC to 67,5ºC, have been documented to date (Tshibalo, Dhansay, Chevalier, Musekiwa and Olivier, 2015:1). Figure 1 shows the geographical distribution of thermal springs in South Africa. Generally, all of the thermal springs in South Africa are confined to a broad band of about 400 km in width that extends across over half of the country from Piketberg in the Western Cape, through KwaZulu-Natal, the Free State and Gauteng provinces, up to the Soutpansberg in Limpopo Province (Kent, 1952). The majority of these thermal springs are located in the Limpopo Province. At least 28 thermal springs and boreholes are recorded in Limpopo, 14 in the Western Cape, 13 in Mpumalanga, 10 in the Eastern Cape, 4 in the Free State, 5 in Kwazulu-Natal and one in the Northern Cape.

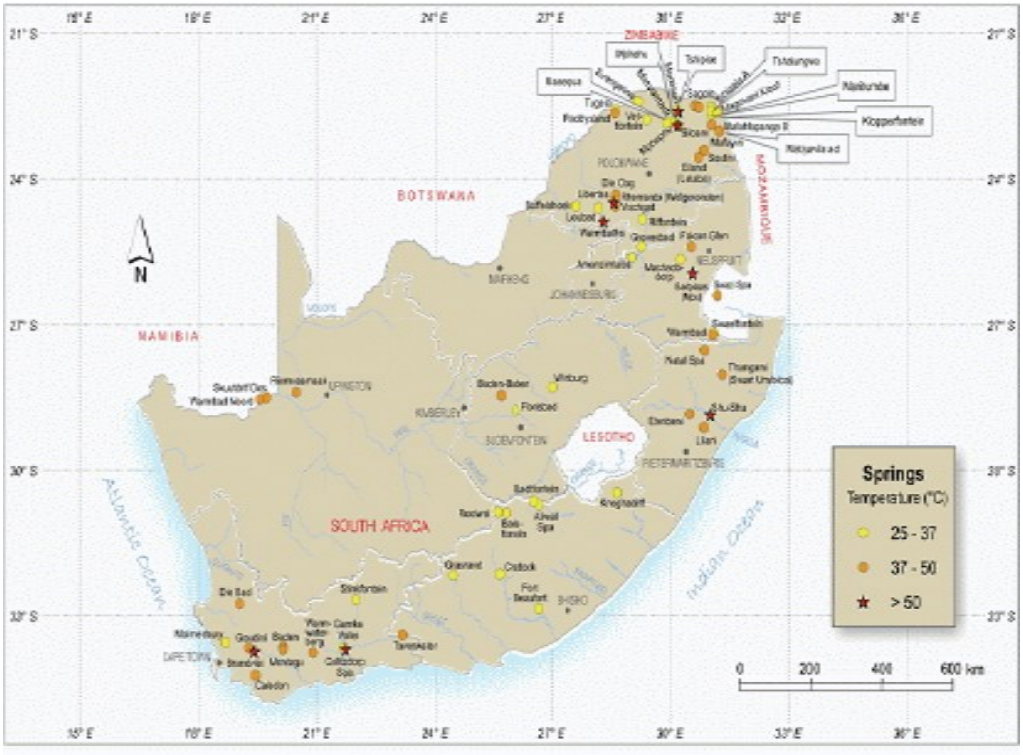

Figure 1: Geographical distributions of thermal springs in South Africa (Olivier and Jonker (2013) (modified)).

A few of these thermal springs are developed as tourism resorts, while the majority are still underdeveloped. Research in the development of thermal springs shows that thermal springs can be developed for direct uses and for geothermal electricity generation. Water temperature determines diverse direct uses of thermal springs. These include fish farming, warming swimming pools, de-icing, soil warming, mushroom growing, balneological baths, greenhouse heating, space heating, aquaculture, and so on (Rinehart, 1980).

During the project many field trips were undertaken to collect water samples from thermal springs throughout the country. The location and distribution of thermal springs were recorded. Temperatures of thermal springs were measured at the source using thermometers calibrated in degree Celsius. Researchers discovered that some of the thermal springs that were documented and mapped during the 1950s have dried up. A few, previously unrecorded thermal springs were found. These include seven found in the Kruger National Park. It was concluded that the Indigenous Knowledge System was used to conserve and sustain a number of thermal springs in Limpopo Province, including the Baleni (previously known as Souting) and Sagole springs in the deep rural areas of the Limpopo Province.

2. DEVELOPMENT OF THERMAL SPRINGS IN LIMPOPO PROVINCE

The recorded thermal springs in the Limpopo Province include: Zimthabi, Die Oog, Rhemardo, Mphephu, Sagole Spa, Forever Eco Tshipise, Forever Eco Eiland, Makutsi Safari, Liberstas, Moreson, and Vischgat (Olivier et al, 2013: 13). Traditional medicinal uses of these thermal springs include the treatment of: skin diseases, chronic Rheumatism, carcinogenic tumours, wound healing after operations, internal bleeding, neuralgia, lumbago, arthritis, incised wounds, respiratory organs, liver ailments, cancer, blindness, sarcoma, Tuberculosis, snake bites, abscesses, mental fatigue, peptic ulcers, fever and diabetes (Oliver and Jonker, 2013). This paper focuses on the following springs located north of Limpopo Province: Sagole and Baleni (Souting), north-east of Limpopo. These springs are hydrothermal and have temperature reading at the surface of 44^0C and 46^0C. Figure 2 shows the distribution of thermal springs in Limpopo Province.

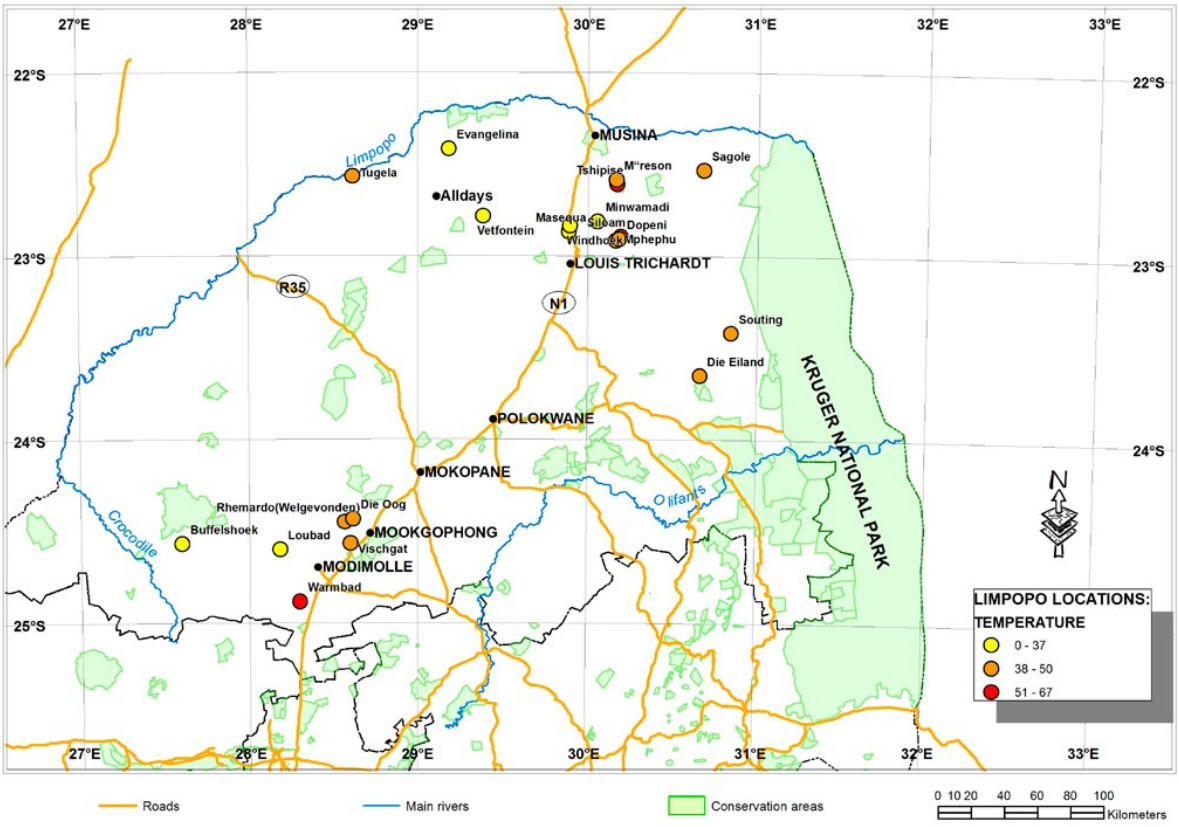

Figure 2: Distribution of thermal springs in Limpopo Province (Tshibalo and Tekere (2015)).

The following section discusses each thermal spring, the historical background, the use of indigenous knowledge, and potential uses and challenges.

3. THERMAL SPRING DEVELOPMENT USING THE INDIGENOUS KNOWLEDGE SYSTEM (IKS)

Indigenous Knowledge Systems may be broadly defined as "the knowledge o [an indigenous (local) community accumulated over generations of living in [an] exacting environment" (Lodhi and Mikulecky, 2010:94). It can be explained further as the local knowledge or knowledge that is unique to a given culture or society. It is the basis for local-level decision-making in agriculture, health care, food preparation, education, natural resource management, and a host of other activities. Such knowledge is passed down from generation to generation, in many societies by word of mouth. Indigenous knowledge has value not only for the culture in which it evolves, but also for scientific and development planners striving to improve social conditions (World Bank, 1998; Lodhi and Mikulecky, 2010:94). Discussions in this paper are based on this understanding of the concept.

Baleni (Souting) and Sagole Spa are used as case studies in this discussion. Table 1 below describes the two thermal springs in terms of the province, location, temperature, flow rate, classification, geologic structure, and potential uses.

Table 1: Description of Sagole and Baleni (Souting) (Olivier and Jonker (2013) (modified)).

Descriptive item	Sagole Spa	Baleni (Souting)
Province	Limpopo	Limpopo
Latitude	22.530	23.417
Longitude	30.681	30.850
Temperature	46,3^{0}C	44,0^{0}C
pH	9.3	7.2
Flow rate	7	Not available
Classification according Kent	Hot	Hot
Geologic structure	Klein Tshipise fault, in mudstone shale	Fault in Archaean granite
Types of accommodation	Chalets and dormitories	Chalets and dormitories
Potential uses	Green house Mushroom farming Fish farming Spirulina production Oyster farming Mineral mining Balneology Tourism	Green house Mushroom farming Fish farming Spirulina production Oyster farming Salt production Tourism

3.1 Baleni (Souting) Thermal Spring

3.1.1 Brief Historical Background

Baleni, previously known as "Souting" (derived from the Afrikaans word "sout", meaning "salt"), is a mineral hot spring situated near the banks of the Klein Letaba River on land belonging to the Mahumani Traditional Authority, south-west of Giyani, in Limpopo Province. It is known as the only undeveloped hot spring in Southern Africa (http://www.africanivoryroute.co.za/camps/baleni). Its water temperature at the source is 43,9^{0}C and the water has a high level of sodium chloride (Antonites, 2006:13). During winter, groups of local women come to the spring to harvest small amounts of salt for their own use and to sell. Old women are allowed to harvest reeds. The hot spring is a sacred site for the local Tsonga community.

3.1.2 Use of the IKS to Control Access and to Manage the Resources of the Thermal Spring

It is interesting to note that access to the thermal spring is controlled using the Indigenous Knowledge System. Face-to-face communication with the tour guides brought the following taboos and rituals to light.

- Persons who have had sexual intercourse the previous night are not allowed to access the resource site.
- Persons entering the resource site must take off their shoes.
- Ritual practices at the source include the use of pseudonyms for common objects around the thermal springs. For example, rocks are referred to as "peanuts", reeds as "spears" or "arrows".

From the team of five researchers from the University of South Africa (Unisa), only two were brave enough to access the geothermal resource site for water sampling and measurements. Taboos and rituals, therefore, are used to manage and protect the natural resource from unnecessary exploitation.

3.1.3 Use of the IKS to Manage the Salt-producing Process

Elderly women are the only people authorised to access the salt-producing site near the spring. The sustainable salt-production process takes the following steps: The process starts off by sacred offerings of bundles of sticks, food, tobacco, snuff and copper coins at the base of a lead wood tree. Using a 2000-year old indigenous technique, women collect salt-encrusted sand and leach it with water

through filters made with clay and leaves. The filtered water is boiled to evaporation point, leaving the pure crystals of Baleni Sacred Salt (Antonites, 2013:106). Salt-production takes place in the winter season.The river valley is flooded by summer rains during summer. The rain water prevents salty underground water to raise to the surface of the river valley. Figure 3 shows the salt-making process at Baleni. Salt is sold by the individual producers directly to the local people and to traditional healers who revere its healing properties. (http://www.baleni.co.za/).



Figure 3: Salt-making at Baleni (Photo by Tshibalo, 2011).

3.1.4 Use of IKS to Manage Access to Reed Harvesting Site around the Spring

Reed is a grass species with a high potential for biomass production. It can be used both as an energy source or as construction material (van der Sluis et al, 2013). Observation and face-to-face communication at the site revealed that, in relation to reed harvesting, only the elderly women and young children are given access to the reeds that grow around the site of the spring. Elderly women can harvest the reeds at the appropriate time. Young women and men are not allowed to enter the reeds area. This is another access control measure to the site, and this control prevents over-harvesting of the resources.

3.1.5 Potential Uses and Challenges

Except for salt-making, research conducted by Olivier et al. (2013:100) shows that, by utilising its heat, the Baleni hot spring could be used for greenhouses, and for mushroom and fish farming. The salt-making process can also be improved. Challenges include the fact that salt-making is seasonal, and therefore no income can be expected during summer. Marketing the salt seems to be an additional challenge.

3.2 Sagole Spa Thermal Spring

3.2.1 Brief Historical Background

Sagole thermal spring was discovered by Ramashia Netshipale while looking after his stock. The spa falls under Chief Tshikundamalema. The community uses the hot spring for domestic purposes and farming. The hot spring is also used as a sacred place (Tuwani, 2011:159).

The development of the hot spring for tourism started in the 1960s. During those days, the hot spring was called “Klein Tshipise” and was visited by such dignitaries as Chief Mphephu who, in 1979, became the President of the then Independent State of Venda. In the mid 1980s, the Venda Development Corporation (VDC), supported by the Apartheid government of South Africa, and the Tshikundamalema Tribal Council, started developing the spa. The Sagole Spa was officially opened by the homeland President Mphephu in 1988 (Tuwani, 2011:161).

Political changes in South Africa since 1990 have had a negative impact on the development of the Spa. The VDC ceased its management of the Spa and the Spa was then leased to an individual who failed to maintain the infrastructure. The infrastructure and facilities at the spa are in a sad state of decay (Tuwani, 2011:161).

Figure 4 shows the empty swimming pools at the Spa and Figure 5 shows the fountain of the spring.



Figure 4: Empty swimming pools at Sagole Spa (Olivier and Jonker (2013) (modified)).



Figure 5: Sagole fountain (Olivier and Jonker (2013) (modified)).

3.2.2 Use of the Thermal Spring as a Sacred Place

Communities at Sagole village use the hot spring for domestic purposes (bathing, cooking and washing), farming, and as a sacred place for traditional rituals. Traditional rituals include the following: *"u phasa and thevhula"* (communicating with the Ancestors) which involves performing the traditional dance called *"Tshikona*" followed by sprinkling water, snuff and the drinking of traditional sorghum beer (Tuwani, 2011:159). The fact that the spring is given the status of a sacred place means a lot in terms of environmental management of natural resources. As a sacred place, the following measures were observed by the researcher:

- The fountain is fenced by the community and access to the site is controlled.
- Separate male and female baths are constructed.
- It is forbidden to kill any snakes, especially pythons, found around the hot springs.

According to Tuwani (2011:160), "legend has it that, beneath the surface of the spring, there is a mysterious python that releases hot water from its mouth squirting it onto the surface". It is also said that there is a harmless, woollen-headed snake that pacifies the natural spirits of the spring (Harrison, 2004). All these measures are used to maintain and sustain the natural resource (the spring) by the community.

3.2.3 Thermal Spring Water used for Traditional Healing using the IKS

Close to the thermal spring, there is a traditional healer called Mr Mudzielwana Mulaudzi, known as "Tshikovha". He is known for healing mental illness using thermal spring water. Many of the visitors to Sagole Spa are patients to the traditional healer. Observation and personal communication with the healer confirmed that some visitors to the Spa are his patients. Scientific analyses of the water at the thermal spring identified lithium in the water. Lithium is known as a mood-stabilizing medication used to treat bipolar disorder or manic depression. It is, therefore, suggested that the healer is using this naturally occurring ingredient of the thermal water to help treat mental illness.

3.2.4 Potential uses and challenges

Tshibalo (2011) identified three sustainable development projects at Sagole. These are:

- Aquaculture (Tilapia farming),
- Health Spa Tourism Centre, and
- Geothermal Science Education Centre.

In 2013, a developer from Johannesburg was interested in the development of Tilapia farming at Sagole. The developer and the researcher initiated the process with the leaders of the local community, the Ward Councillor and the Mutale Municipality. When the Memorandum of Agreement was about to be signed, the Chief intervened and demanded money up front. The whole process came to a stop and the main challenge stemmed from land ownership.

4. CONCLUSION

The results of this study suggest that the Indigenous Knowledge System (IKS) has the potential to sustain thermal spring development in South Africa. However, potential uses and challenges identified in the sustainable development of the two thermal springs, Baleni and Sagole, suggest that both the Indigenous Knowledge System and scientific knowledge are essential for optimal uses of thermal springs in Limpopo Province, South Africa.

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