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# *Zwisima na zwipise ndi fhethu ha zwifho*: traditional hydrological knowledge, conservation and protection of groundwater among the Venda, northern South Africa

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Springs are vital freshwater and hydrothermal groundwater sources. We pose the research question how springs are perceived in indigenous worldview and employ ethnographic and historical sources highlighting springs as sacred sites protected by myths and legends. The Venda regard water as a cultural entity deeply imbued with spiritual importance. Such knowledge is critical in conservation of groundwater, which surfaces through springs. Springs are not only associated with riverine headwaters, but also conform to particular drainage patterns, contributing to the overall water flow and drainage. This is of profound cultural importance where watershed and springs are associated with beginnings of life. Venda myths and legends demonstrate how such sacred environments regulated exploitation and conservation of biodiversity. Given modern infrastructure development, groundwater conservation must be located within particular indigenous worldviews.

## KEYWORDS

Venda, springs (*zwisima/zwipise*), myths, legends, sacred sites (*zwifho*), conservation, biodiversity

## Introduction

Springs are vital freshwater sources for humans (MacDonald et al., 2021), especially in arid regions, as well as hydrothermal sources used for bathing and medical therapy. This paper focuses on natural springs located among the Venda people of northern South Africa, viewing them beyond their geohydrological contexts as water exit points for groundwater. We pose the research question how springs are perceived in indigenous Venda contexts, and their role in expressing the worldview of these people, including the biophysical context that they are part of. Among the Venda, the saying, *zwisima na zwipise ndi fhethu ha zwifho*, refers to both ordinary springs (*zwisima*) and heated springs (*zwipise*) as sacred sites. Indigenous worldviews around these hydrological features, especially the taboos, myths and legends highlight the importance of their conservation as sources of groundwater located within a particular worldview. Like other indigenous societies, the Venda have always been guided toward the management of springs, first through perceiving water as a sacred living entity and not merely as a consumptive resource, and second, the need to restore the environment and regenerate it by way of rituals, ceremonies and prohibitions to ensure conservation and protection of groundwater. Approaches toward biodiversity conservation that centralize not only the importance of groundwater, but also its relevance in a particular indigenous worldview

are missing in contemporary literature. Robust approaches to biodiversity conservation should integrate groundwater and recognize its significance within a specific cultural context and worldview. This involves acknowledging indigenous knowledges as essential for sustainable resources conservation. This paper demonstrates this particular point, highlighting that indigenous societies such as the Venda possesses a worldview that allows biodiversity conservation where traditional knowledge, acquired since deep time, provides valuable insights into sustainable groundwater conservation and ecosystem wellbeing. Integrating such indigenous knowledge and practices with modern approaches to conservation is essential for effective and equitable conservation outcomes. As such they offer insights for policy and management. Integrating these practices into water governance frameworks is crucial for sustainable water conservation, particularly in contexts experiencing water scarcity due to accelerated urbanization and industrialization.

## Materials and methods

### The research area

The research was conducted since early 2024 as part of a scoping study on the cultural importance attached to groundwater in Venda, in the north-eastern part of South Africa. The research area is broadly demarcated by the Limpopo River to the north, the Soutpansberg mountains to the south, the Great Escarpment to the east, while the westward extent is broadly delimited by the Sand River (Figure 1).

### Environment and climate

The middle Limpopo basin is predominantly semi-arid and dry. It experiences a very hot climate, with summer temperatures exceeding 40 °C, while winter temperatures average in the mid-20s. The basin receives summer rainfall, generally with low precipitation, with mean annual precipitation decreasing fairly uniformly westwards, and northwards toward the Limpopo River. Rainfall varies from a low of 200 mm in the hot dry areas to 1 500 mm in the high rainfall areas. The majority of the Limpopo basin receives less than 500 mm of rainfall per year (Zhu and Ringler, 2010) and, as detailed below, this influences the hydrology of the research area. Being semi-arid to arid (e.g., Sikhwari et al., 2022), it is inherently water scarce (FAO, 2004).

### Geology, geomorphology and hydrology

Geologically, is the research area within the Limpopo Mobile Belt, a zone of complexly deformed and metamorphosed Archean gneiss units and rocks of high multi-grade, formed from about 4.0 billion years ago, until about 2.0 billion years ago (Barton and Key, 1981; Mason, 1973). Light, 1982; Paulssen et al., 2022). Geologists have subdivided the Belt into 3 subparallel zones, namely the northern, the central, and the southern. The southern and northern marginal zones have cratonic evidence, comprising large, stable blocks of continental crust dating from the Archean eon. As such they have experienced minimal deformation or

tectonic activity compared to other regions of the earth's crust (Kramers et al., 2011). The central zone, some 3.2 to 2.9 billion years old, is the largest and shows structural complexity and high-grade metamorphism (Zeh et al., 2007). These zones are separated by major shear zones, characterized by intense rock deformation. The Tuli-Sabi shear belt and the Soutpansberg fault zone are major shear zones that mark the boundaries between the marginal and central zones of the Belt (Brandl, 1986; McCourt and Vearncombe, 1987). The geology exhibits distinct hydrological features influenced by its structure and tectonic history (Mason, 1973). This has hydrological implications. Shear zones create pathways for groundwater movement and influence surface water drainage patterns (Olomo et al., 2025). Metamorphic rocks have varying permeabilities, affecting groundwater storage and recharge (e.g., Lachassagne et al., 2011, 2014). The geology influences the chemical composition of surface and groundwater, impacting on water quality (e.g., Abanyie et al., 2023).

A very prominent landform is the Soutpansberg range of mountains (Figure 2) These mountains are named after the giant salt pan on their western side, a source of salt for centuries referred to by the indigenous Venda as *thavha ya muno* ("place of salt"). The Venda, however, have no name for the entire range, except parts of the mountain, e.g., Dzanani, Songozwi, Tswime, within their immediate reach and are identified by indigenous terms. The range trends east-west for about 130 kilometers overlooking the Limpopo basin, where Venda settlement located to the north and east. The mountains are a watershed, with major rivers, e.g., Nzhelele, Mutamba, Mutshedzi, Luvuvhu, Mutale, originating from there and contributing to the basin's water. The mountains recharge the regional groundwater (Brandl, 1999). For the research area where rainfall recharge is highly variable spatially and temporally, recharge by the Soutpansberg mountains provide groundwater that sustains the Venda throughout the year. Groundwater, which comes to the ground surface through springs (*zwisima*) is the main source of water used for domestic consumption. According to Abiye et al. (2020), the hydrogeological system of the Limpopo Mobile Belt is represented by fractured crystalline basement aquifers as the main host for groundwater, overlain by weathered rock and surface soil. The deeper the aquifers in the Belt, the older the groundwater, which becomes saline. In general, groundwater recharge from rainfall provides major input into aquifers, especially in arid and semi-arid areas, where little or no surface water exists (e.g., Baalousha et al., 2018; Zango et al., 2023). In terms of geothermal capacity, such recharge is important. The Belt has deep, fractured aquifers with temperatures of 60°C–80°C, around 1,000–2,000 meters below surface, and temperatures of 100°C–150°C at depths of 3,000–5,000 meters (Tshibalo et al., 2015). The adjacent granites and gneiss have hot, dry rocks in the subsurface due to the normal geothermal gradient (Dhansay et al., 2017). Water recharged into these geological contexts is eventually discharged through fault zones, emerging on the surface as heated springs (*zwipise*).

## Literature review

The Venda, like many indigenous groups, experience a complex dynamic between their traditional knowledge and Western

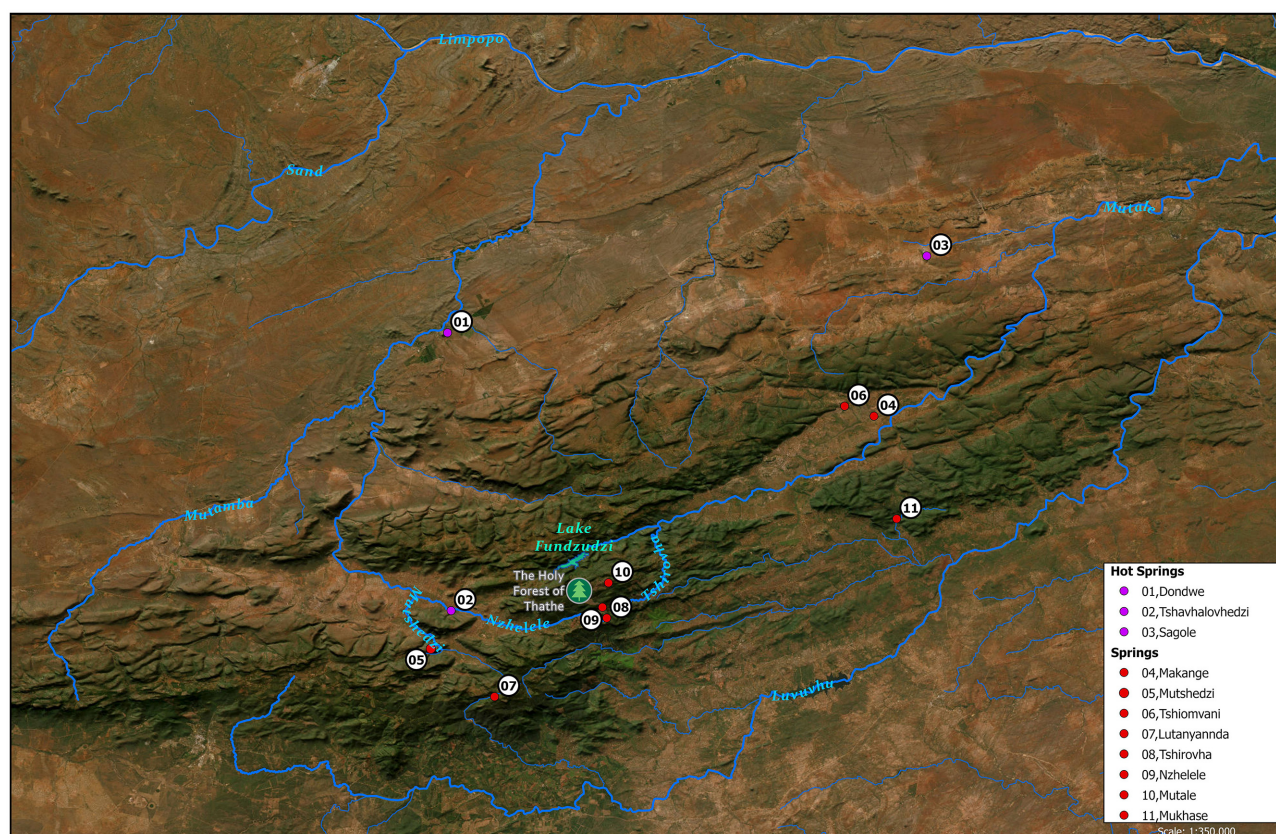


FIGURE 1

Map of the research areas showing the location of some of the springs (*zwisima*) and heated springs (*zwipise*) discussed in the paper (Prepared by Brenda Makanza).

scientific knowledge practices. While a wide range of Venda indigenous knowledges have sustained them for generations, they are increasingly facing challenges arising from Western approaches to biodiversity conservation as well as modern infrastructural development, the latter which have seen them semi-urbanized. Unlike many non-Western societies that have borne the brunt of colonial rule and globalization, the Venda have exercised considerable resilience in preserving indigenous knowledge practices, which have sustained their livelihoods, natural environments and worldviews for centuries (e.g., Pikirayi and Magoma, 2021; Malapane et al., 2024a,b; van der Waal, 1997).

Venda elders have since deep time, played a critical role in the transmission of indigenous knowledge, employing a rich body of oral narratives and folklore (e.g., Kugara and Mokgoatšana, 2022), historical knowledge (e.g., Janisch, 1931), ritual and ceremony (e.g., Ross, 2017) and ecological knowledge (e.g., Munyati and Sinthumule, 2014; Magwede et al., 2019). Researchers on Venda and other indigenous knowledge systems (e.g., Hikuroa et al., 2011) realize the value of integrating these with Western knowledge practices (e.g., Manyaga et al., 2024), with some formulating policy and legal frameworks that recognize the values inherent in such knowledges in decolonized contexts (e.g., Mahwasane et al., 2013 on Venda ethnobotany, Masevhe et al., 2015 and Malapane et al., 2024a on Venda medicinal plants, Malapane et al., 2024b on Venda traditional agricultural practices). Such integration is not

an exercise in verifying non-Western knowledges, but instead, an acknowledgment of non-Western beliefs, values worldviews.

Among the Venda, myths and legends play a critical role not only in history making, but also in the conservation of biodiversity and ecosystems (Mutshinyalo and Siebert, 2010). Such a rich, living and dynamic mythological tradition integrates their cosmology, ancestral reverence, and ecological knowledge, guiding environmental stewardship and the principles and values that guide approaches to cultural interaction (e.g., Hanisch, 1994; Stayt, 1968; van Warmelo, 1932). Their myths and legends highlight the respect for nature and encourage sustainable management of natural resources (Khorommbi, 2001; Khorombi, 2007; Mutshinyalo and Siebert, 2010; Sinthumule and Mashau, 2020). Their mythology explains natural phenomena and how they are connected to such landscapes, some of which are regarded as sacred. Venda legends encode indigenous knowledge systems that sustain both cultural identity and ecological balance, helping toward biodiversity conservation, and underling the inseparable connection between humans and the natural habitat. As such, these myths and legends, which are known since deep time, have helped share Venda cultural identity (Gottschling, 1905; Hanisch, 2008). The most dominant myths refer to the Venda supreme beings, the sacred drum, sacred sites and landscapes and associated nature spirits. To provide a context of the study, we highlight some of these.





FIGURE 2

View of the Soutpansberg mountains captured from the watershed of the Nzhelele River adjacent to Thathe sacred forest. This steep terrain is home to at least three springs – Mutale, Tshirovha and Nzhelele – whose discharge contribute significantly to the water following in the rivers by the same names (Image by Munyadziwa Magoma).

Venda myths and legends constellate around a complex network involving supreme deities who are accredited with the creation of life and humanity, and, humans and human-like creatures and animals residing in sacred forests, water bodies and the underworld (e.g., Barnwell et al., 2021; Schutte, 1978). The Venda have two related or interconnected deities. Raluvhimba, a distant but omnipotent supreme deity, is associated with creation of life, as well as thunder and lightning and is believed to govern both physical and spiritual realms, communicating divine will through meteorological phenomena. The Venda also acknowledge the existence of Mwali (or Nwali), a supreme God, regarded as the creator of humanity and the provider of rain. He is associated with Makonde Mountain, where he communicated with the ancestors. Traditions also say Mwali was conferred the sacred, magical “Drum of the Dead”, *Ngoma Lungundu*, during migration of the Singo clan, from across the Limpopo River and who conquered the autochthonous Venda (Ross, 2017). The drum was highly revered as it could bring fog, hail, rain thunder and lightning when struck by its bearers. The drum is believed to be lying in the deep of Lake Fundudzi, one of the most sacred and spiritual ecosystems among the Venda. This lake is also regarded as the home of a great white python, once terrestrial and married to two women. Venda rituals and ceremonies such as the Domba python dance and the Tshikona pipe dance, the former of which takes place by the lake, seek the intercession of ancestors to prevent droughts and famine, and bring health, fertility and rain (e.g., Mulaudzi, 2016). The pipe dance symbolizes and sustains cultural harmony (Blacking, 1965). While

the water python believed to reside in Lake Funduzi is perhaps the most important water spirit among the Venda, they also have high regard for *zwidutwane* - “half-visible beings”, described as one eyed, one legged, and one-armed water spirits associated with rivers, deep pools and waterfalls (Malapane et al., 2024a). Such belief highlights the interconnectedness between the physical and intangible ecosystems.

Venda myths and legends also account for the complex biodiversity and spiritual ecosystems involving mountains and associated forests (Pikirayi and Magoma, 2021). Thathe sacred forest is one such landscape associated with the Netshidzivhe clan, interacting with the spirits and tasked with the protection of ancestral royal burials, and other resources found therein. Legends talk of a white lion that patrolled the sacred forest and chased nearby villagers exploiting it for resources. This lion is also regarded as the spirit of a former chief, Nethathe, believed to have been half-human and half-lion. The forest is also believed to have been under the protection of the legendary thunder and lightning bird, Ndadzi, which, according to myths, flew on the wings of thunder. These two mythical animals are still regarded as guardians of the forest. As such, Venda myths and legends play a role in averting threats to biodiversity conservation like deforestation, while preserving both physical and spiritual ecosystems and sustaining both tangible heritage and cultural memory (Sinthumule and Mashau, 2020). In this case, human agency highlights the intricate connections with ancestral world. Other legends highlight the need to preserve natural harmony through rituals and ceremonies that connect



celestial patterns with terrestrial livelihoods (Snedegar, 1995). Rituals conducted by the Vhongwaniwapo clan, for example, emphasize the interconnectedness between creation of the earth and the cosmos, humans and nature (Barnwell et al., 2021). These are essential in fostering sustainable ecological practices, human connections with the nature, and ensuring cultural continuity and maintaining social cohesion.

What is missing in current literature, which this study seeks to address, is the deep spiritual and practical connection between Venda worldview and water, including groundwater. Groundwater among the Venda is not just a resource, but is also entity deeply imbued with spiritual and cultural importance. This understanding, shaped by indigenous knowledges acquired since deep time, influences Venda interactions with the natural world, including biodiversity conservation.

## Methodology

### Conceptual framework

To understand the relationship between hydrogeological knowledge and the cultural context of features such as springs, we used concepts from Pikirayi and Magoma (2021), which demonstrate the eternal relationship between humans and landscape, providing the foundation of all other relations in human society. Indigenous values expressing heritage conservation are located within such a continuous and evolving relationship, where humans both shape and are shaped by their environment, impacting cultural, social and representational aspects of life (e.g., Smith et al., 2016). Humans rely on the biodiversity for resources, and simultaneously modify them for various purposes (Coles, 2017). How humans interact with and organize the physical environments around them contributes not only toward its evolution, but also toward the development of social and cultural practices, economic and other activities that impact on them. Recognizing the continuous, evolving and interconnectedness between humans and the environment is essential for fostering sustainability. Human activities have a profound and multifaceted impact on biodiversity (e.g., Howard et al., 2018). While humans depend on biodiversity for essential resources and services, they also significantly degrade ecosystems and reduce species diversity (Dobson, 1996; Eldredge, 2000). The biggest threat to biodiversity at present is the reshaping of natural habitats for agricultural land, settlements and resource extraction. These anthropogenic practices on ecosystems are being accelerated by climate change (Lovejoy and Nobre, 2019). Understanding this complex dynamic is crucial for promoting sustainable practices. A major aim of our research was identifying the interconnectedness between culture and biodiversity and understanding why conserving hydrological features such as springs remains central in Venda worldview.

### Research design

The research area falls within the Vhembe Biosphere Reserve, recognized as a center of endemism and a center of biodiversity and forming part of one of the areas prioritized for conservation in South Africa (van Deventer et al., 2019). However, due to

Western approaches to conservation that only seek to protect the biophysical environment and removed from indigenous worldviews, acknowledging indigenous approaches to biodiversity protection is important. The biocultural traditions and deep-time indigenous practices associated with local communities have been overlooked in the conservation of such environments. Such knowledge offers valuable perspectives and practices for water management and biodiversity conservation among the Venda (e.g., Malapane et al., 2024a). We adopted a research design that intersects geohydrological knowledge with indigenous knowledge about the springs in the research area. We accept Hikuroa et al. (2011)'s argument that indigenous knowledge cannot be verified by scientific criteria nor can science be adequately assessed according to the tenets of indigenous knowledge. Each is built on distinctive philosophies, methodologies and criteria. Indigenous knowledge has been considered incompatible with Western empirical based science, mainly because of its largely intangible but holistic and spiritual components. While there is considerable debate about their relative merits, contests about the validities of the two systems distract from integrating knowledge both approaches generate.

### Research approaches, data collection techniques and analyses

To understand how *zwisima* and *zwipise* are conserved through embodied traditional ecological knowledge and how they are perceived by the Venda since deep time, we initially consulted historical sources and ethnographic records (e.g., Stayt, 1968; Locher, 1989, 1991; van Warmelo, 1932, 1974). A review of archival, historical and ethnographic records, as well as published geological and geohydrological reports, comprise the initial, desktop approaches to data collection. Some of the ethnographic reported on myths and legends on the conservation of sacred landscapes such as Thathe sacred forest and mountain (Pikirayi and Magoma, 2021; Sinthumule and Mashau, 2020). We specifically consulted legends and myths on the conservation of water features and bodies, such as springs, lakes and rivers. Some of this information came from interviews conducted with traditional leaders and elders, some of them serving as custodians of sacred sites, forests and mountains. The interviews, which were scheduled intermittently between April 2024 and March 2025, took the form of unstructured conversational sessions with three chiefs, two principal aunts, three traditional practitioners and eight elderly members of the Vhongwaniwapo clan ( $n = 16$ ). Vhongwaniwapo is a Venda clan whose members have close connections to and stewardship of *zwifho* (Barnwell et al., 2021). The age of participants ranged between 50 and 80 years. Most interviews were conducted at or within close proximity to *zwifho* to enable participants to rationalize the significance of such sacred places. A chief whose clan is connected to a sacred forest was interviewed three times. All conversations were conducted in Tshivenda language. This was followed by hydrogeological surveys, visiting specific springs to observe their physical characteristics such as the immediate ecology, water discharge, and flow. Focus was on springs located in the Nzhelele valley, a densely populated and semi-urbanized area of Venda. This resulted in preliminary documentation of the springs (see Table 1). We also surveyed adjacent hills and

**TABLE 1** Details regarding the location, formation, discharge rates and traditional ownership of some of the springs located in the research area (Data summarized from geohydrological surveys, geology and historical literature).

| Name of spring or hot spring | Location (in decimal degrees)                                    | Formation and type              | Water volume discharged and rate                   | Custodianship                                                                                                                                         |
|------------------------------|------------------------------------------------------------------|---------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mutale                       | Thathe sacred forest (−22.876944; 30.343272)                     | Aquifer, contact                | Perennial; Quantity not measured                   | Netshidzivhe Clan. [Access to spring not granted]                                                                                                     |
| Dondwe                       | Town of Tshipise (−22.611794; 30.172419)                         | Geothermally heated groundwater | 10 liters/sec                                      | Now a holiday resort. Originally under the Dondwe community during the 1950s and 1960s. Forcibly removed from the area to give way to European farms. |
| Lutanandwa                   | Vuvha mountains (−22.997703; 30.222428)                          | Aquifer, contact                | Perennial                                          | Vuvha la Mulambilu                                                                                                                                    |
| Makange                      | (−22.700117; 30.625307)                                          | Aquifer, contact                | Perennial, if silting is controlled                |                                                                                                                                                       |
| Mukhase                      | (−22.808968; 30.649414)                                          | Aquifer, contact                | Perennial                                          |                                                                                                                                                       |
| Mutshedzi                    | Mutshedzi valley (−22.942467; 30.159040)                         | Aquifer, contact                | 0.1–0.5 liters/sec                                 | Tshidzini village                                                                                                                                     |
| Nwali                        | Makonde (−22.799731; 30.544681)                                  | Aquifer, contact                | Perennial                                          | Makonde                                                                                                                                               |
| Nzhelele                     | Nzhelele valley (−22.902936; 30.336942)                          | Aquifer, contact                | Flow quantity not measured; Spring is inaccessible | Vondo                                                                                                                                                 |
| Tshirovha                    | Nzhelele valley (−22.914317; 30.341656)                          | Aquifer, contact                | Flow quantity not measured; Spring is inaccessible | Vondo                                                                                                                                                 |
| Sagole                       | Masisi area (−22.689547; 30.594083)                              | Geothermally heated groundwater | 10 liters/sec                                      | Now a spa. Originally owned by the Dondwe community, under the Nedondwe royal house                                                                   |
| Tshavhalovhedzi              | Nzhelele valley; foot of Tswime Mountain (−22.906483; 30.176239) | Geothermally heated groundwater |                                                    | Dopeni community                                                                                                                                      |
| Tshiomvani                   | Mutale River basin, Thengwe (−22.689547; 30.594083)              | Aquifer, contact                | Perennial                                          | Thengwe community                                                                                                                                     |

mountains, specifically the sources of the Nzhelele, Mutale, Mutshedzi, and Luvuvhu rivers (see [Figure 1](#)). To understand threats associated with the conservation of springs, we assessed threats to groundwater and biodiversity (e.g., [Israel, 2012](#); [Pikirayi and Magoma, 2021](#); [Sinthumule and Mashau, 2020](#); [van Deventer et al., 2019](#)). Data analyses was preliminary, involving basic triangulation of desktop, field surveys and interview data to attempt a qualitative assessment of traditional hydrological knowledge, conservation and protection of groundwater.

## Strategies to counter biases

Firstly, while this study aims to provide valuable insights into conservation of groundwater to enrich our knowledge of the centrality of sacred places, most of the sites we studied were restricted, or had to be avoided due to social and traditional beliefs, mainly because they are considered very sacred. As a result, some informants were not keen to converse certain information they regard as culturally sensitive and of an emic nature. Once we realized that participants were holding back some information, their acts were neither vilified nor questioned. Rather, we allowed them to converse about subjects they were most comfortable to share with us. On some of these sites, it was required by the custodians and elders that images not be captured, since doing so would compromise their sacredness. Secondly, the demarcation of

the study area was determined by references to the history of the Venda. Since Venda history remains contested (e.g., [Gottschling, 1905](#); [Hanisch, 1994, 2008](#); [Locher, 1989, 1991](#); [van Warmelo, 1932](#)), it is written from the perspective of dominant groups, whose narratives marginalize subordinate ones. Our use of legends and mythology sought to challenge such narratives to understand the perspective of Venda autochthonous groups who possess intricate connections with the environment. While myths and legends are not always historically accurate, they serve as valuable sources of information about the past, presenting insights about group identities, beliefs and social organization. We avoided treating myths at face value, regarding them instead as cultural artifacts reflecting particular worldviews. They too have biases, and therefore by using multiple sources and perspectives, we attempted a more nuanced understanding of Venda connection with groundwater.

## Results

[Table 1](#) presents details of the springs discussed in this paper. We first present the results of the ethnography and how these intersect with the indigenous worldview of the Venda. This is followed by findings from the hydrogeological surveys and how these intersect with Venda worldview. Results on Venda myths



and legends demonstrate their centrality in the protection and conservation of groundwater resources. We conclude the section by presenting springs which have been appropriated for modern development, losing their indigenous worldview and the disruption of their traditional functioning.

According to Venda ethnography, *zwisima* have names, all of which symbolize how they originated and how they relate to particular landscapes and local contexts. Some springs are named after a river, e.g., Nzhelele, Mutshedzi. Some are named after the person who founded them, e.g., Tshisima tsha Makange. Some springs are named after the village within which they are located, as well as those that take the name of a particular component in the environment like Tshisima tsha Tshiomvani (Interview with a *mungome* (traditional healer) 15 April 2025). Springs are also associated with Venda deities. Springs such as Tshisima tsha Nwali and Tshisima tsha Tshikuvhuni, are said to have been visited by the deity Mwali or Nwali to drink water from there. Springs are also culturally associated with snakes and mythologies have built around some of these snakes, particularly pythons. Water is sacred to them such that they associate every water source with a python god. A snake is thus symbolic in Venda cosmology. The Domba dance, a Venda pre-marital initiation rite that prepares young girls for marriage and parenthood, is molded around the python. The rite feature moves resembling motions of the python. This snake is associated with rain among the Venda, and if killed it must be thrown in the river (Schapera, 1937). Venda springs are protected by snakes, and one is not allowed to harm them if found in the

vicinity of such water sources, since it renders them dry. This is one of the numerous taboos and cultural prohibitions narrated to us by the *mungome*, designed to conserve biodiversity by preventing human interference.

Tshiomvani spring (Figure 3) exemplifies how the local ecology is protected in traditional contexts. An elder (name withheld, interviewed 20 May 2025), who is also the local *mungome* of the area, highlighted some of the taboos associated with it, which are supposed to be observed by everyone, otherwise there are misfortunes. The local chief had to demarcate the area where the spring is located to protect it. The spring is surrounded by gigantic banana trees which may neither be harvested nor consumed by human beings but only birds and wild animals such as monkeys and baboons. Another elder living in the area (interviewed on 16 May 2025) told us that her aunt once came across an unusual phenomenon in the spring, and since then she never wants to come near it. This spring is said to be protected by a snake with a face resembling a woman and adorning beads on its neck. There are accounts of locals that stole the banana fruit from plants growing nearby and the spring desiccated. The custodian of the spring had to resurrect the spring, by enforcing taboos that avoid negative repercussions from spirits.

In some parts of Venda, such as Thengwe, we recorded springs revived by local farmers through digging areas which used to issue water through vents, e.g., Tshisima tsha Makange (Figure 4). According to an elder (interviewed, 15 April 2025), the earliest reported cases of such digging go back to the 1970s, while the



FIGURE 3

Eye of Tshisima tsha Tshiomvani. Note the ferns surrounding the eye of the spring, which may have been allowed to grow to there to assist in the process of phytoremediation, to leverage the natural abilities of plants to absorb, degrade and immobilize contaminants (Image by Munyadziwa Magoma).





FIGURE 4

Tshisima tsha Makange. Please note the bank to the right showing the dredging done by farmers to conserve the spring. (Image by Munyadziwa Magoma).

most recent is 2010. These excavations have created wells that tap into the natural discharge points of groundwater. By digging such wells, farmers are accessing naturally flowing water from springs and conveying it to their fields. This is also an exercise in reviving springs threatened by siltation arising from agricultural activity. In this case, when agricultural practices are not properly managed, springs and other water bodies can experience significant siltation, with the high sediment load into water sources reducing their discharge and potentially contaminating the water.

Geohydrological surveys reveal that springs are not only associated with the sources of rivers, but also conform to particular drainage patterns, contributing to the overall flow of water within such patterns. The flow of rivers such as the Nzhelele, for example, is regarded as a contradiction to the normal flow of most rivers in Venda that take an east or north-easterly orientation. Among the Venda, the saying ‘*phambana nadzo mulambo wa Nzhelele, minwe i elela itshiya vhubva duvha, wone u elela utshiya vhubvhele*’ means the Nzhelele river flows in a direction opposite other rivers. The Nzhelele and its tributaries initially flow westwards, before making an acute turn the north, then north-eastwards toward the Limpopo River. Nzhelele, Mutshedzi, Mutale, Tshirovha, and Luvuvhu rivers or their tributaries have watersheds environments that have springs. This is of cultural importance among the Venda where watersheds, wetlands and *zwisima* are associated with beginnings of life, as well as healing (Interview with traditional healer, 15 April 2025). Several examples to illustrate the importance of this geohydrological location. Tshisima tsha Mutale (Figure 5) is located on the watershed of the Mutale, Nzhelele and Tshirovha

rivers, which is also the location of the sacred forest of Thathe and the sacred Lake Fundudzi. Access to Tshisima tsha Nzhelele, located in the upper catchment of the Nzhelele River, approximately in between the Khalavha and Vondo villages, within an environment that is not penetrable, is not permitted. As narrated by one Vho-Makhadzi (a senior paternal aunt, interviewed on 6 June 2025), this spring is not known to most Venda, and it is this secrecy that makes it highly sacred. Its sacredness is further enhanced by it being the probable source of the Nzhelele river. According to a traditionalelder (interviewed 16 May 2025), the sources of all big rivers – are very sacred and protected by supernatural powers. and as a result, many people avoid entering or interacting with such environments. Another example on the geohydrological location of springs in watershed contexts comes from the Vuvha mountains, which overlook the Nzhelele Valley to the north. They are host to several wooded environments which host springs, and serve as sources of Lutanandwa, Mudzinga, Tshitamboni and Vilimadi rivers (see Figure 1). A well-known spring from there, Lutanandwa, plays a significant role among villagers in the Nzhelele valley as well as within the wider community of Venda. Traditions say that in the past, persons who had head lice came to bathe in the water emanating from this spring, rendering head lice dead instantly. The name thus comes from the fact that it was used for healing purposes. According to a traditional ruler (interviewed 26 April 2025), the term “lutanyannnda” means to crush head lice. The final example, Tshisima tsha Mukhase, located in Tshidzini village in the upper reaches of the Mukhase River, which is a tributary of the Luvuvhu River (Figure 6). It is believed to offer the





FIGURE 5

Tshisima tsha Mutale in the thicket of Thatshe sacred forest. The eye of the spring could not be accessed due to not only traditional prohibitions, but also as a result of the thicket. The sacred forest is recognized for its significant biodiversity with the forest and thicket communities playing a crucial role in both the natural and spiritual ecosystem. (Image by Munyadziwa Magoma).

cleanest water among all the springs found in Venda. According to an elder (interviewed 15 June 2025), this spring was considered sacred in the past to the extent that it was forbidden to visit its eye. According to the South African Department of Forestry, Fisheries and the Environment, the Mukhasa River supports healthy populations of rare fish species such as the southern barred minnow and the line-spotted barb, both warm and cool water fish species as cool waters from mountain streams mix with warmer waters from rivers in lower altitudes, found in the Luvuvhu and other rivers. The South African government wanted to convert this area into a nature reserve, but this was opposed by the local community.

Venda myths and legends demonstrate how associated landscapes and waterscapes possess sacred status that regulated exploitation by indigenous communities and conserved their biodiversity. This was informed by community elders, with regards to the forest and mountain of Thatshe, and, Lake Fundudzi, both of which are regarded as sacred. According to the traditional leadership of Thatshe sacred forest (interviewed 05 April 2025), the spring of waters that flows to the Mutale is perhaps the most sacred spring in Venda. One of the elders indicated that this spring is located in a wetland within the sacred forest of Thatshe and its waters are guarded by an ancestral spirit. The abovementioned prohibitions extend to the forest's water sources as no person is allowed to visit the eye or the vent of this spring unless granted permission by the Nethathe clan. Water from this spring is conveyed to Lake Fundudzi (Figure 7) by one of the tributaries

of the lake, which is the Mutale River. One elder informed us that the connection between the Thatshe Sacred Forest and Lake Fundudzi is not only in terms of the sacredness of the two places, but also by the water that emanates from the forest. Lake Fundudzi is held as sacred by the indigenous Vhatavhatsindi clan, who, according to a local chief, are also regarded as “people of the pool”. Legends say the lake was formed as a result of a curse by a passing leper who had been refused food and shelter. The cursed villagers disappeared under the waters of the newly formed lake. There are claims by the local people of sounds of drums, bellowing of cattle and wailing of people ostensibly drowned following the formation of the lake. Legends also say the lake is protected by a python god, residing in the surrounding mountain and Thatshe forest, where it also spends some of its time. Because of the existence of these mythical creatures, and the associated prohibitions, Thatshe forest and mountain landscape is regarded as highly sacred by the indigenous Venda people.

Our research results also show that some springs are experiencing significant human-induced threats due to modern infrastructure development, commercialization, and increased human settlement, especially in the Nzhelele valley. Tshisima tsha Mutshedzi (Figure 8), located in Mauluma village, feeds the Mutshedzi River, a major tributary of the Nzhelele. It is easily accessible since it is near a road to the dam and a recreational center a few kilometers upstream. The spring is frequented by congregants of the Zionist Christian Church who collect water for spiritual purposes. It appears some of the rituals are performed by





FIGURE 6

Tshisima tsha Mukhase, surrounded by woodlands and ferns, lies in an area considered unique in terms of biodiversity. The South African government intended to convert the area into a nature reserve, but this was resisted by local communities (Image by Munyadziwa Magoma).

the eye of the spring. d. The traditional sacredness, legends and myths associated with this spring have disappeared completely and overtaken by Christianity, which is now associated with the spring.

Some heated springs have been reported and recorded in the research area. These springs are known to provide healing and wellbeing to local communities. There has been an attempt to commercialize the springs, by developing them for tourism and public enjoyment. Tshipise tsha Vhalovhedzi, Tshipise tsha Sagole and Tshipise tsha Dondwe, all located within a 25 kilometer radius of each other, have experienced significant commercialization. Tshipise tsha Vhalovhedzi (Mphephu thermal spring) on the northern foot of Tswime Mountain, on the edge of the Nzhelele valley (Figure 9) at the nearby Mphephu resort, is used for recreation. The area adjacent has been extensively developed, hosting a shopping mall as well as tourist accommodation facilities. In the past, it was regarded as the spring of Mwali, the Venda God. If a person was unwell, elders recommended such person to bathe in the spring. The negative effects of commercialization are evident in the area demarcated as a spring as well as the adjacent river (Figure 10). We observed substantive dumping of plastics and canned foods alongside the road from the mall, to the spa resort near the spring. Tshipise tsha Dondwe, located in the town of Tshipise 40 kilometers south of the Limpopo River, and some 2-3 from the Nzhelele River, has also been developed into a resort and spa, offering lodges and hotel accommodation, conference facilities, game viewing and golf. The surrounding area was once ruled by Chief Nedondwe, until it was declared a “white area”, after which it simply became referred to as Tshipise. The name is derived from

the Tshivenda term “tshisima tsha ufhisu”, meaning a heated spring. Local people were forcibly relocated during the 1950s and 1960s and the area was turned into a resort exclusive for Europeans. Although Europeans claim to have founded the spring in the 1920s, Venda oral histories show that the Dondwe clan had been staying in the area for hundreds of years prior to European arrival. Tshipise tsha Sagole, some 53 kilometers north-east of Thohoyandou, in the Tshikundamalela Tribal Authority area of the Vhembe district (Tshibalo, 2011), has a fountain regarded as a sacred area and a center of worship for the Netshipale family. Reptiles found near the spring may not be killed. Some wildlife in the area such as pythons may not be killed since it is believed it will result in the spring drying up. Legend says the heated water flows from the mouth of a python, living underground.

## Discussion

The ensuing discussion attempts to link the empirical evidence of the study, the review of literature and the research objectives by showing how these were achieved. We engage with relevant previous studies to contextualize the results.

Background detail provided regarding the geomorphology and hydrology of the research area highlights the centrality of shear zones in creating pathways and contexts for the movement and storage of groundwater and surface water drainage patterns (Olomo et al., 2025). The fractured crystalline basement aquifers function as hosts for groundwater (Abiye et al., 2020), in a region considered water scarce. This water emerges on





FIGURE 7

Lake Fundudzi, a waterbody regarded as sacred by the indigenous Vhatavhatsindi clan as well as by many Venda people. The lake has two major inlets, one of them shown in this image. This lake is spring-fed, since its primary water source is groundwater discharged from Tshisima tsha Mutale (Image by Innocent Pikirayi).

surface through *zwisima* and *zwipise*. Venda interaction with this geomorphic environment and hydrological system since deep time has generated indigenous understandings of the environment and worldview (see e.g., [Munyati and Sinthumule, 2014](#); [Magwede et al., 2019](#)). Springs are apparently the most important hydrological features in Venda worldview that demonstrate the interconnectedness between culture and biodiversity, and why protecting the latter was key, since it also meant protecting their groundwater. Located in mountain wetlands and forests, as well as in transitional zones between hills and valleys, springs feed into all if not most major rivers found in the research area. These rivers are sustained by groundwater discharge, and the protection of these water sources remains central to the Venda since time immemorial. Venda worldview around these landscapes is regulated by taboos. Entry into sacred forests and water bodies such as lakes and waterfalls carry certain prohibitions designed toward the protection and conservation of biodiversity. As such they also help regulate Venda social order and maintain cultural identity.

The Venda possess a high respect of the natural world around them. Such respect is located in their indigenous knowledge, through myths and legends (e.g., [Khorombi, 2007](#)), which highlight the sacredness of nature and the central importance of water (e.g., [Pikirayi and Magoma, 2021](#); [Sinthumule and Mashau, 2020](#)).

While such sacredness is well-documented in other contexts (e.g., [Nabokov, 2006](#) with regards to native Americans), such research is underdeveloped in Africa. Among the Venda, the sacred nature of water is evident in its being regarded not merely as a resource, but also as an entity fundamental to life, human survival, ecosystem integrity and cultural significance. The emergence of water from the Thathe sacred forest for example, flowing into Lake Fundudzi and also feeding rivers such as Nzhelele and Tshirovha, highlight this worldview. Legends about Lake Fundudzi underline the critical role played by water and landscape in indigenous Venda origins and local histories. Together with the nearby Thathe forest and mountains, a worldview developed where water acquired spiritual status. The prohibitions regulating use of the sacred forest and approaches to the lake attest to deep time approaches by indigenous people to protect not just the water, but also the sacred spaces it emanated from or flowed to. Connected to this is the indigenous worldview around watersheds. Watersheds are regarded in many African worldviews as vital for life and often associated with spiritual significance. Water emanating from these environments is regarded as life-giving, purifying and healing. As such many connect these health and wellbeing attributes with the supernatural (e.g., [Ogwu and Kosoe, 2024](#)). Our research in Venda confirms this. We are also of the view that while this connection between water, landscape and culture is not common





FIGURE 8

Eye of Tshisima tsha Mutshedzi. Christianity seems to have adapted the pre-existing reverence for the spring, transforming it into a “holy well” (Image by Munyadziwa Mogoma).



FIGURE 9

The wetland associated with Tshipise tsha Vhalovhedzi in the Nzhelele valley (Image by Innocent Pikirayi).

knowledge among the ordinary Venda, elders entrusted with the protection of these forests and mountains have been tasked with some secrecy or confidentiality rooted in ancestral beliefs, spiritual significance and traditional ecological knowledge. Safeguarding such knowledges since time immemorial played a crucial role in

protecting biodiversity and natural resources (e.g., [Sinthumule, 2023](#)).

Beyond the sacred forests and mountains, we also documented springs in the more accessible valleys, where you find human settlements and farmland. While most springs found here have





FIGURE 10  
Dumping of waste on the precincts of the wetland formed by Tshipise tsha Vhalovhedzi (Image by Innocent Pikirayi).

retained their sacredness, some springs have, however, lost their sacred status, the best example being Tshisima tsha Mutshedzi. This is indicative of such hydrological features as part of a wider natural and spiritual ecosystem, which is fast diminishing due to human impact (e.g., [Sinthumule, 2024](#)). In the case of Tshisima tsha Mutshedzi, Christianity seems to have adapted pre-existing reverence for the spring, transforming it into a “holy well” associated with healing and spiritual renewal (e.g., [Harte, 2008](#)). Heated springs (*zwipise*) in the research area have lost their sacredness, following their commercialization to tap into the therapeutic properties of geothermal waters (see [Oliver and Jonker, 2013](#); [Dhansay et al., 2017](#); [Durowoju et al., 2018](#); [Tshibalo et al., 2015](#), for electricity generation potential). Current developments make little consideration of the worldview of indigenous communities who have had a long association with these places (e.g., [Vogel, 1999](#) for heated springs of Arkansas and the Grand Canyon, [Hikuroa et al., 2010](#); [Taute et al., 2023](#); [Parson et al., 2025](#), for the Maori).

While the research area is witnessing an increase in human settlement, other areas of the Limpopo basin are undergoing industrialization. The consequences are groundwater pollution and depletion (e.g., [Alley et al., 1999](#); [Jung et al., 2024](#)), leading to decreased water quality and reduced surface water flows. *Zwipiswe* and *zwisima* in the Nzhelele and Mutshedzi valleys are most vulnerable in this regard. The springs are being contaminated through poor management of waste disposal, making their water increasingly unsuitable for human use and consumption. Cases of springs drying up have also been reported in the interviews, ostensibly as a result of people tampering with the local contexts in which the springs are located, or as a result of the failure to observe taboos and rituals associated with them. A key observation on a number of springs we visited, particularly in thickly wooded contexts, is the presence of ferns growing around spring vents

and adjacent watershed contexts (e.g., [Figures 3, 6, 8](#)). Ferns and watersheds are linked because ferns thrive in such moist environments or wet habitats. Studies elsewhere show that ferns influence the behavior of watersheds by helping to stabilize slopes, reducing erosion and regulating water flow. What is crucial in this case is the role they play in water purification, through a process called phytoremediation, a clean-up strategy where some plants are used to render environmentally toxic pollutants harmless in contaminated soil and water ([Kafle et al., 2022](#)). Given an environment where leaf litter has a bearing on water quality, it is possible that the Venda may have known of this knowledge of water purification of springs since deep time. However, we did not get this from the interviews we conducted.

Given the threat posed by modernization on indigenous knowledges, we wind up this discussion by invoking legislation and policy that may help protect natural and spiritual ecosystems. The South African National Environmental Management Biodiversity Act (2004) tracks ecosystem threat status and protection levels employing indicators such as the percentage of an ecosystem type within protected areas. The Department of Forestry, Fisheries and the Environment has identified some 120 of the 456 terrestrial ecosystem types categorized as threatened, which make up approximately 10% of the natural habitat of the country. Of these threatened terrestrial ecosystems, 55 are critically endangered, 51 endangered and 14 are vulnerable. The remaining natural extent of threatened terrestrial ecosystems has increased from 8% of the country to 10%, given ongoing habitat loss and threats from invasive species over the past two decades. Our research area falls within the Vhembe Biosphere Reserve, where the Soutpansberg range is recognized as a center of endemism and a center of biodiversity and has been prioritized for conservation. However, areas such as the Nzhelele Valley and much of Venda, have been completely ignored. The Department of Department of



Forestry, Fisheries and the Environment is also the custodian of South Africa's water resources and assumes public trusteeship of such resources, which includes watercourses, surface water, estuaries, aquifers, etc. The National Water Act (No. 36 of 1998) recognizes that the entire ecosystem and not just the water itself, and any given water resource constitutes a resource that must be conserved. No development or other activity may take place within a watercourse unless it is authorized. The water legislation, which categorizes springs, wetlands and rivers as watercourses, allows for the protection of water resources, including the maintenance of the quality of these to encourage sustainable use. However, both pieces of legislation overlook indigenous worldviews when it comes to water and biodiversity conservation. They completely ignore indigenous worldviews around water. The same government has developed policy principles and guidelines for control of development affecting natural forests, published in September 2009, which outline the framework for managing and protecting natural forests in South Africa. The policy principles and guidelines stress the need to balance development with the conservation of forest ecosystems and biodiversity, placing a strong focus on sustainable management and responsible development practices. Although reference is made to community involvement, indigenous worldviews are overlooked – despite the fact that numerous forests have been mapped in much of South Africa, including the research area, and classified as indigenous in type (see [von Maltitz et al., 2003](#)). By incorporating indigenous knowledge and practices into biodiversity conservation policies and strategies and by ensuring that these communities exercise roles in decision-making processes, South Africa can foster more effective and sustainable biodiversity conservation outcomes.

## Conclusion

We have demonstrated that the Venda people of northern South Africa possess deep-time ecological understanding of their immediate environment, which plays a critical role in the conservation of their natural and cultural biodiversity. With the help of myths and legends, the Venda have successfully managed forests and waterscapes, which they regard as sources of life and sustenance. Such biodiversity, characterized by wetlands, mountains, valleys and forests, functioned and continue to function as natural groundwater recharge or harvesting zones. Springs found in the research area attest to the ability of the environment to maintain natural recharge processes where mountains have high infiltration rates supporting the flow of groundwater. Therefore, by accepting and integrating traditional knowledge systems, we can harness knowledge valued by indigenous communities since deep time to harvest and protect groundwater. Their approaches in managing groundwater by invoking their worldview has helped conserve some of the most sensitive ecosystems in the world (e.g., [Cantonati et al., 2006](#)). Although springs are abundant globally, many are disappearing due to climate change and anthropogenic factors. To stem this trend, resource protection and conservation must be located within particular worldviews. The core ethical approaches that guided indigenous communities toward careful and responsible biodiversity management rested on treating water as a sacred living entity and the need to give back

and help regenerate the environment through rituals, ceremonies and prohibitions to ensure groundwater is continuously protected. Thus, groundwater was seen, and should continue to be perceived beyond utilitarian approaches. This also requires a reciprocal mutually beneficial connection between people and the natural world guided by community-led conservation efforts to restore biodiversity and improve human wellbeing and livelihoods. Our research findings must be treated as preliminary. Future research requires aerial and geohydrological mapping of springs to understand hydrogeological processes and the effects of groundwater withdrawals. This requires a methodology informed not only by advances in geohydrological mapping, but also by indigenous communities who already possess knowledge regarding spring location, discharge, and traditional conservation approaches. The world is also witnessing accelerated environmental changes. There is need to understand the impacts of climate change on spring ecosystems and water availability, developing sustainable management strategies, and enhancing the recognition of springs not only as valuable water resources, but also as spiritual resources deeply valued by indigenous peoples.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

This study was conducted to understand the potential for indigenous-led conservation of groundwater in northern South Africa and adjacent regions. Permission for the research was granted by the Ethics Committee of the Faculty of Humanities, University of Pretoria, Reference No.: 1131 1828 [HUM046/1120]), approved on 31 May 2021. The traditional leaders and elders interviewed during the research offered their informed consent. The authors also consented to respecting the sacredness of the places they visited by observing rituals and associated prohibitions.

## Author contributions

MM: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Writing – original draft, Writing – review & editing, Project administration, Validation. IP: Data curation, Formal analysis, Investigation, Methodology, Resources, Writing – original draft, Writing – review & editing, Conceptualization, Funding acquisition, Software, Supervision, Visualization.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships

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