International Association of Hydrogeologists
the World-wide Groundwater Organisation

Karst Commission

IAH 2026
World Groundwater Congress

Criteria for selecting the most important karst springs – Output of the MIKAS Project (Most Important Karst Aquifers' Springs)



Zoran Stevanović, Prof. Ret. Centre for Karst Hydrogeology, University of Belgrade, Serbia
E-mail: zstev_2000@yahoo.co.uk
John Gunn, School of Geography, Earth and Environmental Science, University of Birmingham, UK
Neven Kresic, Independent Consultant and Director, Karst Waters Institute, Warrenton, VA, USA
Augusto Auler, Instituto do Carste / Carste Ciência e Meio Ambiente, Belo Horizonte, MG, Brazil
Junbing Pu, School of Geography and Tourism, Chongqing Normal University, P.R.China
Peter Malik, Geological Survey of Slovakia, Bratislava, Slovakia
Avihu Burg, Geological Survey of Israel, Jerusalem, Israel
Benjamin Tobin, National Cave and Karst Research Institute, Carlsbad, NM, USA

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PAPER

Global distribution of carbonate rocks and karst water resources

Nico Goldscheider[1] · Zhao Chen[1] · Augusto S. Auler[2] · Michel Bakalowicz[3] · Stefan Broda[4] · David Drew[5] · Jens Hartmann[6] · Guanghui Jiang[7] · Nils Moosdorf[8,9] · Zoran Stevanovic[10] · George Veni[11]

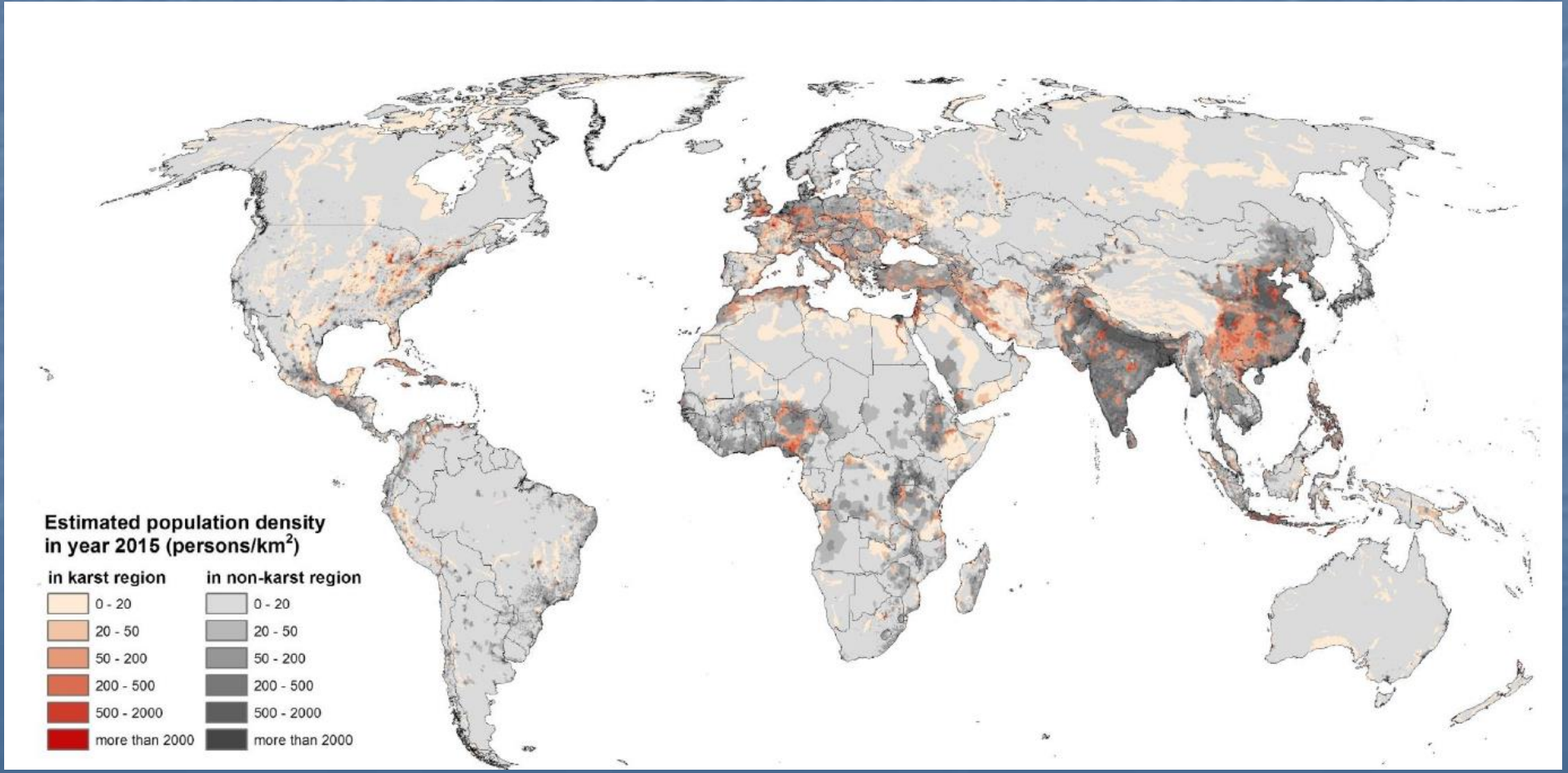
Environmental Earth Sciences _####################_
https://doi.org/10.1007/s12665-019-8670-9

THEMATIC ISSUE

Karst waters in potable water supply: a global scale overview

Zoran Stevanović[1]

Continent Name	1000 km²	Carbonate rock areas CC 1000 km²	CC %	DC and mixed 1000 km²	DC and mixed %	total 1000 km²	total %
Europe	9,944.0	1,509.6	15.2	657.0	6.6	2,166.6	21.8
Africa	30,068.4	2,495.9	8.3	1,558.5	5.2	4,054.4	13.5
Asia	44,928.4	4,624.9	10.3	3,723.2	8.3	8,348.2	18.6
Australia	8,149.0	373.7	4.6	128.9	1.6	502.6	6.2
North America	22,579.3	3,131.9	13.9	1,302.8	5.8	4,434.8	19.6
South America	17,797.5	443.1	2.5	324.4	1.8	767.5	4.3
World	133,466.7	12,579.1	9.4	7,694.8	5.8	20,274.0	15.2





IAH Karst Commission project MIKAS

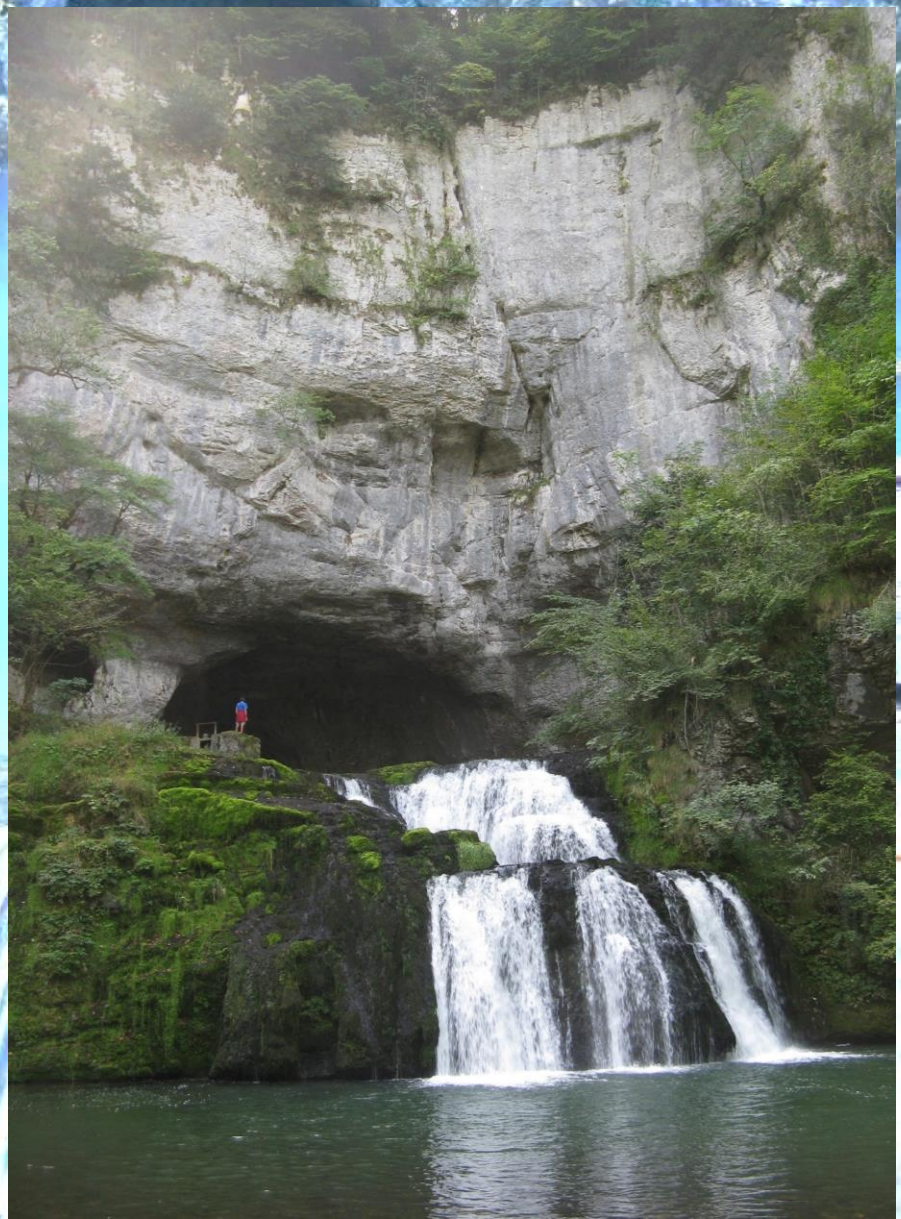
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The aim of the MIKAS (Most Important Karst Aquifer's Springs) project is to create the first complete list of the most important karst springs at the global, but also at the national level (NIKAS). The project was launched at the annual meeting of the Karst Commission (KC) of the International Association of Hydrogeologists (IAH) in June 2022, during the last EUROKARST conference held in Malaga. The MIKAS project's is run by Advisory Board and national experts.



1. establish the list of MIKAS and NIKAS springs based on agreed upon criteria;
2. create the Code of Practice for these springs' utilisation and protection; and
3. promote these springs by their *in situ* labelling and internet publicising.



Organizational setup



Project Advisory Board

AB members – Regional Coordinators:

- Western Europe, Australia and Oceania, **John Gunn**
- Southeastern and Eastern Europe, Africa **Zoran Stevanović**
- Asia, **Junbing Pu**
- North America, **Neven Kresic**
- South America, **Augusto Auler**
- Co-Chairs of the KC IAH **Peter Malik, Avi Burg, Ben Tobin**

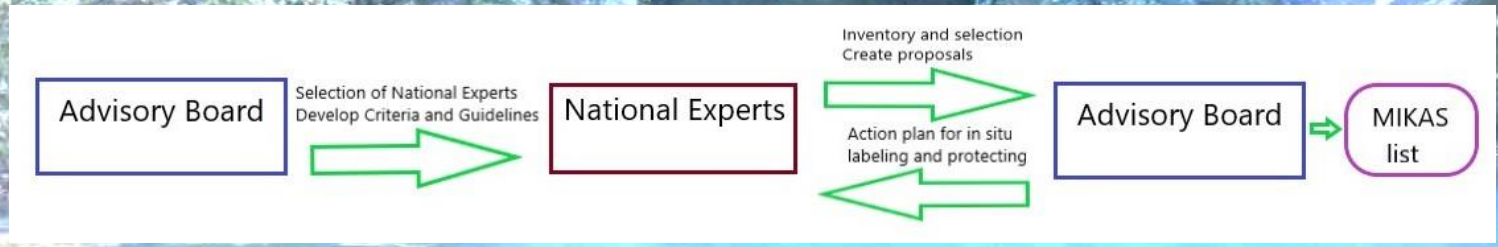
- Project Coordinator (Team Leader) **Zoran Stevanović**
- UNESCO IHP monitoring **(Aurelien Dumont)**

- **National experts, responsible**
- **Assistants**

MIKAS project – Procedure

MIKAS

(Most Important Karst Aquifer Springs)





To facilitate the work of the NEs, it was decided at the AB meeting to apply a simple procedure, i.e. "Expert's Opinion", instead of assigning numerical value, which still remains an optional solution.

Along with a Survey for each of the springs, the NE should propose the list for which the spring would be a candidate (MIKAS and/or NIKAS) and provide justification for such a potential decision.

Justification should be more detailed, as well as illustrated, for springs that are proposed for the MIKAS list.



M I K A S

(Most Important Karst Aquifer Springs)

Guidelines for the Selection of Springs

Criteria for the selection of most important karst springs:

- Historic, **H**
- Aesthetic, **A**
- Economic, **E**
- Scientific. **S**
- Ecological **Ec**

H - Numerous springs in the world have historic and/or cultural significance for local nations or community development.

A - The aesthetic criterion is problematic, as *de gustibus non est disputandum*. E.g waterfall, a spring under a huge cliff, or large cave behind a spring, nice landscape.

E - The economic-management value should consider a spring's active use (potable water supply, irrigation, local industry). Even if not tapped, water from karst springs can sustain ecosystems, maintain the baseflow of rivers or fill large reservoirs.

S - Specific discharge mechanisms of the springs (maximal yield, intermittent flowing, gas bubbling, changing water quality in coastal areas (fresh, brackish and saline).

Ec - specific depending eco system, endangered species, Ramsar site, or some other properties in interest of the biology, ecology, hydrogeology and science in general.

Inquiry list for the spring - An example

MIKAS project — MOST IMPORTANT KARST AQUIFER SPRINGS

Project MIKAS – Most Important Karst Aquifers' Springs

Spring Survey
Instructions for filling

1) Spring Location and Hydrogeological Information

Spring name	**Vrelo Mlave**	**Dominated aquifer's lithology and stratigraphy**	Limestones
Country / Region	Serbia, Eastern Serbia, Homolje, Carpathians Mts.		Upper Jurassic - Lower Cretaceous (strata from Oxfordian to Aptian age)
Nearest settlement	Žagubica	**Important or unique karst features in the catchment**	It is the largest among group of springs in contact of karst aquifer and lacustrine basin' sediments. A few swallow holes, numerous sinkholes and one sinking stream in the catchment
River/Hydrogeological basin	Mlava River basin, Beljanica Mt.	**Type of Spring**	Permanent, ascending – vauclusian type, freshwater spring
Coordinates	N 44° 11' 29.63" E 21° 47' 1.98"	**Regime of spring discharge (Q in l/s, min/av/max)**	270 / 1900 / 16500
Z(altitude)m asl	321	**Specific characteristics**	Spring is inside Kučaj – Beljanica National Park (est. in January 2022). Rare short discharge interruptions due to knee type drainage siphon
Intake structure*	Not tapped, N/A		
Amount of used water* and ecological flow*	N/A		
Water physical and chemical characteristics	T 9.2 °C; 0.1-5 NTU; TDS 0.28 g/l; pH 7.7; 11.8 °dH		
Groundwater protection	No sanitary protection zones established		
Remarks (web pages)	https://sr.m.wikipedia.org/sr-el/%D0%92%D1%80%D0%B5%D0%BB%D0%BE_%D0%9C%D0%BB%D0%B0%D0%B2%D0%B5 https://www.srbijaplus.net/zagubica-vrelo-mlave.htm https://beljanicatrail.org/?page_id=414		

Fig. 1 Location Map of Vrelo Mlave spring in Serbia
Fig. 2 Google Earth map with pinned spring
Fig. 3 Sketch HG Map (after Marinović, 2022)
Fig. 4 Schematic cross section (after Vasić, 2017)
Fig. 5 Vrelo Mlave, siphon section (Milanović, 2010)
Fig. 6 Vrelo Mlave typical spring hydrograph (y.1980)
Fig. 7 Vrelo Mlave spring (summer)
Fig. 8 Vrelo Mlave spring (winter)
Fig. 9 Vrelo Mlave, panoramic view

All photos of the spring by Z. Stevanović

*/ in case of spring tapped

2) Spring Importance / Criteria

Criterion	Justification / Facts	Criteria order
Historic, H **Aesthetic, A** **Economic, E** **Scientific, S** **Ecological, Ec**	*Vrelo Mlave, the main source of river Mlava, is the largest karst spring in Carpathian karst of eastern Serbia. This is typical vauclusian spring issuing from lake of 30m in diameter. It is most studied spring with 60 years of systematic discharge measurements, which is the longest period for one karst spring observation in the country. Jovan Cvijić, the founder of karstology, conducted here his first explorations (1889-1896), including measuring of lake and siphon depths by cannon ball, and observing spring's reaction on an earthquake whose epicentre was some 50 km away. Spring was further studied in detail since 1980s and its characteristics explained in several studies and dissertations (see list of references). Mlava karst aquifer contains large static reserves stored in deeper aquifer sections and was proposed for detail research and possible engineering interventions to regulate minimal flows and in case of positive results to be used for regional water supply including suburb area of the capital city Belgrade which is located at the distance of some 120 km.*	S H E A Ec
Current status	*Vrelo Mlave spring belongs to natural reserve area – National Park Kučaj-Beljanica established in 2022 (comprises c. 45,000 ha). Vrelo Mlave is also inscribed in the national list of the Natural Monuments since the beginning of 2000s.*	
Final proposal for list MIKAS or NIKAS	**MIKAS**	

3) References and source

References, which validate spring importance	*Cvijić J. (1895) Caves and underground hydrography in eastern Serbia (Serb. original: Pećine i podzemna hidrografija u istočnoj Srbiji), Glas SKA, XLVI, Belgrade, 101 p.* *Cvijić J. (1896) Springs, peat bogs and waterfalls in eastern Serbia (Serb. original: Izvori, tresave i vodopadi u istočnoj Srbiji), Glas SKA, LI 18, Belgrade, 122 p.* *Milanović S. (2010) Creation of physical model of karst aquifers on example of Beljanica Mt. (Eastern Serbia) (in Serbian) Doct. Dissert., Hydrogeol. Dpt., Fac. Min. & Geol, Univ. Belgrade* *Ristić V. (2007) Development of simulation model for daily discharges of the karst springs (in Serbian) Doct. Dissert., Hydrogeol. Dpt., Fac. Min. & Geol, Univ. Belgrade* *Stevanović Z. (1982) Hidrogeology and water budget of karst groundwater of Vrelo Mlave catchment area (in Serbian), "Naš krš", vol. 6, no. 12, 13, Sarajevo, pp. 67-78* *Stevanović Z., Filipović B., Stevanović I. (1986) Prospects for groundwater capturing in the upper basin of the Mlava River for water supply of Belgrade or other users (in Serbian). Voda i sanitarna tehnika, vol. VI, pp. 17-26* *Stevanović Z. (1991) Karst hidrogeology of the Carpathian-Balkandies of eastern Serbia and water supply opportunities (in Serbian) Spec. ed. Fac. Min. & Geol, Univ. Belgrade, 245 p.* *Stevanović Z., Milanović S., Benderev A. (2015) Specific discharge mechanism of some karstic springs in the Carpathian – Balkanides. Recueil des Traveaux de la Acad. Serb. Sci et Arts, Belgrade, vol.10, pp. 163-186* *Vasić Lj. (2017) Genesis and water circulation conditions of the complex karst systems of Kučaj-Beljanica massif (in Serbian) Doct. Dissert., Hydrogeol. Dpt., Fac. Min. & Geol, Univ. Belgrade*
Data collected by:	Zoran Stevanović
Assisted by (collaborators):	
Remarks	*Spring siphon was explored by divers on several occasions. The narrow knee has been found at the depth of about 30m.The total reached depth is 73m, but gallery is further expanded and extended to the inner part of the karst aquifer. The two tracer tests confirmed connection of Vrelo Mlave spring with sinking stream Crna Reka (apparent velocities in low water period were 0.013-0.019 m/s). Spring hydrograph is characterized by several discharge peaks (snowmelt, after heavy rains in springtime and summer) and about two months recession period usually in August-September). During recessions in late 1970s the two coefficients of laminar drainage are indicated: α_1 = 0,0530; α_2 = 0,0145. Based on isotopic analyses of ^3H and $^3H/^3He$ karst system is „relatively fast", groundwater age is around 6 years. The spring is a known touristic place, well-advertised and labelled at the spot, there is also a motel downstream of spring site, on left riverbank.*

4) Optional data

Grading criteria for proposing the spring	S = 4; H = 4; E = 3; A = 3; Ec = 3
Surface of catchment area (km²)	120
Water distribution system*	N/A
Purpose of water used*	*Main water source of river Mlava, ensures its baseflow. A few km downstream from spring site water is used for big trout fishpond.*
Sort and number of beneficiaries*	N/A
Groundwater chemistry	*Dominant ions Ca and HCO_3 are witnessing prevailing presence of limestones in the catchment area. Content of other ions are significantly lesser, while micro constituents are often below detectable limit.*
Water treatment*	N/A
Threats to spring water quality	*Local solid waste dump is around 1 km away, and cemetery 0.5 km, but both aren't in direct connection with the karst aquifer. Catchment is not permanently populated, farming to a low extent and livestock grazing, take place mostly during summer months.*





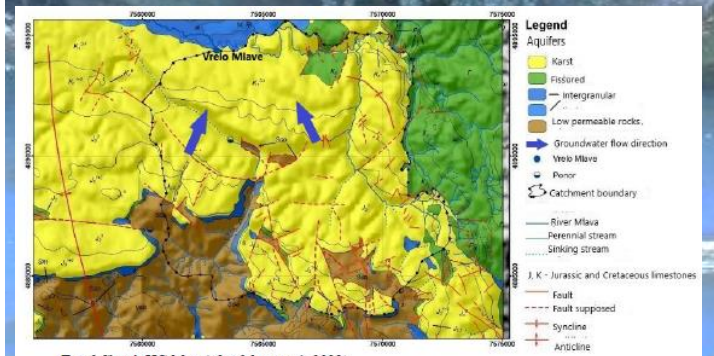
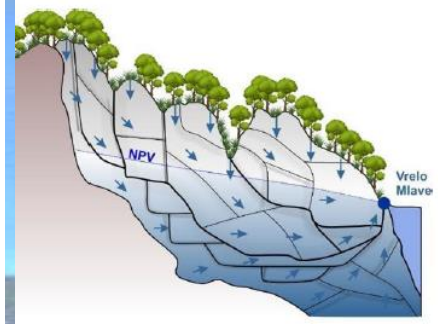
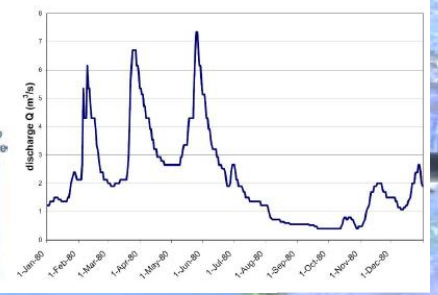
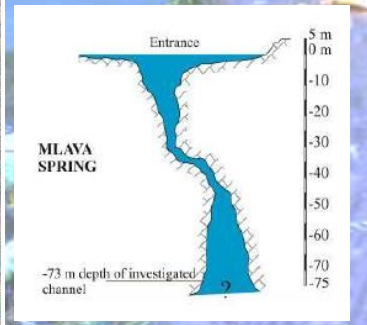


Fig. 3 Sketch HG Map (after Marinović, 2022)





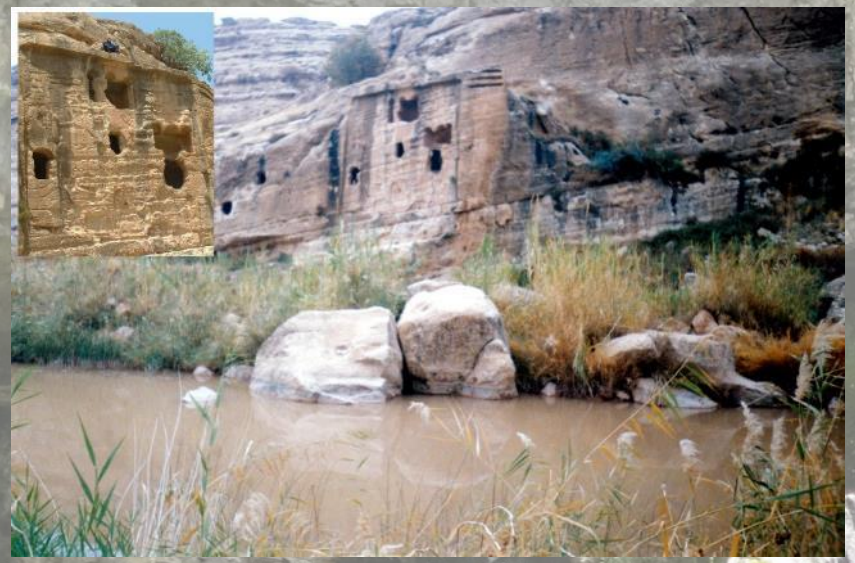




MIKAS
MOST IMPORTANT KARST AQUIFER SPRINGS

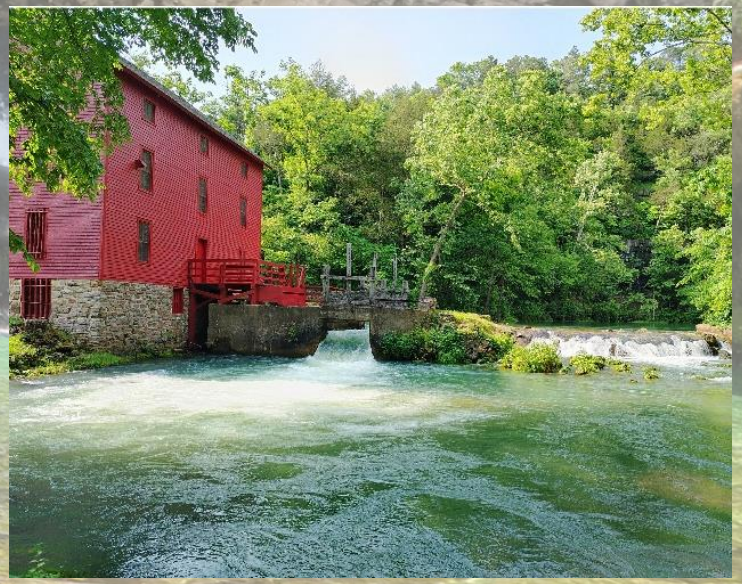
Project to select, label and protect the world's most important karst springs

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MIKAS

MOST IMPORTANT KARST AQUIFER SPRINGS

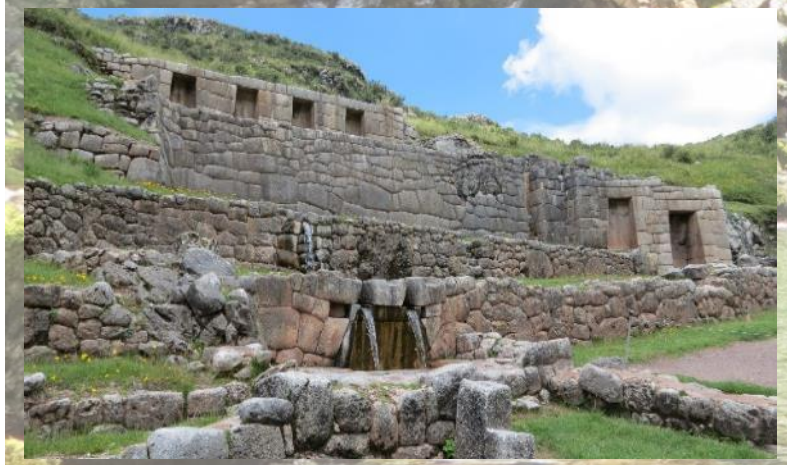
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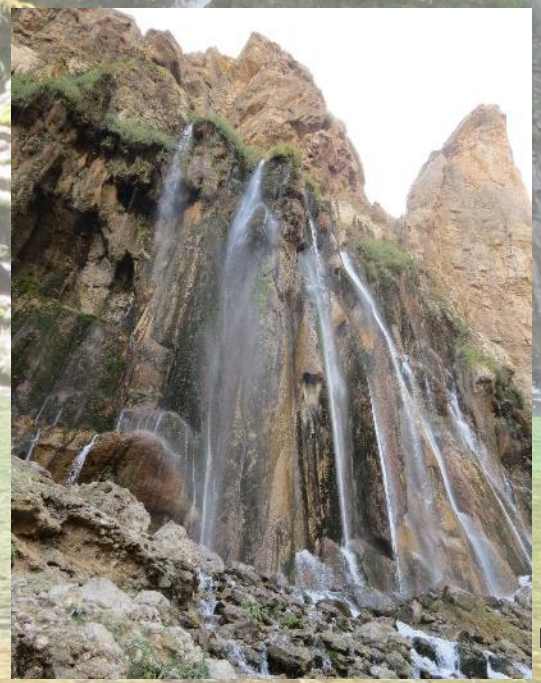
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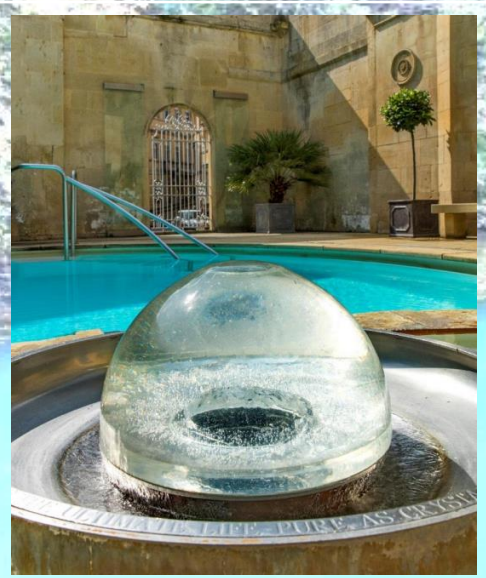


Historic criterion

The Bath Hot springs (UK)

Karst Commission

The Bath Hot springs were developed as a spa in Roman times. The historical economic importance of the Roman baths at Bath has been recognised for many centuries. The city of Bath is designated a World Heritage Site, which is due to the historical development of the hot springs which led to the prosperity and subsequent historical development of the City. Numerous studies estimate that thermal water has been in circulation in the limestone for at least 1000 years (Holocene). The Bath hot springs remain an important tourist attraction to this day, attracting more than 1 million visitors each year.





Historic. 1. The Bath Hot springs (UK) - developed as a spa in Roman times. 2. Waikoropupu (New Zealand) - high cultural value for indigenous Maori people. 3. Gihon spring (Jerusalem, Israel) - mentioned in the bible and in the Christian tradition.



Photo A. Grey

Historic criterion

Waikoropupu (New Zealand)



Karst Commission

One of the largest springs in Oceania. Very high cultural value (wahi tapu) for indigenous Maori people. Spring is protected in National Park. Its 714 km^2 recharge area is only partly protected, but a Water Conservation Order is in legal process to protect the quality and quantity of water recharge. Clearest karst spring ever measured. Close to theoretical limit for water clarity.



By Bruce Hayward



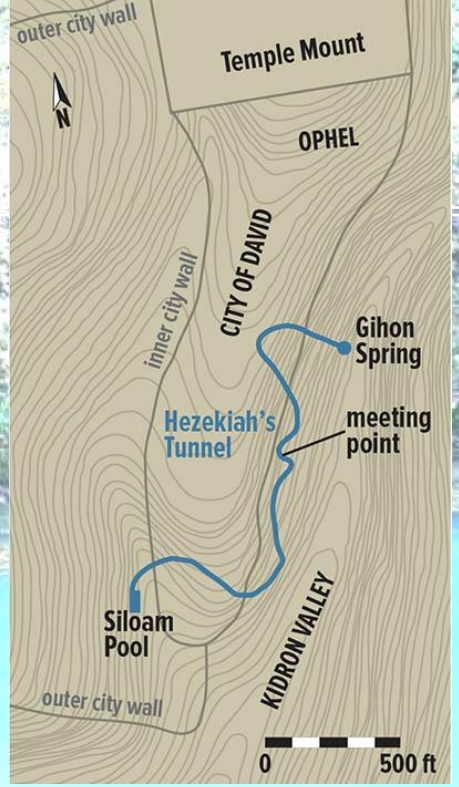
By Paul Williams

Historic criterion

Gihon spring (Israel)

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The spring has great historical significance and is located inside the city of Jerusalem, at the foot of a historical hill known as the “City of David“. The spring is mentioned in the bible, e.g. King Solomon was anointed by the waters of this spring. This tunnel was built in the biblical period in the late 8th or early 7th century BC, when King Hezekiah prepared Jerusalem for a siege by the Assyrians. To this end, he blocked the spring outlet and led the water straight down through an artificial tunnel toward the Shiloah pool, which was located inside the fortified City of David.





The tunnel, 533 m long and still functioning, leads the water to the ancient Pool of Siloam or Shiloah and both spring and pool are important archaeological and tourist sites in Jerusalem.


photo source: *Times of Israel*

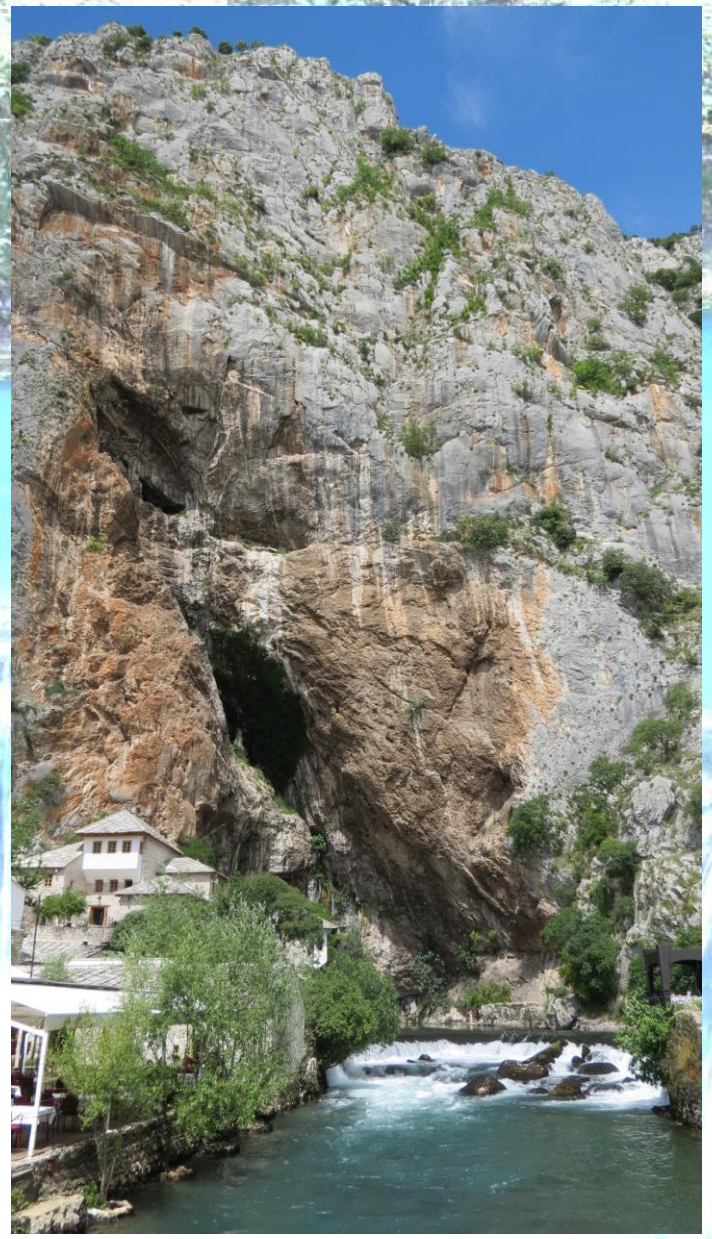
Aesthetic criterion

Buna spring (Bosnia & Herzegovina)

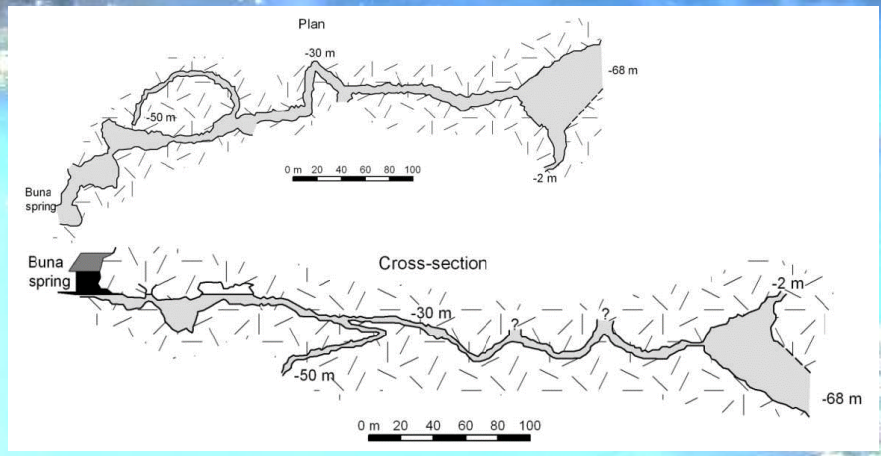
- Member of „200 IUGS geoheritage sites”

Karst Commission

Vrelo Bune is an ascending spring with deep siphonal channels, and issuing under a big cliff. It has one the highest average yields in Europe Q=23.7 m^3/s, and has one of the largest maximal spring yields in the world Q=133 m^3/s. The spring, the tekke - tekija (building of Islamic thinkers - dervishes from the Ottoman period) and the Buna River represent a unique ambient entity that has significant cultural, social and economic significance. It also represents an important tourist site. It is of great importance for the preservation of the biodiversity of the Buna and Neretva rivers. It is declared a national Natural Monument.



Aesthetic. 1. Buna spring (Bosnia & Herzegovina) - the largest European spring, flows out from a submerged cave under a high cliff. 2. Ventanas de Tisquizoque (Colombia) – 270m high three-tiered waterfall. 3. Blautopf (Germany) - typical representative of springs characterised by ascending circulation of “blue” water from a deep siphon.





Aesthetic criterion

Ventanas de Tisquizoque (Colombia)

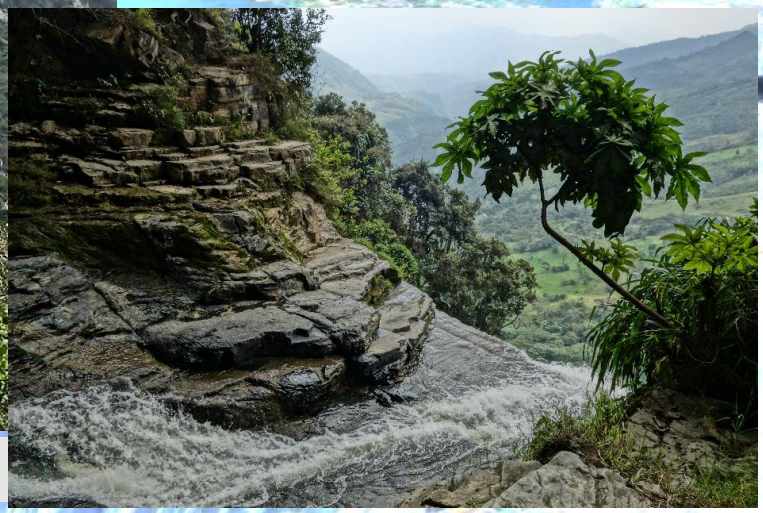
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La Venta creek crosses a natural cave high up on a mountain, flowing out into a three-tiered waterfall of 270 meters high with a spectacular panoramic view of Florián municipality and the surroundings forests. The spring is open and public. Recently, as the site has become more notable, local income by tourism increased. Some small creeks, affluents of La Venta supply the water for the local aqueducts.

The spring has an historic and spiritual value since it receives the name from Tisquizoque chief (cacique) who ruled this land around the year 1539 CE, when Spaniards invaded the territory. Together with his warriors he fought them until he was the last alive. Then, honouring his people, he preferred to die by jumping from the imposing waterfall rather than being captured by the Spanish yoke.







Photos by Marianela Vargas

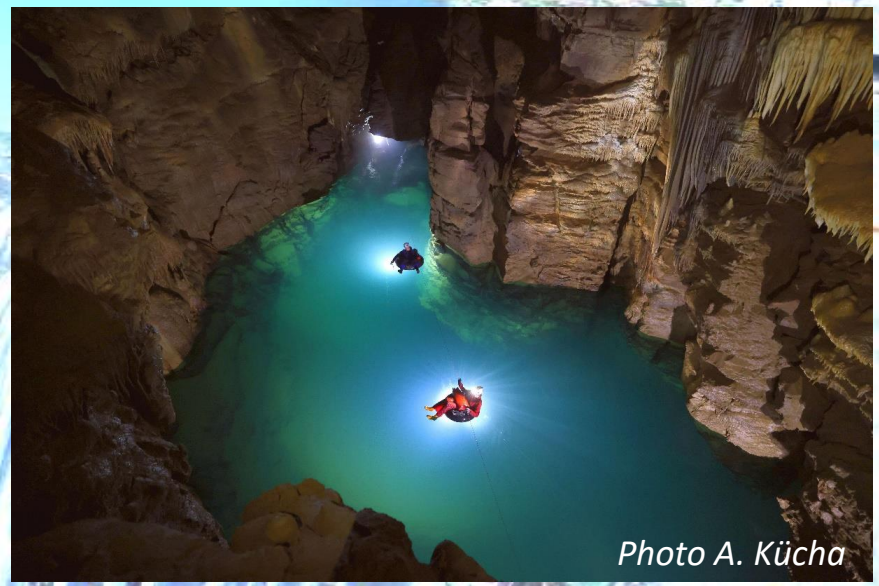
Aesthetic criterion

Very aesthetic site with deep blue colour (German: blau), which even gives the name not only to the spring (Blautopf), but also to the town (Blaubeuren), the river (Blau) emerging at the spring, the valley (Blautal) and the karst area around (Blaubeurer Alb). The high aesthetic factor gives the Blautopf spring a high brand value in the region, which attracts about 500,000 visitors each year. The Blautopf is the second largest spring in Germany and since 1870 was used ("Albwasserversorgung") to supply water to the population of the Swabian Alb. Today, water from Blautopf is no longer used for water supply. The Blauhöhle (Blue Cave), one of the largest caves in Germany (17.7 km) is directly connected to the spring. Blautopf is part of Special Area of Conservation (SAC) under the EU's Habitats Directive and part of the UNESCO Global Geopark Swabian Alb.



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Blautopf (Germany)

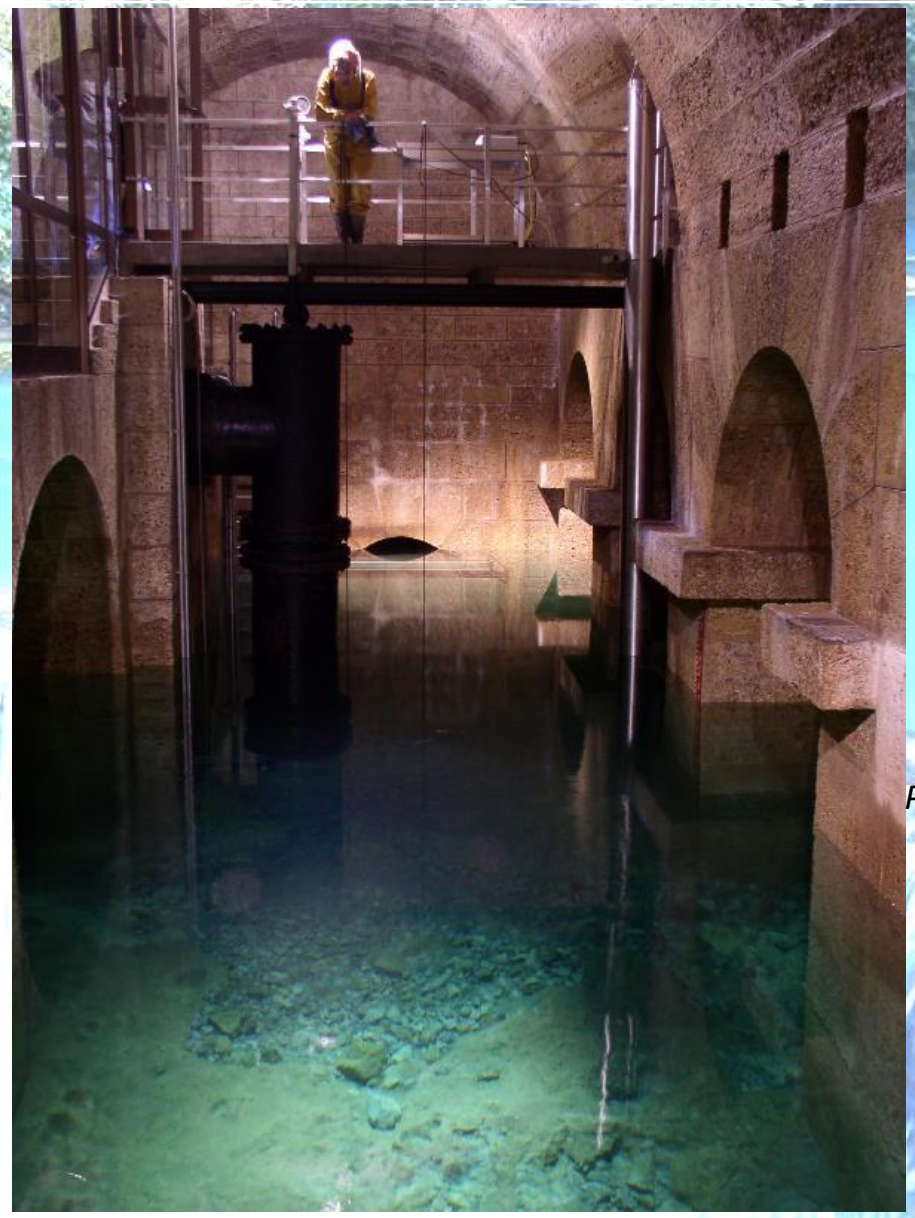


Economic criterion

Kaiserbrunnen spring (Austria)

Karst Commission

Spring has great historical importance as supplying Austrian capital Vienna (today ca. 2 Mio. inhabitants) with potable water since 1873 from distance of 170 km (1st Vienna Water Main). Springwater is of high quality. An impressive building and engineering masterpiece for the 19 Ct. has been constructed around the spring to tap the water. Spring and water museum can be visited on guided tours. The catchment area is a water protection area accessible by cableway.



Economic. 1. Kaiserbrunnen spring - supplying water to 1.7 million citizens of Vienna since 1873. 2. Jeita - the main source of potable water for Beirut. 3. Peschiera spring - supplies 80% of Rome's drinking water.



Photos by L. Plan

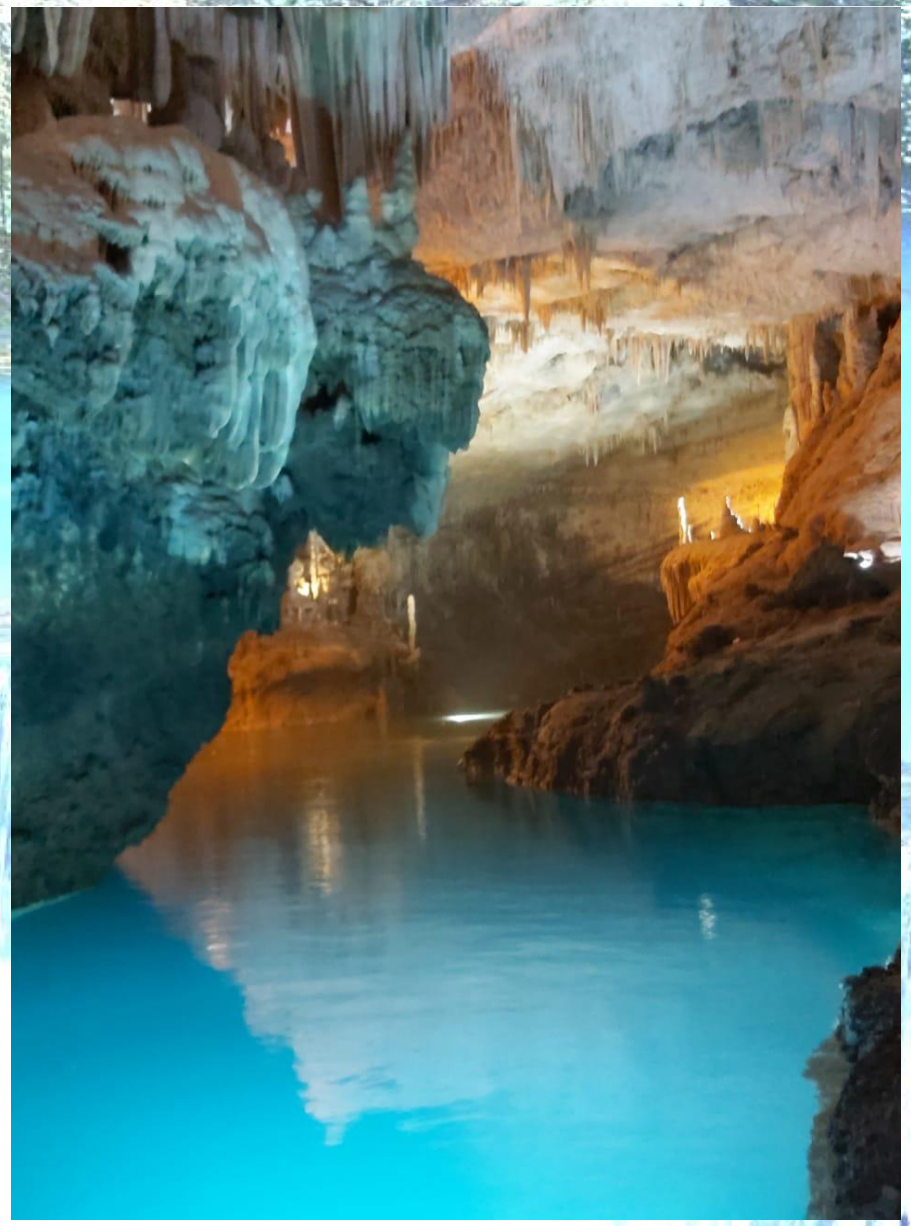


Economic criterion

Jeita (Lebanon)

Karst Commission

Jeita spring, one of the largest in Lebanon, is the main source of potable water for Beirut. Its catchment mostly of Middle Jurassic limestones, covers c. 150 km^2. Spring is associated to one of the most spectacular and longest caves in Lebanon. The cave is 10,5 km long and has two levels: a dry and a saturated level, with passages and speleothems of all types. The spring has been long investigated scientifically, but is also tourist attraction by hosting numerous concerts and thousands of tourists per year. The spring overflow is responsible of keeping Nahr El Kalb River active between April and June.







Photos courtesy of Joanna Doummar

Economic criterion

Peschiera spring (Italy)

Karst Commission

The Peschiera Springs (Sorgenti del Peschiera) are major karst water sources located near the Velino river valley in the municipality of Castel Sant'Angelo in the province of Rieti, Lazio, Italy. It is tapped by long gallery, a structure commonly applied by Italian engineers. It supplies about 80% of Rome's drinking water: the Peschiera Aqueduct supplies water to over 3 million residents in Rome and surrounding area. It discharges about 18 m^3/s in average, with roughly half sent directly to Rome. The Peschiera-Capore aqueduct system was built in the 1940s. Photos Z. Stevanović



Photos Z. Stevanović





Scientific criterion

Fontaine de Vaucluse (France) - Member of „200 IUGS geoheritage sites”

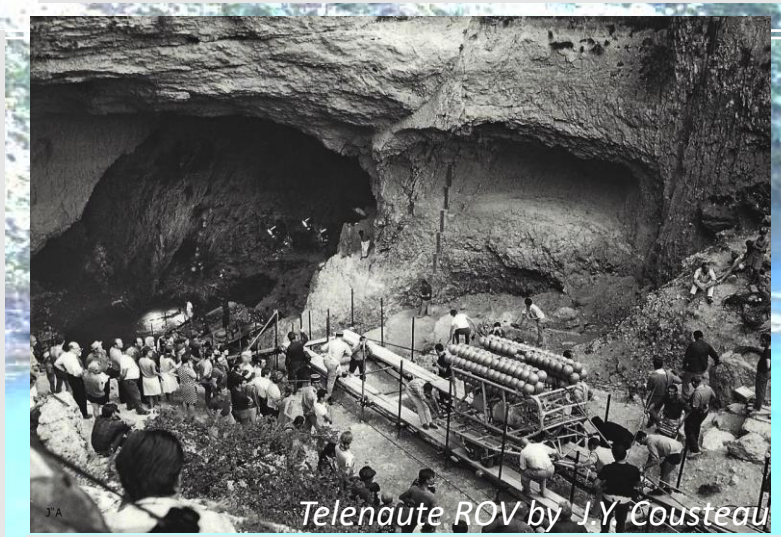
Karst Commission

The Fontaine de Vaucluse (FdeV) is one of the most famous and best explored karst springs in the world (the discharge records: monthly mean since 1887. FdeV is a lake spring with deep siphonal karst conduits, and is considered as locus typicus for all such springs worldwide (the term: “vauclusian type”).

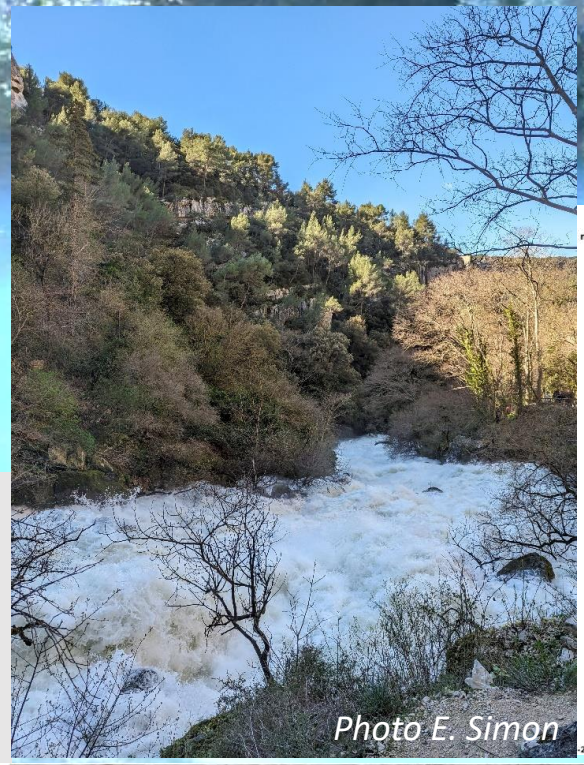
Fontaine de Vaucluse is France's major spring in terms of average flow rate. Over one hydrological year, the mean water table level fluctuations at the outlet are of about 25m. It is characterized by deep siphonal karst conduits, the huge discharges variation and the high minimal discharge values during low flows. The catchment area is estimated on 1,160 km^2.

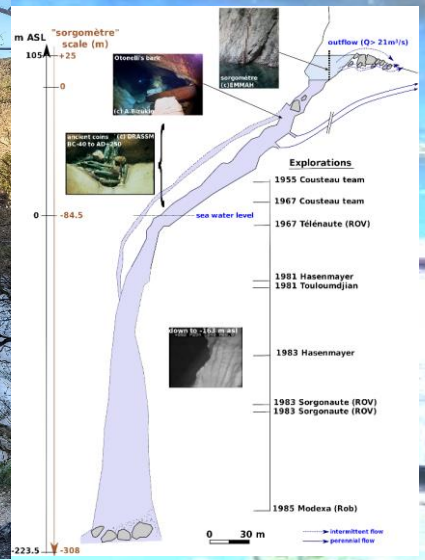
The spring has conduit itself, explored by a ROV up to -308 m.

The main economic resource of Fontaine-de-Vaucluse, with an average annual attendance of 1.5 million visitors. Listed heritage site according to the French law (1930).



Scientific. 1. Fontaine de Vaucluse (France) - one of the most famous (“vauclusian type”) and best explored springs in the world (discharge recorded since 1887). 2. Lez spring - an excellent engineering solution, ensures drinking water to Montpellier, France. 3. João Baio (Brasil) - the only rhythmic (ebb and flow) spring known in South America.









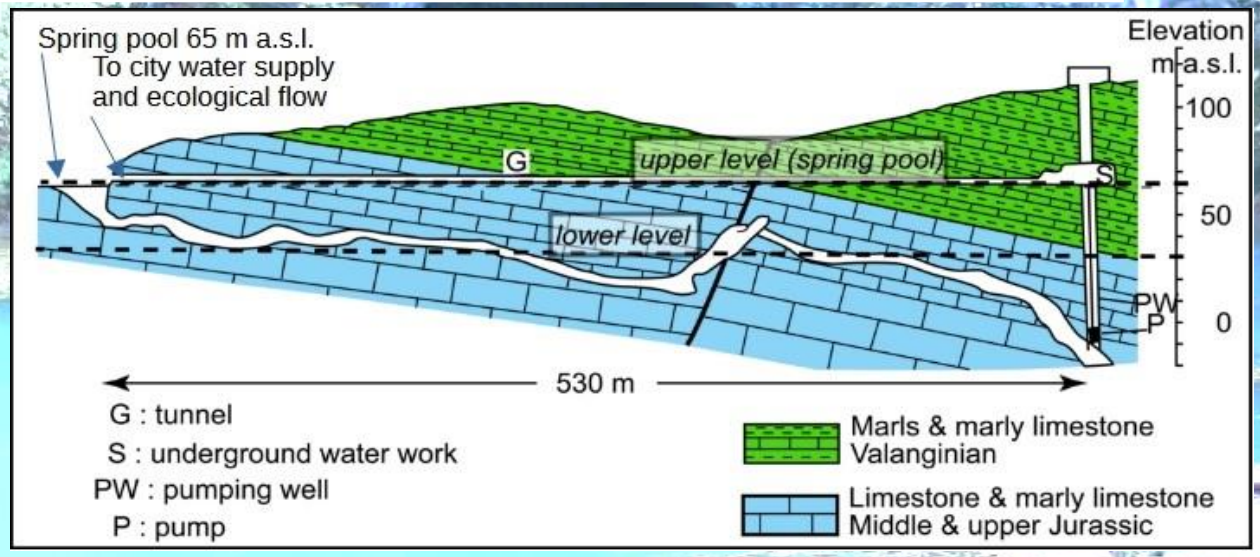
Scientific criterion

Lez spring (France)

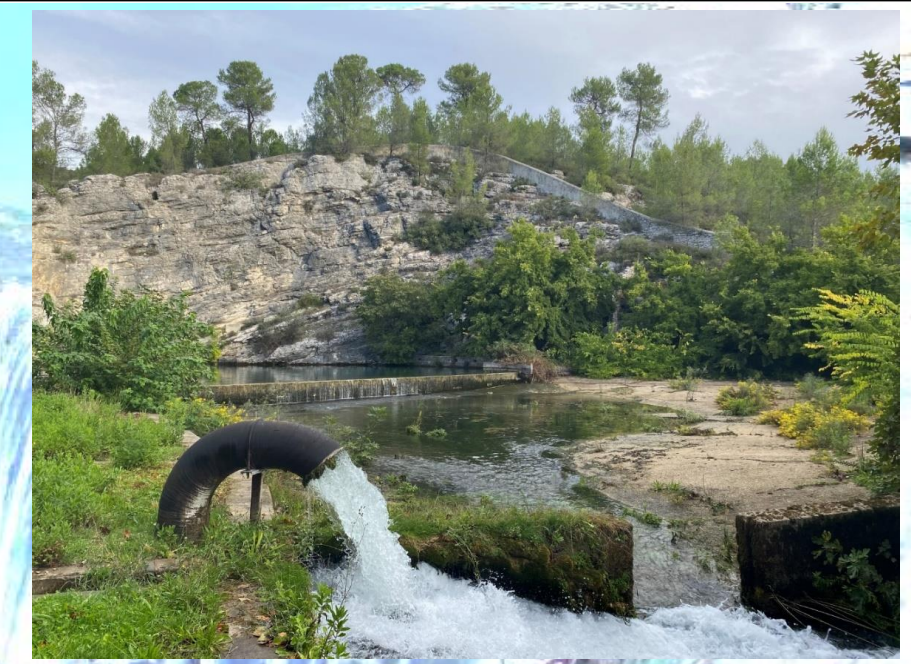
Karst Commission

An engineering masterpiece of Prof. J.V. Avias and his team who launched large project implemented in 1980's, by building of the large pumping station in Jurassic – Cretaceous aquifer (with autogenic limestone basin 130 km^2) over the Lez natural spring site. Firstly, cave diving mapped karst conduit up to 540 m at -101.3 m below actual spring level. Today "Prof. J.V. Avias" pumping station consists of 4 boreholes (av. rate 1.02 m^3/s) intersecting the main conduit at -48 m below spring level (17 m asl). By an active management of the aquifer, the present-day authorised drawdown might be increased of 20 m. When during autumn, the natural spring dries up, a continuous ecological flow (230 l/s minimum) is diverted to Lez River in order to preserve its aquatic biodiversity.









Scientific criterion

João Baio (Brasil)

Karst Commission

Being the only rhythmic (ebb and flow) spring known in South America, and among the few in the world, makes this spring most important to understand the mechanisms behind such remarkable and short (minutes) cycles of discharge variation. It is a scenic spring, located amidst a forested zone. The spring was brought to the attention of scientists just a few decades ago. No earlier descriptions are available.





Photos A. Lobo

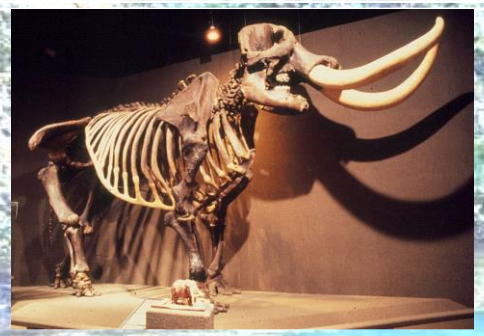
Ecological criterion

Wakulla spring (Florida, USA) - Member of „200 IUGS geoheritage sites”

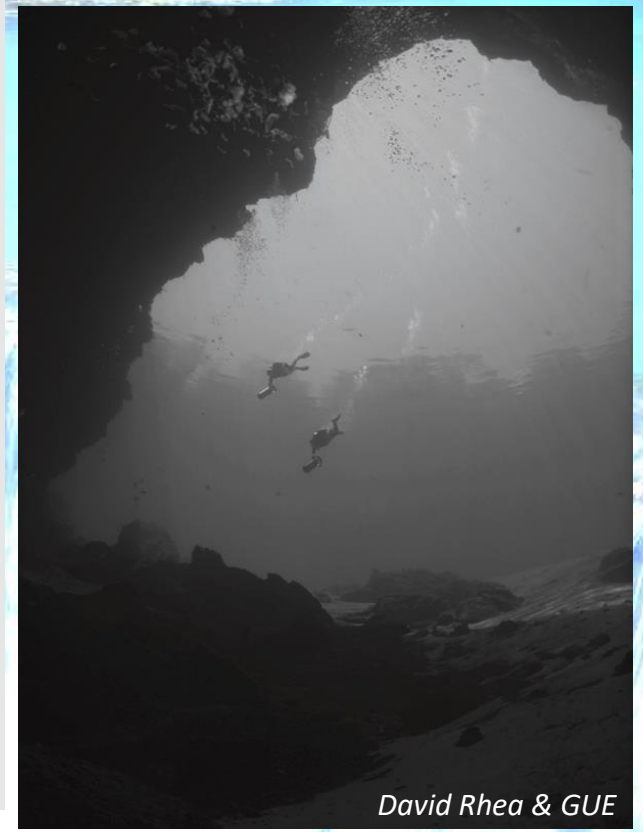
Karst Commission

Wakulla Springs is a nature reserve, an important recreational site for residents and tourists, entertaining over 200,000 visitors a year. Alligators, manatees and an abundance of bird life can be seen at Wakulla Springs. As one of the largest and deepest freshwater springs in the world, It provides abundant freshwater for a complex and highly productive ecosystem of wild plants and animals. This crystal clear, freshwater spring in the Florida panhandle has been a popular place to swim and watch the wildlife. A mastodon skeleton referred to as “Herman” was recovered from the depths of Wakulla Springs in 1930 by FGS staff.

Wakulla Springs, is at the terminus of one of the largest and deepest cave systems in the world. Research divers have extensively explored and mapped the underwater cave system connected to the spring. Currently, there are more than 56 km of mapped cave passage with 35 of them at a depth of 58 meters or more. This is a first magnitude spring, one of only 75 in the United States.



Ecological. 1. Wakulla spring (Florida, USA) – the archaeological site with the longest explored submerged passages, provides abundant freshwater for a complex ecosystem of wild plants and animals. 2. Xe Bang Fai (Laos) - one of the largest springs in the world, vital water source for wildlife, livestock and people. 3. Baotu spring (China) – the source recorded in documents 3,500 years ago, ensures baseflow of downstream river and lake





Ecological criterion

Xe Bang Fai (Laos)

Karst Commission

Permanent, gravity, freshwater spring issuing from middle Carboniferous to early Permian limestones. The very large discharge from the Xe Bang Fi Cave during the wet season and especially during flood pulses is among the world's largest

The Xe Bang Fai River is the only surface water source in Hin Nam No National Park (and areas upstream and downstream of the park) for 3-4 months in the latter part of the dry season. So it is a vital water source for wildlife, livestock and people.

The Xe Bang Fai Cave and its spirits have spiritual significance for local people living near it, who have animist beliefs.





Photos P. Williams

Ecological criterion

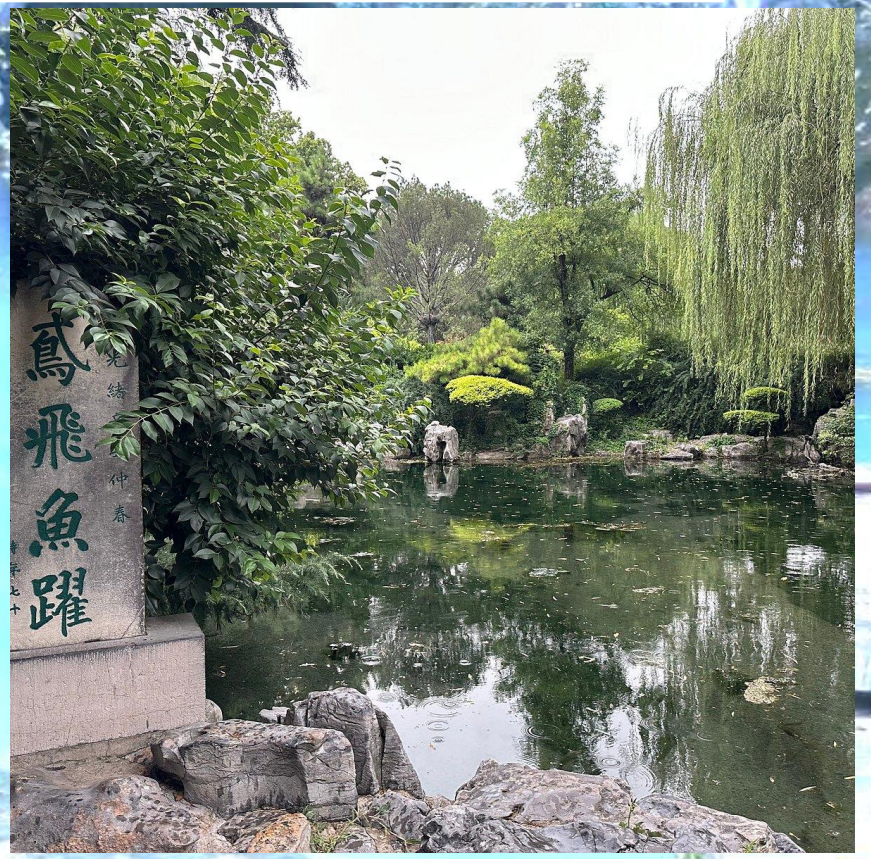
Baotu spring (China)

Karst Commission

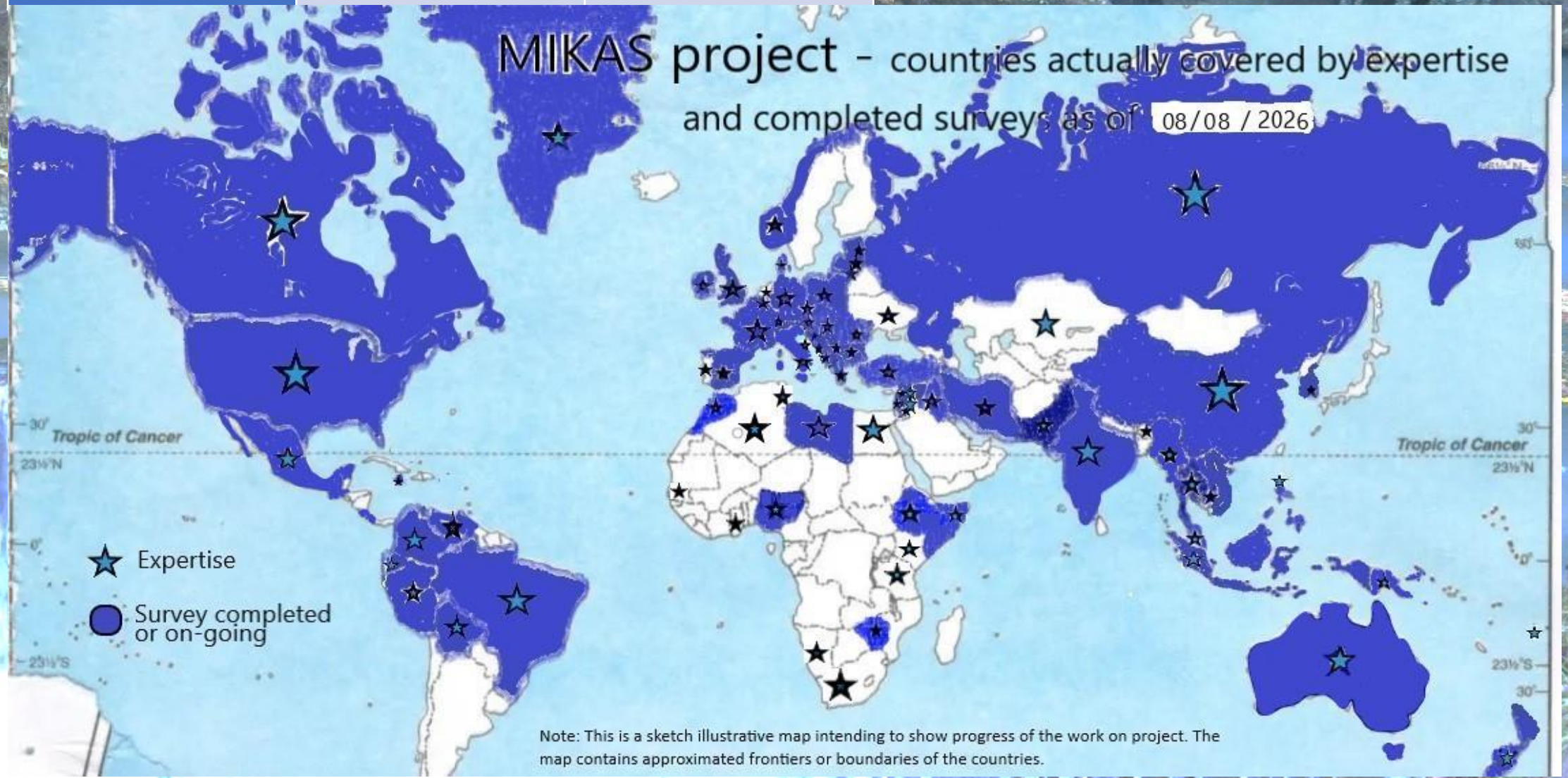
This Important source of water ensuring baseflow of downstream river system (river ecology and Daming lake). The catchment is 1700 km^2, out of which some 450 km^2 is direct recharge area (autogenic). Baotu spring park has a beautiful natural landscape and historical sites.

Baotu spring has three outlets equidistant from north to south. Flow variability, physico-chemical variability influenced by both natural and artificial factors. In ancient times, the emperor of Lu Dynasty and Qi Dynasty met in Baotu spring area in 694 BC. Many geographers and poets described Baotu Spring, (Northern Wei Dynasty, Jin Dynasty, Song Dynasty).





Continent	Number of covered countries	Number of experts and assistants involved
Africa	14	18
Americas	14	41
Asia	27	50
Australia & Oceania	4	13
Europe	34	143
Total	93	265



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Ask Gemini
mikasproject.org
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International Association of Hydrogeologists
the World-wide Groundwater Organisation

MORE ABOUT PROJECT MIKAS

The aim of the MIKAS (Most Important Karst Aquifer's Springs) project is to create the first complete list of the most important karst springs at the global, but also at the national level. The project was launched at the annual meeting of the Karst Commission (KC) of the International Association of Hydrogeologists (IAH) in June 2022, during the last EUROKARST conference held in Malaga. The MIKAS project's is run by Advisory Board and numerous national experts.





SRP
16:45
20/08/2026



Albania

MIKAS springs:

1. Blue eye (Syri i Kalter)

View more details



Austria

MIKAS springs:

1. Fürstenbrunner Quelle
2. Kläfferquellen (Kläffer spring)
3. Pießling-Ursprung
4. Kaiserbrunnen

View more details



Belgium

MIKAS springs:

1. Eprave

View more details



Bolivia

MIKAS springs:

1. Chiflonqaqa

View more details



Bosnia & Herzegovina

MIKAS springs:

1. Buna (Vrelo Bune)
2. Vrelo Bosne

View more details



Brazil

MIKAS springs:

1. Baía Bonita
2. João Baio
3. Pratinha

View more details



Bulgaria

MIKAS springs:

1. Devnya
2. Iskrets (Peshta)
3. Musina

View more details



Colombia

MIKAS springs:

1. Manantial de Cañaverales
2. Ventanas de Tisquizoque

View more details



Ecuador

MIKAS springs:

1. Jumandy Cave



Estonia

MIKAS springs:

1. Lavi



Greece

MIKAS springs:

1. Almyros
2. Aggitis river Springs (Maaras



Hungary

MIKAS springs:

1. Heviz Thermal Lake Spring
2. Jósva Spring (group of Medence,

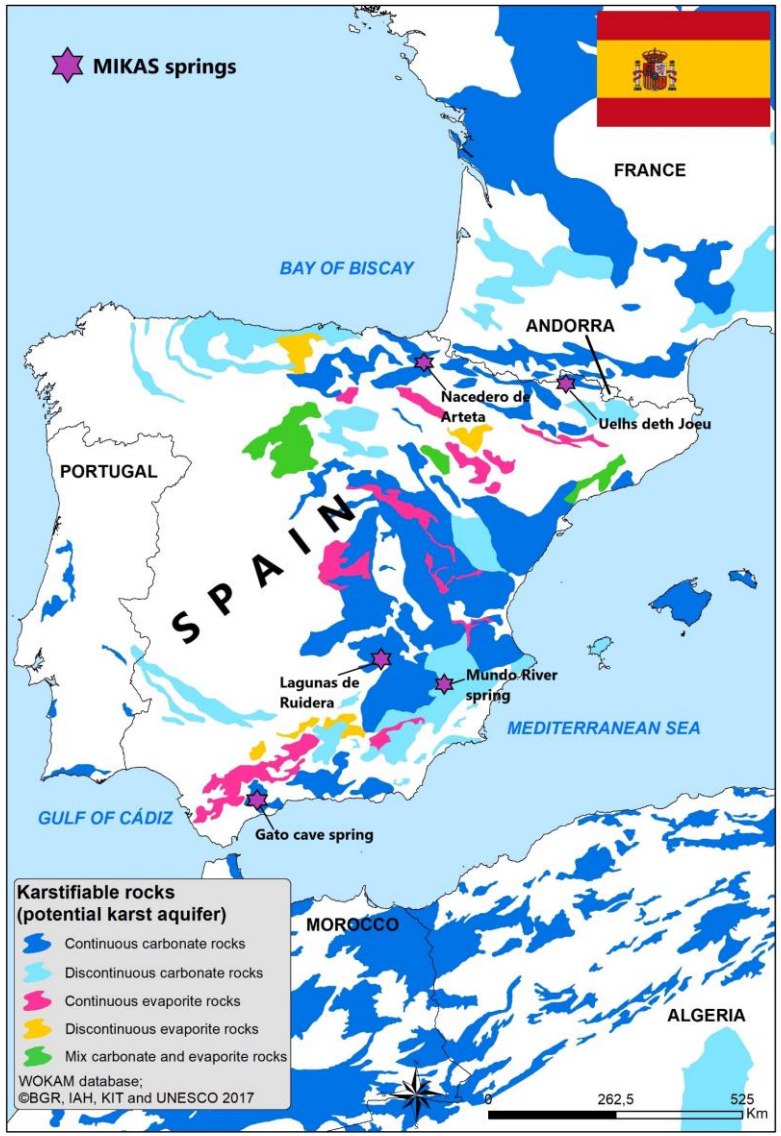
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MIKAS

MOST IMPORTANT KARST AQUIFER SPRINGS

Visit: https://mikasproject.org/

Example of country presentation



Country	MIKAS springs	Coordinates / Nearby City	Spring discharge (Q in l/s,min/av/max) / tapped or not	Criteria* in order / Main justification */ H-historic, A-aesthetic, S-scientific, E-Economic, Ec-ecologic	Data collected by
Spain	1. **Gato Cave spring**	N 36º 43' 39" W 5º 14' 19" Z = 445 m asl Benaoján (Málaga)	16/1,500/17,800 Tapped, Part of water used for irrigation	***Ec, S, A, H, E*** *Gato Cave spring is one of the outlets of a speleological complex known as the Hundidero-Gato system, located in the Sierra de Líbar. There is evidence that the cave was inhabited since prehistoric times: the excavations carried out near this entrance determined the presence of vestiges of different prehistoric phases. In the 18th century, the cave from which the spring emerges was a refuge for bandits who travelled through the Serranía de Ronda. The cave is composed of 70m high rooms, fossil galleries, speleothems, canyons, shafts that are being extensively investigated. Gato Cave spring is located in a beautiful and attractive natural setting, surrounded by spectacular karst landscapes and permanently draining crystalline waters. The outflow of water from the spring into the Guadiaro river generates a beautiful waterfall. This set is listed as a Natural Monument and is located within the Natural Park of the Sierra de Grazalema.*	Beatriz de la Torre Martínez
	2. **Lagunas de Ruidera**	From (SE): N 38º54'42" W 2º48'55" to (NW): N 38º58'20" W 2º53'15" Z = 790-860 m asl Ruidera (Ciudad Real) and Ossa de Montiel (Albacete)	<1,000/1,800/13,000 Not-tapped	***Ec, A, S, E, H*** *15 lakes and wetlands limited by tufa barriers are developed along the Guadiana River, one of the largest rivers in Spain. The lakes are fed by at least 24 mostly permanent, gravity, fresh, submerged outlets. The Ruidera Lakes are recognized as a biodiversity hotspot, harboring a diverse range of plant and animal species. The various ecosystems within the lakes support a rich array of life, contributing to the overall biodiversity of the region. Particularly, the lakes serve as crucial habitats for numerous bird species, both migratory and resident, as well as fish and amphibian. In fact, the IUCN recognizes the Ruidera lakes as Freshwater Key Biodiversity Area. The lakes are also designated as a Natural Park, Special Protection Area under the European Union's Birds Directive (SPA), Site of Community Importance, a designation under the EU's Habitats Directive (SCI), Ramsar Site and UNESCO's Biosphere Reserve "Mancha Húmeda". A legend of the magical origin of Ruidera lakes is told in many books of the 17th century, but it is particular relevant its appearance in the Cervantes' adventures of Don Quixote de la Mancha.*	José Manuel Gil Márquez

MIKAS - Gato Cave spring



Oil on canvas to Manuel Barrón y Carrillo (1869) (Retrieved from https://www.carmenthyssenmalaga.org/obra/emboscada-a-unosbandoleros-en-la-cueva-del-gato)



Gato Cave waterfall (Retrieved from https://www.tripadvisor.es/Attraction_Review-g265784-d10236448-Reviews-Cueva_del_Gato-Ronda_Costa_del_Sol_Province_of_Malaga_Andalucia.html)

MIKAS - Lagunas de Ruidera



Retrieved from http://www.turismocastillalamancha.es/naturaleza/parquenatural-de-lagunas-de-ruidera-en-albacete-58272/descripcion/

Photo Gallery

Example / South America

Visit: https://mikasproject.org/

Brazil



Cycle of discharge variation few meters downstream from the spring. Low discharge Alexandre Lobo)

MIKAS - Pratinha



Aerial view of Pratinha Spring (Photo by Alexandre Lobo)

Colombia

MIKAS - Manantial de Cañaverales



Crystal clear waters of Manantial de Cñaverales. Retrieved from, https://semanariovoz canaverales-manantial-amenazado-muerte/

MIKAS - Ventanas de Tisquizoque



Ventanas de Tisquizoque three-tiered waterfall (Photo by Marianela Vargas)

Ecuador

NIKAS - Rio Cacapishco (Gruta de los Tayos)





Photos of the Gruta de los Tayos and Cacapishco River (Guía Espeleológica de la Provincia Napo). From Sánchez Cortez (2017)

Photo Gallery



Video links

Visit: https://mikasproject.org/

MIKAS – Ventanas de Tisquizoque, Colombia:
https://www.youtube.com/watch?v=tnuMdpbqscM

Available clips at the Internet (up to 6 minutes duration) **of some of the studied MIKAS / NIKAS springs:**

MIKAS – Blue Eye (Siri I Kalter), Albania:
https://www.youtube.com/watch?v=GTU52SYqcDE
https://www.youtube.com/watch?v=9_FzKLOrGE0

NIKAS – Syri I Sheganit, Albania:
https://www.youtube.com/watch?v=-fmfRiagKrY

MIKAS – Fürstenbrunner Quelle, Austria:
https://www.youtube.com/watch?v=3P9cPhL6cGo

MIKAS – Kläfferquellen, Austria :
https://www.youtube.com/watch?v=qFwfniq5J78

MIKAS - Pießling-Ursprung, Austria:
https://www.youtube.com/watch?v=LRTAjjAbUvw

MIKAS – Chiflonqaqa, Bolivia :
https://www.youtube.com/watch?v=WRnuFC3ODEc

MIKAS – Buna (Vrelo Bune), Bosnia & Herzegovina:
https://www.youtube.com/watch?v=hSOSrIccw8I

MIKAS – Vrelo Bosne, Bosnia & Herzegovina:
https://www.youtube.com/watch?v=kwvvqSsDH6Y

MIKAS – Pratinha, Brazil:
https://www.youtube.com/watch?v=-QZaPfAL6tE

MIKAS - Manantial de Cañaverales, Colombia:
https://www.youtube.com/watch?v=HExXpqPOaDY

MIKAS - Ventanas de Tisquizoque, Colombia:
https://www.youtube.com/watch?v=tnuMdpbqscM

MIKAS – Jumandi cave, Ecuador :
https://www.youtube.com/watch?v=9G1XXnE9Mvo

MIKAS – Almyros, Greece :
https://www.youtube.com/watch?v=I2EDjmiW5qY

MIKAS - Aggitis river Springs (Maaras cave), Greece:
https://www.youtube.com/watch?v=f7-E6PYZIjI

MIKAS – Achabalang, India:
https://www.youtube.com/watch?v=-HOkkOjxn-8

MIKAS project articles

БЪЛГАРСКА АКАДЕМИЯ НА НАУКИТЕ. BULGARIAN ACADEMY OF SCIENCES
ИНЖЕНЕРНА ГЕОЛОГИЯ И ХИДРОГЕОЛОГИЯ, 36
ENGINEERING GEOLOGY AND HYDROGEOLOGY, 36
София, 2022. Sofia

Project "Most Important Karst Aquifer Springs" (MIKAS) and Bulgaria's participation in it

Aleksey Benderev[1]

[1]Geological Institute, Bulgarian Academy of Sciences, 1113, Sofia, Bulgaria;
e-mail: alekseybenderev@yahoo.com

Проект „Най-важни извори от карстови водоносни хоризонти" (MIKAS) и участието на България в него

Алексей Бендерев

Benderev, A. 2022. Project "Most
participation in it. *Engineering Ge*

Abstract. Karst has a wide distribu
formed in it are important for prov
of ecosystems. Considering the imp
Karst Aquifer Springs" – MIKAS
scientists from different countries
in the respective countries. Its org
National experts from the respectiv
prepare Global and National lists
for each country. Determining the
aesthetic, economic, scientific and
springs by the experts from the diff
for preparing accompanying forms
others. As a sample, two completec
spring, Iraq, proposed for inclusion
of Serbia. In Bulgaria, it has been
local importance on its territory. P
with different weight. From these
it is planned to select a part of the
an extended National list. The wei
assessment and ranking will be m
which will include the most highly
spring. This list will be presented
which of the springs could be inclu

Keywords: karst spring, karst

Резюме. Карстът има широко раз
в него подземни води имат в



Фиг. 3. Древен каптаж при с. Мусина, област Велико Търново (https://uspelite.bg/otkriha-misteriozna-podvodna-zala-ot-rimsko-vreme-krai-musinskata-peshtera-1).
Fig. 3. Ancient tape near the village of Musina, Veliko Tarnovo Region (https://uspelite.bg/otkriha-misteriozna-podvodna-zala-ot-rimsko-vreme-krai-musinskata-peshtera-1).



Фиг. 4. Изворът „Клептуза", Велинград.
Fig. 4. Kleptuza Spring, the town of Velingrad.

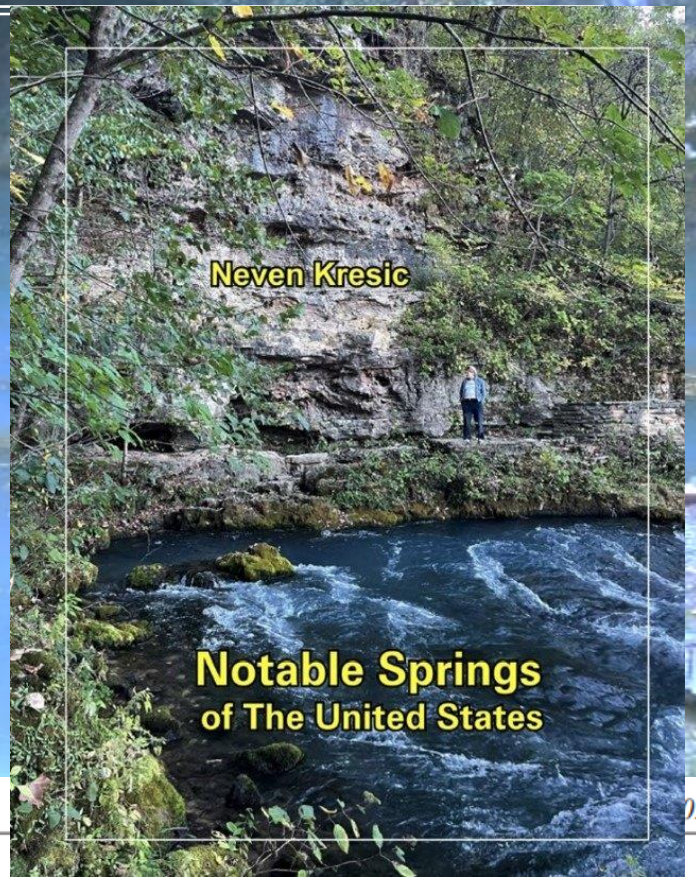
https://doi.org/10.52321/igh.36.1.45

Preliminary selection of the most significant karst springs in Bulgaria

Aleksey Benderev[1], *Boyka Mihaylova*[1], *Konstantin Kostov*[1], *Evelina Damyanova*[2]

Table 2
Summary table of the severity criteria of the selected springs (with blue colour are springs of significant importance, with green – of medium importance and with yellow – of local importance; in italics – springs with subthermal waters)

№		Исторически	Естетически	Икономически	Научни	Екологични
1	Пеща, (Искрецки)					
2	Глава Панега					
3	Житолюб, г. Лакатник					
4	Котелски					
5	Топля					
6	Хотница					
7	Мусина					
8	Триградски					
9	Маарата, Крушуна					
10	Бистрец					
11	Девненски					
12	Вриса					
13	Куманица					
14	Пали лула					
15	Бели извор					
16	Язо и Кьошка					
17	Настански					
18	Тъжа					
19	Хубча, Момчиловци					
20	Текира					
21	Кобиляк					
22	Паволче					
23	Клептуза					
24	Каменополе					
25	Крачимирско врело					
26	Злидол					
27	Габаре					
28	Крапец					
29	40-те извора					
30	Монтана					
31	Скакля, г. Бов					
32	Врелото, Студена					



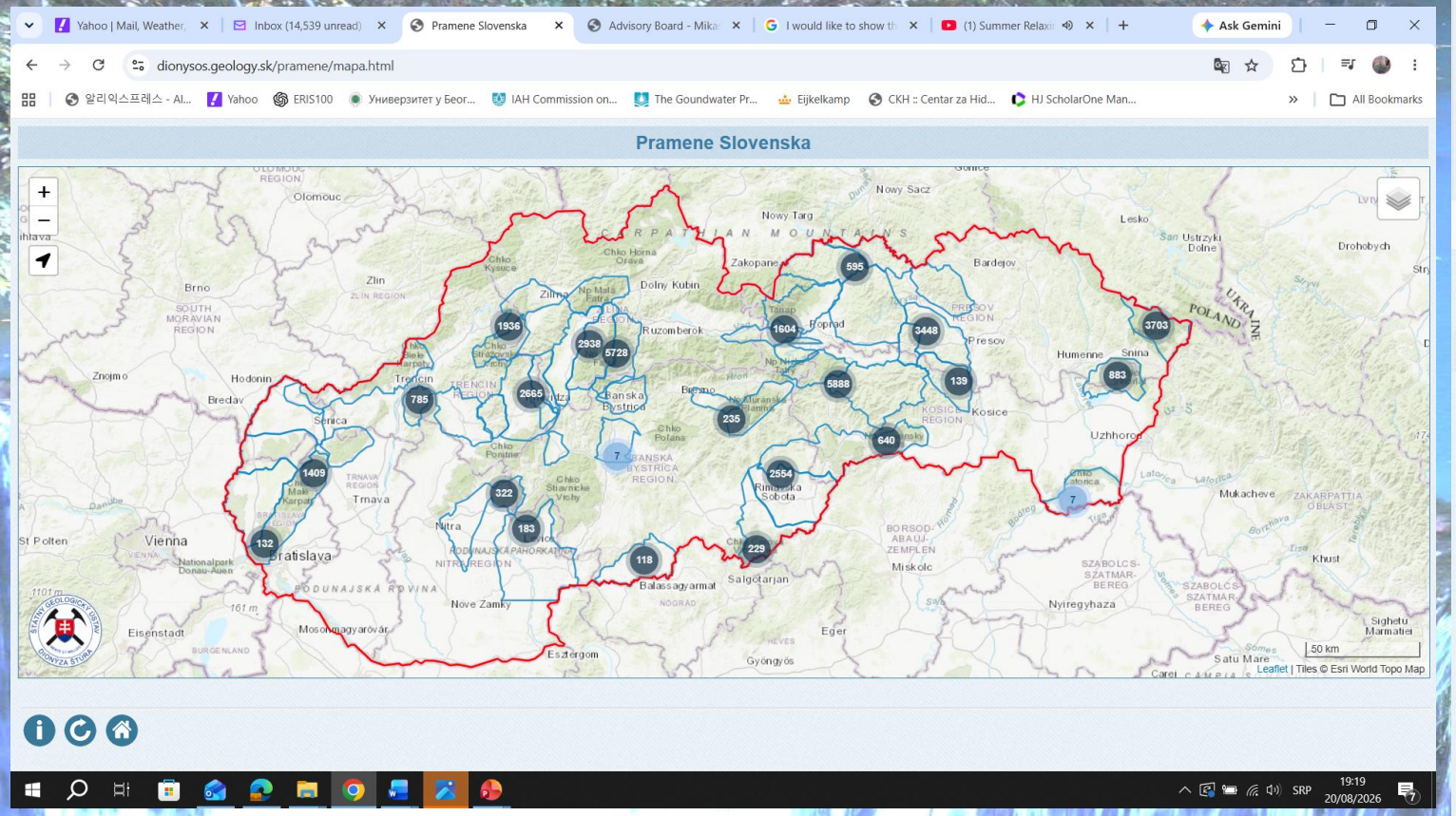
Polskie źródła krasowe i wywierzyska na liście światowego dziedzictwa naturalnego – realizacja projektów MIKAS oraz NIKAS

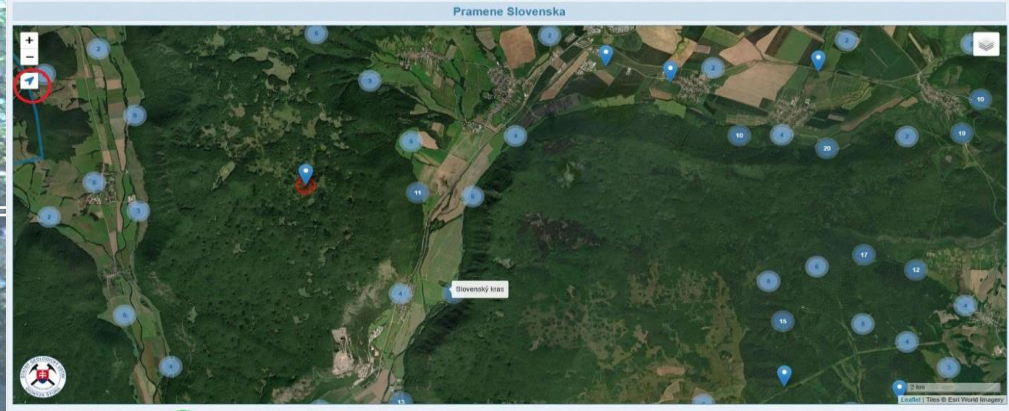
Grzegorz Barczyk[1], Stanisław Chmiel[2], Anna Chwalik-Borowiec[3], Jerzy Małecki[1], Dorota Okoń[4], Jacek Różkowski[5], Joanna Sposób[2], Marek Turczyński[2]

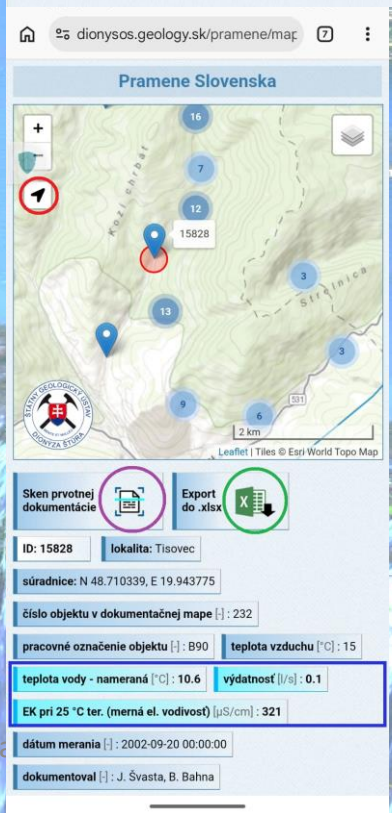
Database of springs in Slovakia

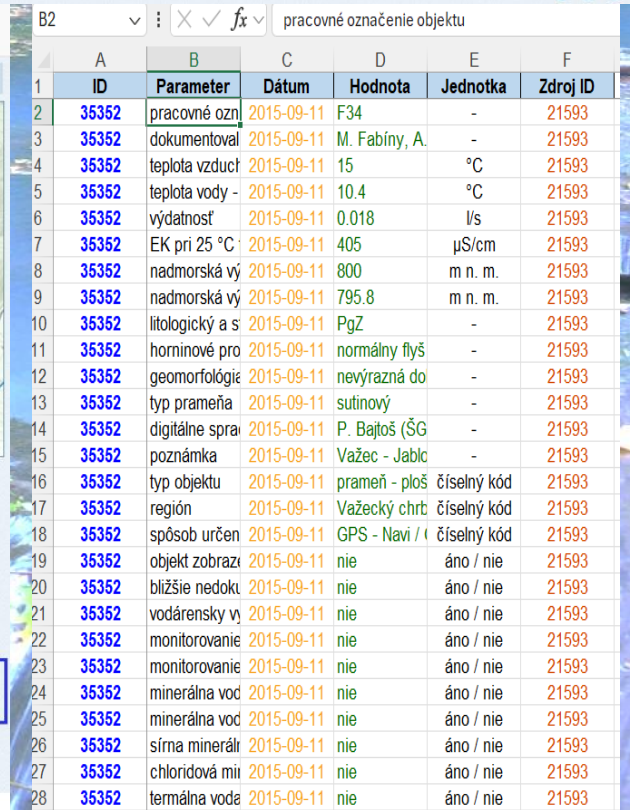
MOST IMPORTANT KARST AQUIFER SPRINGS

Database contains all springs that were documented by the Slovak Geological Institute (all together 36,148). There are also scans of original documentation notes and the information can be downloaded for a circuit of 1 km.



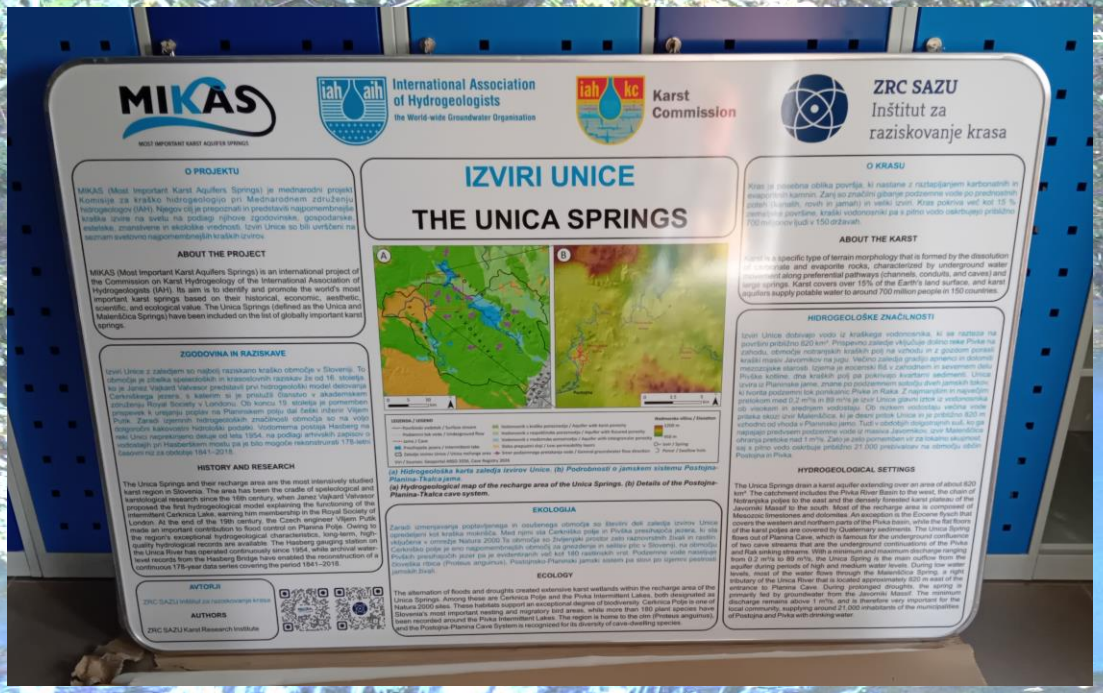


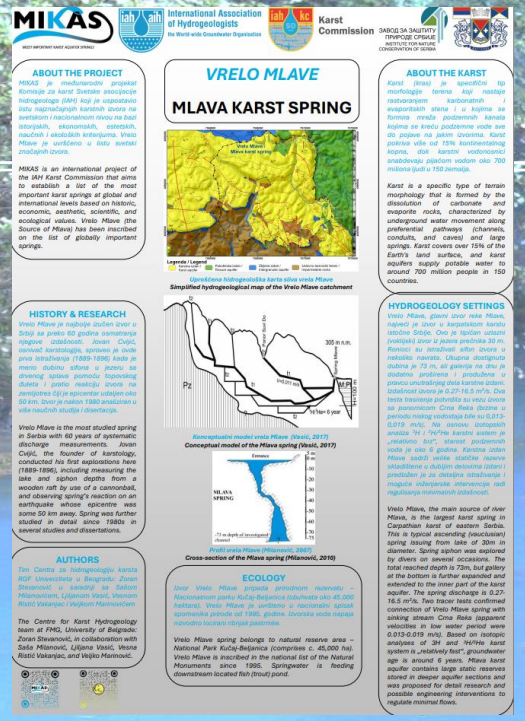


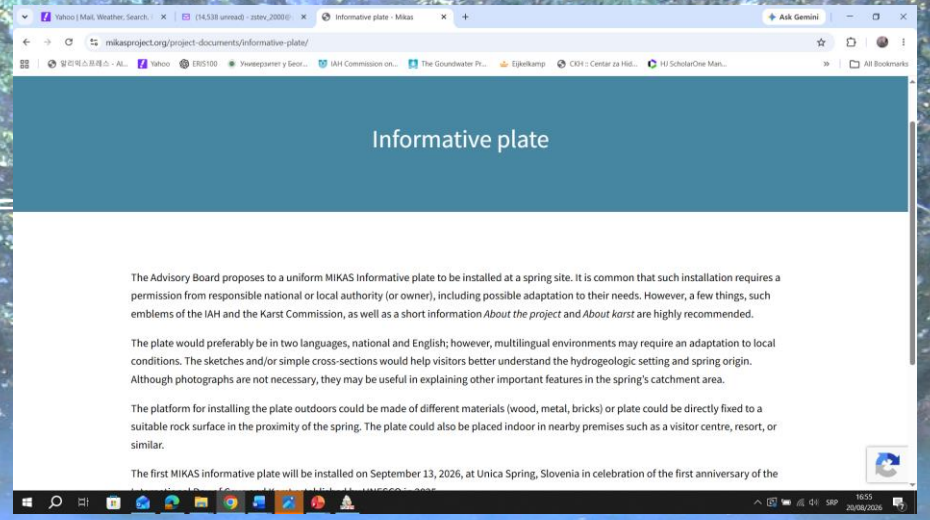


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3	35352	dokumentoval	2015-09-11	M. Fabíny, A.	-	21593
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6	35352	výdatnosť	2015-09-11	0.018	l/s	21593
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8	35352	nadmorská vý	2015-09-11	800	m n. m.	21593
9	35352	nadmorská vý	2015-09-11	795.8	m n. m.	21593
10	35352	litologický a s	2015-09-11	PgZ	-	21593
11	35352	horninové pro	2015-09-11	normálny flyš	-	21593
12	35352	geomorfológia	2015-09-11	nevýrazná do	-	21593
13	35352	typ prameňa	2015-09-11	sutinový	-	21593
14	35352	digitálne spra	2015-09-11	P. Bajtoš (ŠG	-	21593
15	35352	poznámka	2015-09-11	Važec - Jablc	-	21593
16	35352	typ objektu	2015-09-11	prameň - ploš	číselný kód	21593
17	35352	región	2015-09-11	Važecký chrb	číselný kód	21593
18	35352	spôsob určen	2015-09-11	GPS - Navi / (	číselný kód	21593
19	35352	objekt zobraz	2015-09-11	nie	áno / nie	21593
20	35352	bližšie nedoku	2015-09-11	nie	áno / nie	21593
21	35352	vodárensky vy	2015-09-11	nie	áno / nie	21593
22	35352	monitorovanie	2015-09-11	nie	áno / nie	21593
23	35352	monitorovanie	2015-09-11	nie	áno / nie	21593
24	35352	minerálna voc	2015-09-11	nie	áno / nie	21593
25	35352	minerálna voc	2015-09-11	nie	áno / nie	21593
26	35352	sírna mineráln	2015-09-11	nie	áno / nie	21593
27	35352	chloridová mir	2015-09-11	nie	áno / nie	21593
28	35352	termálna voda	2015-09-11	nie	áno / nie	21593

MIKAS project













MIKAS

MOST IMPORTANT KARST AQUIFER SPRINGS

iah kc 50 years Karst Commission

INTERNATIONAL DAY OF CAVES AND KARST

13th of September







MIKAS

MOST IMPORTANT KARST AQUIFER SPRINGS

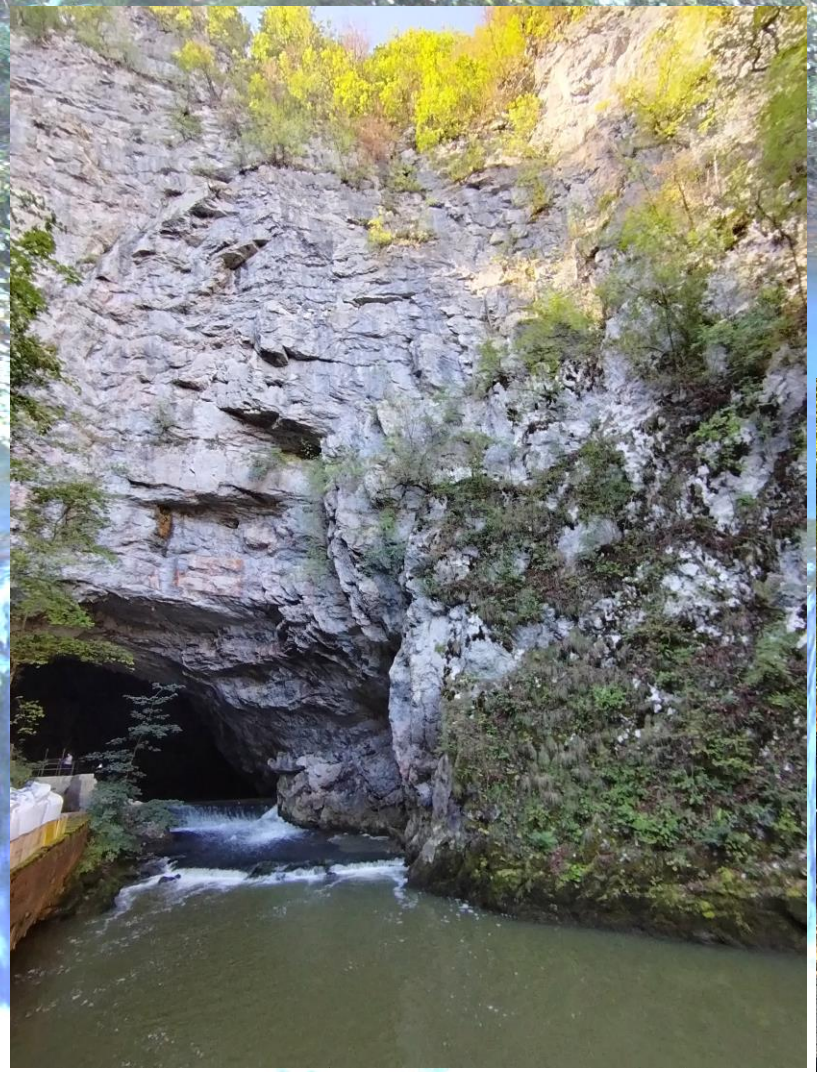
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Karst Commission



INTERNATIONAL DAY OF CAVES AND KARST

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MIKAS
MOST IMPORTANT KARST AQUIFER SPRINGS

iah kc 50 Karst Commission

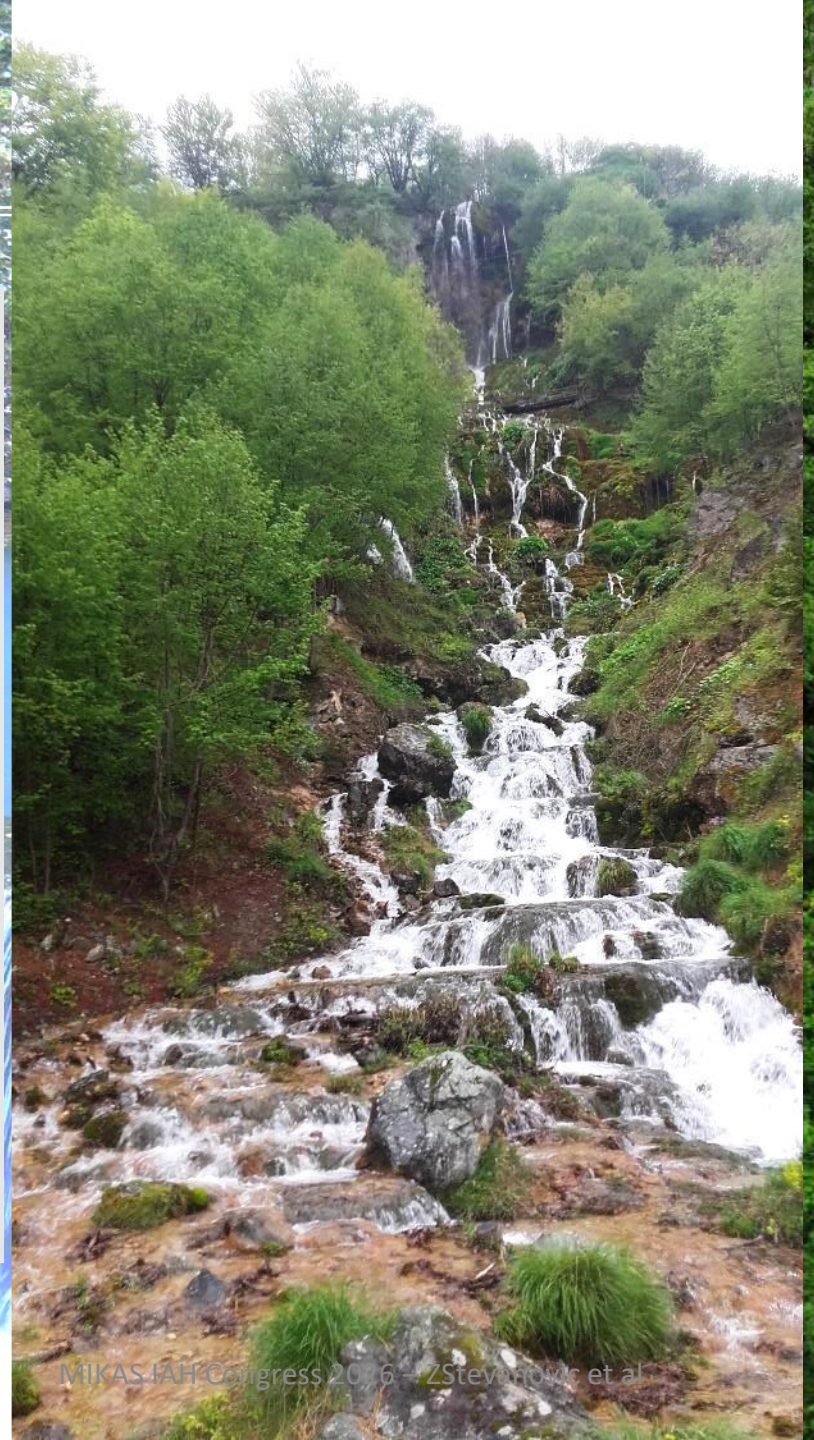
Proposal

Code of Practice – In preparation

The idea of identifying and protecting selected springs does not imply prevention of their further use. On the contrary, the aim of the initiative is to:

- highlight their importance,
- defend them from possible devastation, and
- ensure that any further intervention takes into account their protected status.

In case a spring is actively used for water supply, which would necessitate its greater protection, there would still be space for visits of organised groups during designated time slots.





MIKAS

Karst Commission

After 13 evaluation rounds we have preliminary list of 296 evaluated springs from 71 countries, out of which there are 195 MIKAS and 101 NIKAS Currently, 3 country reports are under evaluation.

Country (MIKAS+NIKAS)	MIKAS	NIKAS
Albania (1+2)	1. Blue eye (Syri i Kalter)	1. Syri Sheganit 2. Uji Ftohte
Austria (4+4)	1.Fürstenbrunner Quelle 2.Kläfferquellen (Kläffer spring) 3.Pießling-Ursprung 4.Kaiserbrunnen	1.Dachserfall 2."Gollinger Wasserfall (Schwarzbachfall)" 3.Teufelskirche 4.Waldbach-Ursprung
Bosnia & Herzegovina (2+0)	1.Buna (Vrelo Bune) 2.Vrelo Bosne	
Estonia (1+4)	1.Lavi	1.Uuemõisa Suurallikas 2.Aravete springs 3.Imastu springs 4.Võlingi (Võllingu) spring
Greece (2+0)	1.Almyros 2.Aggitis river Springs (Maaras cave)	
Israel (3+1)	1.Banias 2.Dan 3.Gihon	1.Ein Gedi
Lithuania (1+1)	1.Smardonės	1.Žalsvasis
New Zealand (1+0)	1.Waikoropupu	
Poland (2+12)	1. Goryczkowe (Wywierzysko Goryczkowe) 2. Zygmunt spring (Źródło Zygmunt)	1.Lodowe spring (Lodowe Źródło) 2.Bystra Spring (Wywierzysko Bystrej)" 3.Chochołowskie spring (Wywierzysko Chochołowskie) 4.Olczyskie spring (Wywierzysko Olczyskie) 5.Błękitne Źródła 6.Źródło Hydrografów 7.Niebieskie spring (Niebieskie Źródła) 8.Winiary spring (Źródło Winiary) 9.Zimne wody (Źródło „Zimne Wody") 10.Krasnobród spring (Krasnobród Kapliczka Podlasztor) 11.Wąwolnica 12.Zaporze
Slovenia (2+2)	1.Hubelj 2. Unica	1.Dobličica 2. Rižana
USA (15+0)	**1."Chassahowitzka No. 1 (7 Sisters Springs)" 2. Gainer Springs 3. Ichetucknee 4. Jackson Blue Spring 5. Rock Springs and Wekiwa Springs 6. Silver Springs Group 7. Suwannee Springs 8. Wakulla Springs 9. Warm Mineral Springs 10.Weeki Wachee 11.Giant Springs 12.Warm Springs 13.Comal Springs 14.San Marcos springs 15.San Solomon Springs**	

MIKAS

MOST IMPORTANT KARST AQUIFER SPRINGS

MIKAS
MOST IMPORTANT KARST AQUIFER SPRINGS

Global Karst Springs Expertise & Evaluation

Comprehensive breakdown of world experts, regional coverage, and classified springs

265

INVOLVED EXPERTS

Collaborating globally across 6 continents to map vital water resources.

71 / 93

COUNTRIES COVERED

71 countries with confirmed springs in MIKAS/NIKAS groups, out of 93 total countries.

195

MIKAS SPRINGS

Karst springs successfully evaluated, verified, and approved under the MIKAS category.

101

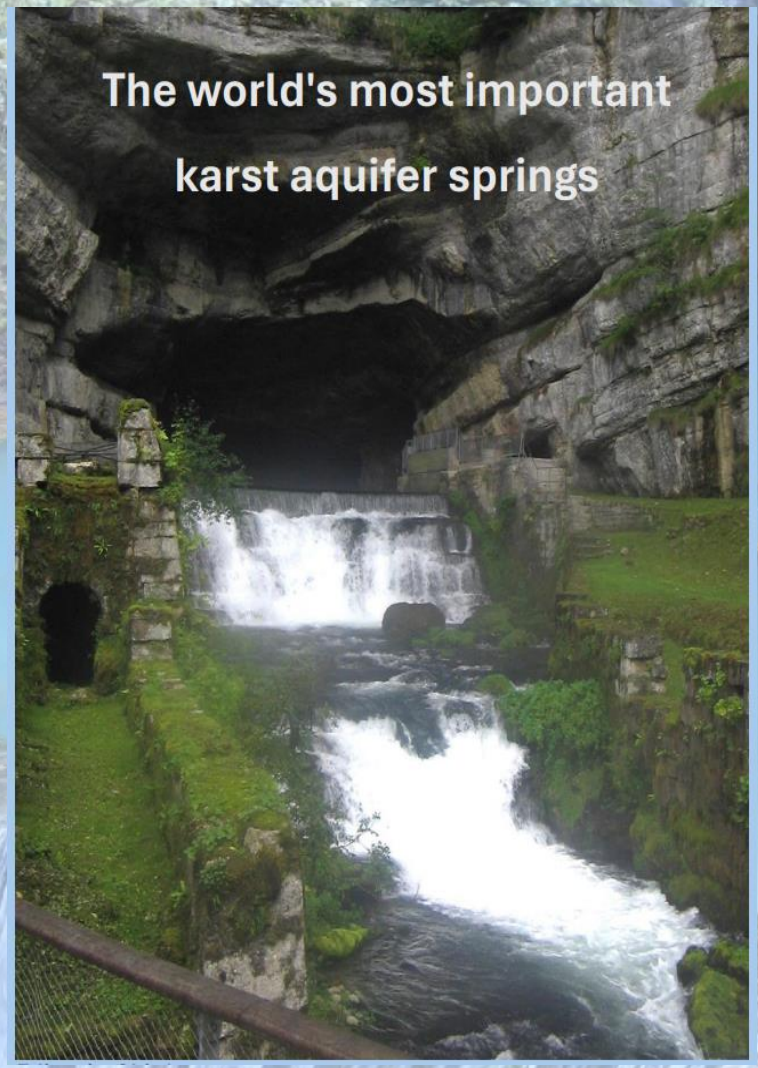
NIKAS SPRINGS

Karst springs successfully evaluated, verified, and approved under the NIKAS category.

Karst Commission

MIKAS – Further Steps

- Finalise Code of Practice for MIKAS
- Make a preliminary assessment of the countries where expertise is lacking by Work of AB members (about 15 additional countries)
- Prepare Open access Monograph



Draft

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MOST IMPORTANT KARST AQUIFER SPRINGS

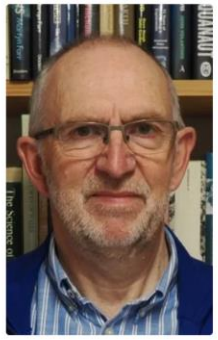
Project MIKAS - select, label and protect the world's most important karst springs

IAH 2026
World Groundwater Congress

Karst Commission



Zoran Stevanović
Prof. Ret. University of Belgrade, Serbia
Team Leader and Coordinator for Southern and Eastern Europe, Africa



John Gunn
Prof. Honor. University of Birmingham, UK
Coordinator for Northern and Western Europe, and Oceania



Neven Kresic
Independent Consultant and Director KWI, Warrenton, VA, USA
Coordinator for Northern America



Augusto Auler
Consultant and Director Instituto do Carste, Belo Horizonte, MG, Brazil
Coordinator for Southern America



Jubing Pu
Prof. Chongqing Normal University, P.R.China
Coordinator for Asia, IAH Karst Commission – Co-Chair



Avihu Burg
Geological Survey of Israel, Jerusalem, Israel
IAH Karst Commission, Past Co-Chair



Peter Malik
Geological Survey of Slovakia, Bratislava, Slovakia
IAH Karst Commission, Past Co-Chair



Benjamin Tobin
Kentucky Geological Survey, University of Kentucky, Lexington, KY, USA
IAH Karst Commission, Past Co-Chair



Thank you for attention

Visit: https://mikasproject.org/