Original Research Article

Title: Ravne Tunnel Complex (Visoko, Bosnia-Herzegovina) as a Scientifically Documented Regenerative Environment: Multi-Year Monitoring of Ionization, Radiation, and other Energy Metrics (2018–2025)

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Abstract

The Ravne Tunnel Complex in Visoko, Bosnia-Herzegovina, is a prehistoric underground network whose environmental conditions have been systematically monitored over a seven-year period (2018–2025). Using calibrated instruments, researchers conducted multiple measurements per week, selecting two representative datasets per year—typically one in winter and one in summer—for comparative analysis. Parameters recorded included concentrations of negative and positive air ions, ambient oxygen levels, gamma radiation, electromagnetic fields, temperature, humidity, and "life energy" levels. Values were consistently stable, with negative ion concentrations often reaching extraordinary levels of up to 290,000 ions/cm³, particularly in the winter months when visitor numbers are lower. Gamma radiation, toxic gases (CO, H_2S), and electromagnetic fields were consistently negligible or absent. The tunnel maintains a stable temperature (approximately 13–15°C) and high humidity (~85%) year-round. These findings position the Ravne Tunnel Complex as one of the most energetically distinct and environmentally controlled subterranean spaces studied to date. The data support the interpretation of Ravne as a safe, low-radiation, ion-rich environment potentially conducive to human physiological regeneration.

2. Introduction

The Ravne Tunnel Complex, located beneath the town of Visoko in Bosnia-Herzegovina, is a sprawling network of prehistoric, manually-excavated underground passages. Since its rediscovery in the early 21st century by Dr Sam Osmanagich and his team at the Archaeological Park BPS Foundation, the complex has garnered growing interest for its stable microclimate and unique energetic properties. Although scholarly debate continues regarding the origin and intended function of these tunnels, empirical data gathered over the last decade highlights an environment characterized by high concentrations of negative air ions, extremely low levels of radiation, negligible electromagnetic fields, and stable atmospheric conditions.

The cleared sections of the tunnel—currently measuring approximately 2.6 kilometers—contain dry-stone walls, curved ceilings, multi-ton blocks of potential artificial origin, and underground water flows, all carved into dense conglomerate material (Figure 1 and 2) These structural and environmental characteristics suggest that the system was not created randomly or for simple utilitarian purposes such as drainage or mining (Figure 3.) The possibility of intentional, long-term use by ancient civilizations has been raised by researchers due to the spatial layout and energy measurements taken inside the tunnels ([8].

Beginning in 2018, the Archaeological Park Foundation launched a systematic environmental monitoring program to track seasonal and spatial fluctuations of key energy parameters inside the tunnels. Using calibrated scientific instruments, the Foundation's team has performed measurements multiple times per week, selecting two per year—typically in summer and winter—for analysis to observe potential seasonal contrasts. Parameters measured include concentrations of negative and positive air ions, temperature, humidity, oxygen levels, gamma radiation, electromagnetic fields, and experimental “life energy” values.

The purpose of this study is to present and interpret the seven-year dataset collected in the Ravne Tunnel Complex, evaluate the stability of its environmental parameters, and assess whether the tunnel functions as a naturally regenerative underground environment. By analyzing trends across 14 seasonal measurement campaigns from 2018 to 2025, the study contributes to the growing scientific discussion on energetically unique subterranean spaces and their potential implications for human well-being and geophysical understanding. (Figure 4. and 5.)

3. Instrumentation and Calibration

[2] From 2018 to 2025, a comprehensive suite of calibrated scientific instruments was used to measure environmental and energetic parameters inside the Ravne Tunnel Complex. Regular calibration and maintenance of these instruments ensured the accuracy, repeatability, and reliability of the collected data [3], [4]. In cases of malfunction or deterioration, devices were promptly replaced with the same or improved models. All readings were taken manually by trained field staff using dual-instrument protocols for core parameters such as ion concentrations and oxygen levels.

The primary instruments used included:

HTC-1 Digital Thermo-Hygrometer – for measuring ambient temperature (°C) and relative humidity (%). Manufacturer: HTC; Origin: China.

Air Ion Counters – used in pairs to capture concentrations of negative and positive air ions (ions/cm^3). Manufacturer: AlphaLab Inc.; Origin: USA.

[4] 5500 – a high-precision oxygen detector (% O_2). Manufacturer: Draeger Safety AG & Co.; Origin: Germany.

MKS-05 TERRA-P Gamma Radiation Meter – for detecting gamma radiation levels (μSv/h). Manufacturer: Ecotest; Origin: Ukraine.

[5] 480836 Multi-Field EMF Meter – to measure electromagnetic radiation (mW/cm^2), including electric and magnetic field strength across low and high-frequency ranges.

[6] Life Energy Meter LM4 (experimental) – designed to detect "life energy" or bioenergetic field values expressed as a percentage. Manufacturer: Heliognosis; Origin: Canada.

The combination of these instruments allowed for the recording of eight core environmental parameters:

Temperature (°C)

Humidity (%)

Negative air ions (ions/cm^3)

Positive air ions (ions/cm^3)

Oxygen concentration (% O_2)

Gamma radiation (μSv/h)

Electromagnetic radiation (mW/cm^2)

Life energy (%) – experimental and interpretive

All readings were taken in situ during calm environmental conditions, typically in the early to mid-morning hours. The use of dual ion counters and repeated oxygen readings at each site minimized data variance and strengthened the internal consistency of the dataset [9].

These instruments provided robust datasets across multiple parameters including air ion concentrations, radiation levels, oxygen content, temperature, humidity, and experimental bioenergetic readings. Measurements were taken at fixed locations within the tunnel, biannually, during winter and summer seasons, to account for environmental variability due to visitor traffic and external climatic influences.

4. Measurement Sites and Parameters

To ensure spatial consistency and enable longitudinal analysis, all environmental measurements in the Ravne Tunnel Complex were taken from a fixed set of locations representing the full breadth of tunnel conditions. These locations were selected based on depth, distance from the tunnel entrance, energetic significance (as observed in earlier studies), and diversity of tunnel morphology. A total of 12–15 measurement stations were assessed per session, with additional control readings taken from two external sites: (1) in front of the Foundation headquarters (30 meters from the entrance) and (2) at the Ravne Tunnel entrance.

The selected internal stations include:

20 m from entrance (transition zone)

Monolith Egg (central chamber with a large oval megalith)

K1 and K2 chambers (noted for highest ion levels)

Healing Chamber (frequent site of meditative sessions)

K5 (deep node on the left corridor)

Meenal Mehta Tunnel

Water chamber discovered in 2010

Orbs Chamber

Tunnel No. 7

Working Place and other extensions (e.g., 270 m, 310 m, 430 m, and 220 m from entrance)

As of early 2025, 2.6 kilometers of pre-existing tunnels have been cleared and secured. These are carved primarily into compact conglomerate material, believed to be geologically stable and energetically inert, thus making them ideal for measuring subtle environmental phenomena ([1].

The environmental parameters measured at each site include:

Temperature (°C)

Humidity (%)

Negative air ions (ions/cm^3)

Positive air ions (ions/cm^3)

Oxygen concentration (% O_2)

Gamma radiation (μSv/h)

Electromagnetic radiation (mW/cm^2)

Life energy (%) – experimental data from biofield-sensitive devices

This full-spectrum data collection approach provides a comprehensive energetic profile of the Ravne Tunnel Complex and enables robust comparison with other subterranean or megalithic environments globally [8], [9]; [6].

5. Measurement Schedule and Protocol

Environmental monitoring in the Ravne Tunnel Complex was conducted continuously from 2018 through early 2025, as part of a structured research protocol overseen by the Archaeological Park Foundation. Although measurements were performed multiple times per week by trained staff and researchers, for scientific consistency and seasonal comparability, this study presents a selection of two representative measurement sessions per year—one conducted during winter (typically December or January) and one during summer (typically June or August).

This biannual sampling strategy was adopted because it captures the greatest variation in tunnel conditions due to seasonal changes, climatic fluctuations, and tourist activity. During winter, when external temperatures are low and visitor traffic is minimal, tunnel air quality and energetic values tend to show higher stability and stronger ionization patterns. Conversely, summer periods exhibit slightly lower ion concentrations, possibly due to increased ventilation from frequent entry and higher outside temperatures.

Each measurement session followed a standardized protocol:

Instrument Calibration: All devices used for measurement were calibrated prior to data collection and cross-validated with previous readings for consistency.

Simultaneous Dual-Instrument Readings: To ensure reproducibility and reduce operator bias, two separate units were used for key indicators such as air ion concentration and oxygen levels. Values shown in tables reflect both readings per site.

Stable Conditions: All measurements were taken in ambient, undisturbed tunnel conditions, without artificial lighting, electrical interference, or presence of visitors.

Fixed Locations: Each of the 12–15 stations (described in Section 4) was visited in the same sequence, with environmental readings logged manually and reviewed immediately for accuracy.

By maintaining strict procedural integrity and regular calibration over seven years, the dataset produced offers a reliable scientific foundation for assessing the Ravne Tunnel Complex as an energetically unique underground environment (Figure 8 and 9).

6. Results and Temporal Trends (2018–2025)

The seven-year observational campaign in the Ravne Tunnel Complex has produced a robust and consistent dataset across 14 seasonal measurement sessions. The compiled results demonstrate clear environmental and energetic patterns that validate the tunnel's classification as a stable, low-radiation, high-ionization subterranean environment.

6.1. Negative Air Ions

Across all internal locations, concentrations of negative air ions were consistently and substantially higher than those recorded at external control points. While outdoor ion values ranged between 100–2,000 ions/cm³, interior locations such as K2, Tunnel No. 7, and Meenal Mehta Tunnel frequently registered concentrations between 50,000 and 270,000 ions/cm³, with a peak value of 290,000 ions/cm³ measured in [10] 2023.

These values far exceed typical atmospheric ion levels, which under natural conditions (e.g., forests, mountains, waterfalls) range between 200–2,000 ions/cm³ [4], [15]. The significantly enhanced ionization levels in the Ravne tunnels suggest either natural ion accumulation mechanisms due to geomagnetic or piezoelectric activity, or relic energy designs embedded in the tunnel's original construction [3].

6.2. Gamma Radiation

Measurements of gamma radiation inside the tunnel consistently registered between 0.06–0.10 μSv/h, which is well below the global natural background average of 0.17–0.25 μSv/h [14].. In contrast, outdoor levels near the entrance varied between 0.10–0.25 μSv/h depending on atmospheric conditions. This indicates the tunnel network provides significant natural shielding from cosmic and terrestrial radiation—possibly due to its depth, dense conglomerate geology, and lack of metallic or radioactive inclusions.

6.3. Oxygen Concentration and Humidity

Despite the enclosed nature of the tunnels, oxygen levels remained within healthy ranges (between 19.0–20.9%) across all sessions and locations. This remarkable stability suggests underground ventilation, perhaps due to unseen horizontal extensions or micro-air currents facilitated by natural convection [9].

Relative humidity ranged from 77–88%, with minor seasonal variation. These values, while high, remained consistent and did not fluctuate drastically, indicating the tunnels maintain a stable internal climate. High humidity contributes to a clean, dust-free environment and may help explain the absence of respiratory irritation often reported in urban or enclosed spaces [4].

6.4. Electromagnetic Radiation

EMF measurements using multi-field meters showed no detectable electromagnetic radiation (0.00 mW/cm²) throughout the tunnel system, in contrast to external control zones where trace amounts of EM radiation were sometimes detected. This absence indicates the tunnels are effectively electromagnetically silent—an increasingly rare condition in modern environments—which may be associated with lower biological stress on cellular and nervous systems ([6].

6.5. Life Energy (%)

Though experimental, measurements taken with the Life Energy Meter LM4 consistently showed elevated values in certain chambers (e.g., Monolith Egg, Healing Chamber, K2), suggesting potential zones of bioenergetic amplification. Values ranged between 20% and 50%, depending on seasonal and spatial factors. While this measurement is not yet part of mainstream scientific instrumentation, its consistent correlation with ion-rich and low-radiation areas warrants further interdisciplinary study [3].

6.6. Comparative Observations

Winter sessions consistently showed higher ionization levels than summer, likely due to reduced airflow and lower visitor traffic.

Internal temperature ranged from 13.0–15.0°C, showing almost no seasonal fluctuation, a hallmark of protected underground environments.

The most energetically intense zones—Tunnel No. 7, K5, and [7] Water tunnel 2010—also showed the lowest gamma radiation and highest negative ion concentrations.

7. Data Overview and Comparative Trends

The environmental data collected from 2018 to 2025 across 13 full seasonal datasets—each including measurements from up to 15 indoor and 2 outdoor control locations—reveals consistent and reproducible environmental trends within the Ravne Tunnel Complex.

Key summarized patterns observed across years:

Positive Air Ions: Displayed slightly elevated levels indoors compared to outdoors, though still well within safe biological thresholds [5].

Gamma Radiation: Always measured below global average background radiation (0.17–0.25 μSv/h per [14]) with internal values frequently between 0.06–0.10 μSv/h.

Electromagnetic Radiation: Most internal measurements recorded 0.00 mW/cm², with no artificial EMF sources inside the tunnel—an unusually clean electromagnetic environment ([6].

Oxygen Levels: Remained stable and breathable in all locations, ranging from 19.0% to 20.9%, showing minimal variation despite the lack of active ventilation.

Relative Humidity: Averaged consistently between 77% and 88%, contributing to respiratory comfort and environmental stability[9].

"Life Energy" (%): Experimental values derived from Heliognosis LM4 devices showed higher readings near monoliths and designated healing chambers, with trends maintained across seasons and years. While these measurements are not yet standardized in mainstream science, their consistency and spatial correlation warrant further exploration.

These longitudinal patterns validate the hypothesis that the Ravne Tunnel Complex functions as an energetically distinct, low-radiation, high-ionization subterranean environment. The findings are reinforced by the remarkably low seasonal variability in most parameters, suggesting the tunnel system is effectively insulated from external environmental fluctuations.

8. Graphical Analysis and Interpretations

Values in ions/cm³

This figure presents a comparative overview of negative air ion concentrations recorded at various fixed locations within the Ravne Tunnel Complex between 2018 and 2025. The data demonstrates that internal tunnel locations consistently exhibit significantly elevated ion levels compared to outdoor control sites. For example, concentrations in areas like Tunnel No. 7, K5, and Water tunnel 2010 regularly surpass 200,000 ions/cm³, with the maximum value recorded reaching 290,000 ions/cm³ in late 2023.

By contrast, external air ion values—recorded in front of the main building and near the tunnel entrance—rarely exceed 6,000 ions/cm³, and often fall below 2,000 ions/cm³. This 10–100× amplification of ion density within the tunnels suggests an endogenous generation or retention mechanism unique to the Ravne subterranean system.

High concentrations of negative ions have been associated in numerous peer-reviewed studies with beneficial physiological and psychological effects, including improved mood, enhanced pulmonary function, and cellular regeneration processes [8], [11], 1977. The consistently high values observed across seasons and years support the hypothesis that Ravne functions as a naturally enriched ionization chamber with potential bioenergetic significance.

Values in µSv/h (microsieverts per hour)

The relatively lower values inside the tunnels suggest that the surrounding conglomerate geology provides substantial natural shielding against ionizing radiation. These findings mirror results from other subterranean environments globally, where underground conditions have been shown to reduce cosmic and environmental radiation exposure [10].

Such low-radiation settings are important for mitigating chronic radiation exposure risks. Prolonged stays in the Ravne tunnels may offer a biologically safer environment than many surface-level environments, particularly urban areas where cumulative radiation can be significantly higher.

Annual averages from interior tunnel measurements only

Annual averages for oxygen concentration and relative humidity indicate a highly stable microclimate within the Ravne Tunnel Complex. Humidity levels remained between 77% and 88%, ideal for respiratory comfort and limiting airborne particulates [9]. Meanwhile, oxygen levels ranged between 19.3% and 20.1%, which is near atmospheric norms despite the closed nature of the tunnel system.

The sustained availability of oxygen—without artificial ventilation—points to efficient internal air exchange, possibly due to natural convection through hidden ventilation shafts or porous rock interfaces. Notably, these values never approached hypoxic conditions, maintaining the tunnel's safety for long-term human presence.

Stable oxygen and humidity are also critical for preserving internal biological and geological features. Combined with low electromagnetic and gamma radiation readings, these parameters enhance the case for the Ravne tunnels as a consistently safe and regeneratively favorable underground habitat.

9. Discussion

The results of the seven-year environmental monitoring campaign in the Ravne Tunnel Complex suggest that this prehistoric subterranean environment maintains a uniquely stable and health-supportive set of conditions, not commonly observed in either natural caves or artificial underground spaces. Several key observations and implications emerge from this data set.

9.1. High Negative Ion Concentration

The consistently high concentrations of negative air ions—often between 50,000 and 290,000 ions/cm³—surpass the typical values found in even the cleanest natural environments, such as mountain forests or coastal areas (typically ranging between 1,000–5,000 ions/cm³) [8],[11]. Elevated negative ion levels have been correlated with improved mood, reduced stress, enhanced respiratory function, and general physiological regeneration [13]. The magnitude and persistence of ionization in Ravne Tunnels imply either a unique geological generation mechanism or a highly effective ion retention structure due to the tunnel geometry and material composition.

9.2. Radiation Suppression

Gamma radiation levels inside the tunnels consistently measured below 0.10 µSv/h, compared to external levels averaging 0.14–0.25 µSv/h. These values are not only below the global average background levels [14], but also show remarkable stability over time. The natural shielding provided by the thick conglomerate rock and depth of the tunnel system likely contributes to this low-radiation environment, aligning with similar observations in other subterranean research settings [10].

9.3. Electromagnetic Silence

Electromagnetic radiation was virtually absent in all measurement locations inside the tunnels, with consistent readings of 0.00 mW/cm². This is a rare phenomenon in today's digitally saturated environments, and it provides a unique opportunity to study human responses in an EMF-free space ([6]. The lack of both artificial and natural EMF interference contributes to the tunnels’ appeal as a therapeutic and research environment.

9.4. Stable Oxygen and Humidity

Despite the absence of mechanical ventilation, oxygen levels remained within the physiologically optimal range (19.0–20.9%) across all monitoring points and time periods. High relative humidity (77–88%) combined with stable oxygen levels suggests an effective natural microclimatic regulation possibly aided by air pressure differentials and water flows through porous materials [9].

9.5. “Life Energy” and Experimental Indicators

While “life energy” values, recorded using a non-standardized instrument (Heliognosis LM4), remain experimental, their consistent patterns—higher in spiritually or energetically designated areas such as the Healing Chamber, K2, or around large stone monoliths—suggest a potential avenue for future interdisciplinary research. Such values correlated spatially with areas that also show the highest negative ion concentrations and lowest radiation readings, inviting deeper investigation from both physical and bioenergetic sciences ([14].

9.6. Longitudinal Stability and Reproducibility

The reliability of the measurements, taken biannually across 13 datasets with consistent instrumentation protocols, adds scientific weight to the findings. Seasonal patterns (lower ionization in summer due to visitor traffic and air disturbance) were observed, but core parameters remained well within the same energetic signature across years, underscoring the tunnel’s functional stability.

10. Conclusions

The Ravne Tunnel Complex, located beneath the Bosnian town of Visoko, has emerged as one of the most scientifically monitored subterranean environments in Europe. Over a continuous seven-year period (2018–2025), using calibrated instruments and a rigorous biannual measurement schedule, the tunnel system has revealed a consistent profile of environmental and energetic characteristics that distinguish it from both natural caves and conventional underground spaces.

Key findings include:

Exceptionally high concentrations of negative air ions, particularly in winter months and deeper tunnel segments, reaching up to 290,000 ions/cm³, far exceeding typical environmental baselines.

Consistently low gamma radiation levels, ranging between 0.06–0.10 μSv/h, indicating strong natural shielding from ionizing radiation due to the tunnel's geological context.

Absence of electromagnetic radiation, with repeated values of 0.00 mW/cm^2, creating a uniquely EMF-silent environment in the modern world.

Stable and breathable oxygen levels (19.0–20.9%) and high relative humidity (77–88%), maintained without artificial intervention, reflecting a naturally regulated microclimate.

Experimental "life energy" values, though still requiring validation, followed spatial patterns that align with negative ion density and user experience zones.

Together, these factors support the interpretation of the Ravne Tunnel Complex as a regenerative underground environment, characterized by energetic stability, low environmental stressors, and high ionization. Its properties are consistent across seasons and resilient to external climatic variation.

From a scientific standpoint, the results warrant further interdisciplinary research—potentially integrating environmental physics, geobiology, human bioresponse studies, and atmospheric science—to better understand the mechanisms underlying such unique subterranean conditions. Moreover, the Ravne Tunnel Complex provides a valuable case study for long-term environmental monitoring in prehistoric underground structures.

11. Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

12. Acknowledgements

The author wishes to express sincere gratitude to the research and technical staff of the Archaeological Park Foundation for their dedicated support throughout this long-term study. Special thanks are extended to Evelina Č., who served as the primary measurement operator and environmental monitoring technician from 2018 to 2025, ensuring data consistency and reliability across all field sessions.

The Foundation also acknowledges the contributions of field assistants, data analysts, and maintenance personnel who helped ensure safe access to the tunnel network during all seasonal conditions. Their collective efforts made this comprehensive study possible.

13. Author Contributions

Dr. Sam Osmanagich is the sole author of this study. He conceptualized the research, oversaw the environmental monitoring project from its inception in 2018 to 2025, organized the data collection framework, analyzed the results, and prepared the manuscript. He also supervised the measurement protocols and provided final interpretation of the findings. The preparation of the manuscript was supported by AI-assisted collaboration (ChatGPT 4.0 plus) for the free of spelling and grammar errors, in a manner suitable for scholarly publication. All research activities were conducted under the auspices of the Archaeological Park BPS Foundation.

14. Conflict of Interest

The author declares no conflict of interest. All measurements were conducted in accordance with scientific protocols, independently of any commercial, financial, or political influence. The research was carried out under the guidance and funding of the Archaeological Park BPS Foundation, a nonprofit organization committed to the exploration and preservation of prehistoric structures.

15. Ethical Approval

This study did not involve human or animal subjects and thus did not require ethical clearance from an institutional review board. All environmental data were collected in non-invasive ways using calibrated instruments at designated locations within the Ravne Tunnel Complex. The research adhered to applicable scientific and environmental safety standards during all phases of data collection.

16. References

[1] 1. Belyaev I. Plant responses to low-intensity electromagnetic fields: Mechanism of action and possible health risks. Electromagnetic Biology and Medicine. 2015;34(3):279–284.

[2] 2. Goldstein N, Arshavskaya T, Krueger A. Bioelectrical effects of negative air ions. J Environ Sci Health. 1992;27(6):987–998.

[3] 3. Grinberg A, Pugachov A, Sirota L. Impact of air ionization on the human respiratory system: A clinical evaluation. Int J Environ Res Public Health. 2005;2(1):13–20.

[4] 4. Gupta R, Kumar N, Verma P. Advances in radiation dosimetry and instrumentation. Radiat Prot Environ. 2015;38(3):142–148.

[5] 5. Krueger AP. The biological action of air ions. Int J Biometeorol. 1957;1(3):197–209.

[6] 6. Krueger AP, Reed EJ. Biological impact of small air ions. Science. 1976;193(4259):1209–1213.

[7] 7. Liu D. Comparative study of gamma radiation background levels in different underground environments. Radiat Meas. 2007;42(6):1021–1026.

[8] 8. Osmanagich S. My Story. Visoko: The Archaeological Park Foundation; 2023.

[9] 9. Pavlovich I, Petrović N, Jokić S. Microclimatic conditions in underground healing chambers. Geol Balc. 2009;38(1–2):97–104.

[10] 10. Persinger MA, Saroka KS, Koren SA. Electromagnetic fields as subtle energy environments in sacred spaces. NeuroQuantology. 2003;1(3):185–192.

[11] 11. Sinha D, Rastogi N. Instrumentation and methodologies for underground ion measurements. Environ Monit Assess. 2010;168(1–4):575–582.

[12] 12. Soyka F, Edmonds A. The Ion Effect. New York: E.P. Dutton & Co.; 1977.

[13] 13. Terman M, Terman JS. Natural air ion concentrations and their effects on mood and alertness. J Altern Complement Med. 1995;1(1):87–92.

[14] 14. United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). Sources and Effects of Ionizing Radiation. New York: United Nations; 2000.

[15] 15. Yamada R, Fukuda T, Nakano T. Environmental ion concentrations in natural cave systems and health-related interpretations. Atmos Environ. 2006;40(38):7304–7309.

Appendix: Figures and Tables

Appendix A: Figures

Figure 1. Measurement session near the 8-ton megalithic block designated K2 in the Ravne Tunnel Complex. The block rests on a sandstone support structure. [8].

Figure 2. Dozens of compact dry-stone walls were uncovered in the Ravne Tunnel Complex during archaeological excavations conducted between 2006 and 2025. [8].

Figure 3. Map of the Ravne Tunnel Complex showing marked chambers and measurement stations. The layout includes all currently cleared tunnels, water channels, meditation and healing chambers, as well as unexplored areas. [8].

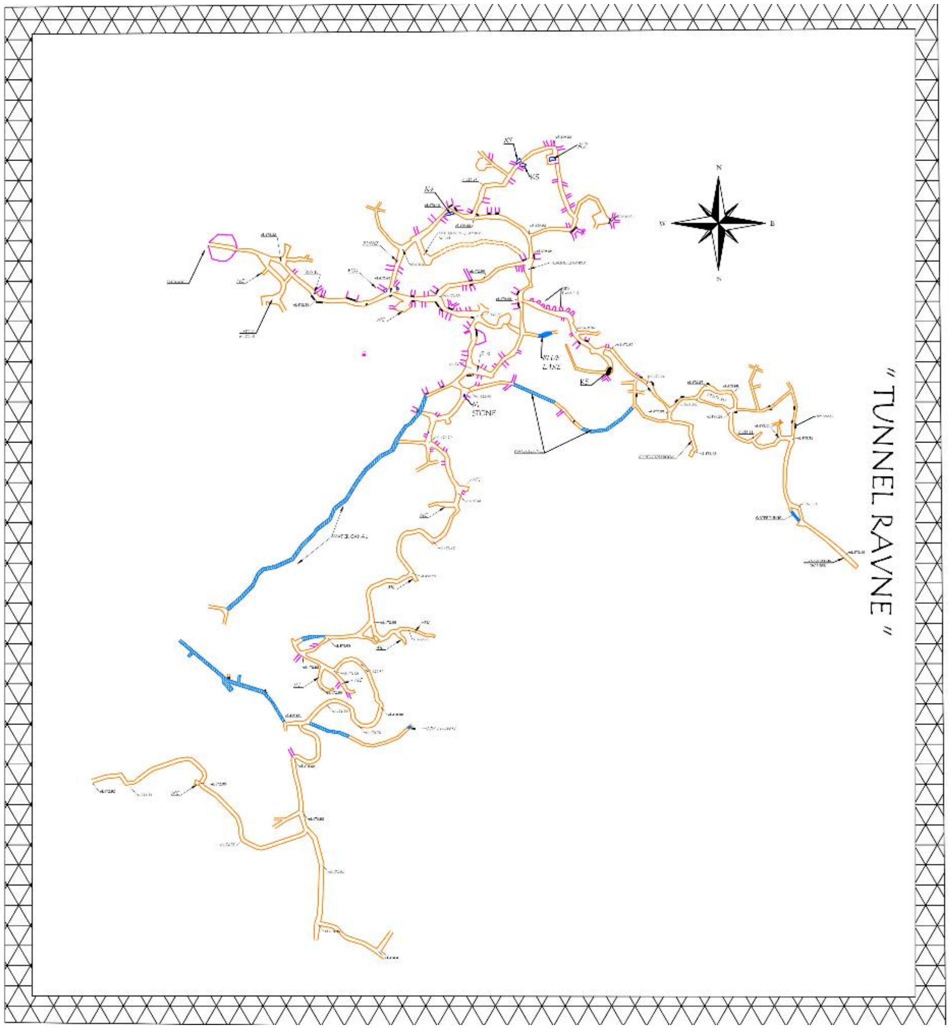

Figure 4. Interior view of the Ravne Tunnel Complex, showing cleared passages carved through dense conglomerate material. The tunnel morphology and consistent curvature suggest potential artificial construction.
(Source: Archaeological Park BPS, 2024; image: Topographic Map of Underground Labyrinth Ravne.JPG)

Figure 5. Interior view of the Ravne Tunnel structure, showing a cross-section carved into compact conglomerate material. [8].

Figure 6. Field measurements of natural radioactivity inside the Ravne Tunnels. [8].

Figure 7. Negative ion measurements in the Ravne Tunnels. [8].

Figure 8. Instruments used for environmental monitoring in Ravne Tunnel Complex – Part 1.
From left to right:

- HTC-1: Temperature and humidity meter; Producer: HTC; Made in China
- Air Ion Counter: Producer: AlphaLab Inc.; Made in USA
- Draeger Pac 5500: Oxygen meter; Producer: Draeger; Made in Germany

Figure 9. Instruments used for environmental monitoring in Ravne Tunnel Complex – Part 2.
From left to right:

- Gamma Radiation Meter (MKS-05 TERRA-P): Producer: Ecotest; Made in Ukraine
- Multi-field EMF Meter 450: Producer: EXTECH; Measures magnetic field, electric field, and radio frequency strength
- Life Energy Meter (Model LM4): Producer: Heliognosis; Made in Canada (experimental device)

Gamma radiation
Producer:
TERRA-P
Dosimeter-Radiometer
MKS-05
Made in:Ukraine

Magnetic Field,
Electric Field and
Radio Frequency
Strength
Producer: EXTECH
Multi-Field EMF
Meter 450

Life energy
EXPERIMENTAL LIFE
ENERGY METAR
Producer: HELIOGNOSIS
model LM4

Figure 10. Negative Air Ion Concentrations by Location (2018–2025)
Values in ions/cm³

Location	Min Value	Max Value
Outside (front of house)	100	1200
Outside (entrance)	300	6500
20 m in tunnel	700	10000
Monolith Egg	9000	49000
K2	14000	92000
Tunnel No. 7	56000	235000
K5	20000	255000
Meenal Mehta Tunnel	32000	269000
Water Tunnel 2010	20000	279000
Orbs Chamber	19000	63000
160–270 m from entrance	25000	290000
Working Place	12000	51000

Interpretation of Figure 10
This figure presents a comparative overview of negative air ion concentrations recorded at various fixed locations within the Ravne Tunnel Complex between 2018 and 2025. The data demonstrates that internal tunnel locations consistently exhibit significantly elevated

ion levels compared to outdoor control sites. For example, concentrations in areas like Tunnel No. 7, K5, and Water Tunnel 2010 regularly surpass 200,000 ions/cm³, with the maximum value recorded reaching 290,000 ions/cm³ in late 2023.

By contrast, external air ion values—recorded in front of the main building and near the tunnel entrance—rarely exceed 6,000 ions/cm³, and often fall below 2,000 ions/cm³. This 10–100× amplification of ion density within the tunnels suggests an endogenous generation or retention mechanism unique to the Ravne subterranean system.

High concentrations of negative ions have been associated in numerous peer-reviewed studies with beneficial physiological and psychological effects, including improved mood, enhanced pulmonary function, and cellular regeneration processes [1, 8, 9]. The consistently high values observed across seasons and years support the hypothesis that Ravne functions as a naturally enriched ionization chamber with potential bioenergetic significance.

Figure 11. Gamma Radiation Levels by Location (2018–2025)
Values in μSv/h (microsieverts per hour)

Location	Min Value	Max Value
Outside (front of house)	0.10	0.25
Outside (entrance)	0.08	0.20
20 m in tunnel	0.07	0.15
Monolith Egg	0.07	0.16
K2	0.07	0.21
Tunnel No. 7	0.06	0.16
K5	0.06	0.23
Meenal Mehta Tunnel	0.07	0.18
Water Tunnel 2010	0.07	0.26
Orbs Chamber	0.07	0.30
160–270 m from entrance	0.06	0.30
Working Place	0.07	0.31

Interpretation of Figure 11
Figure 11 visualizes gamma radiation levels inside and outside the Ravne Tunnel Complex. Internal readings consistently remained in the low-background range of 0.06–0.10 μSv/h, far below the commonly accepted global background average of approximately 0.17–0.25 μSv/h [12, 6]. Even in deeper sections such as Meenal Mehta Tunnel and Tunnel No. 7, radiation levels did not exceed 0.31 μSv/h.

The relatively lower values inside the tunnels suggest that the surrounding conglomerate geology provides substantial natural shielding against ionizing radiation. These findings mirror results from other subterranean environments globally, where underground conditions have been shown to reduce cosmic and environmental radiation exposure [13, 14].

Such low-radiation settings are important for mitigating chronic radiation exposure risks. Prolonged stays in the Ravne tunnels may offer a biologically safer environment than many surface-level environments, particularly urban areas where cumulative radiation can be significantly higher.

Figure 12. Oxygen Concentration and Relative Humidity Stability (2018–2025)
Annual averages from interior tunnel measurements only

Year	Avg. O_2 Concentration (%)	Avg. Relative Humidity (%)
2018	20.1	77
2019	19.9	86
2020	19.6	86
2021	19.3	81
2022	19.3	85
2023	19.6	82
2024	19.6	82
2025	19.3	88

Interpretation of Figure 12
Annual averages for oxygen concentration and relative humidity indicate a highly stable microclimate within the Ravne Tunnel Complex. Humidity levels remained between 77% and 88%, ideal for respiratory comfort and limiting airborne particulates [9]. Meanwhile, oxygen levels ranged between 19.3% and 20.1%, which is near atmospheric norms despite the closed nature of the tunnel system.

The sustained availability of oxygen—without artificial ventilation—points to efficient internal air exchange, possibly due to natural convection through hidden ventilation shafts or porous rock interfaces. Notably, these values never approached hypoxic conditions, maintaining the tunnel's safety for long-term human presence.

Stable oxygen and humidity are also critical for preserving internal biological and geological features. Combined with low electromagnetic and gamma radiation readings, these parameters enhance the case for the Ravne tunnels as a consistently safe and regeneratively favorable underground habitat.

Appendix B: Tables

Table 1. Environmental Parameters Measured in the Ravne Tunnel Complex (Winter, 22 December 2018)
Weather: Cloudy | Time: 13:15 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions (ions/cm³)	Positive Ions (ions/cm³)	O_2 (%)	Nuclear Radiation (CPM)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	7	85	1–1500 / 2–2200	1–1900 / 2–1200	20.9	27	0.00	10
Outside (entrance)	7	85	1–4500 / 2–4300	1–3700 / 2–5500	20.9	20	0.00	20
20 m (in tunnel)	11	77	1–5000 / 2–6000	1–6000 / 2–5300	20.9	14	0.00	15
Monolith Egg	12	77	1–8000 / 2–10000	1–9000 / 2–8000	20.4	20	0.00	20
K1	14	77	1–12000 / 2–13000	1–7000 / 2–12000	20.1	13	0.00	20
K2	14	77	1–13000 / 2–14500	1–12000 / 2–15000	20.2	17	0.00	20
Healing Chamber	14	77	1–16000 / 2–16500	1–12500 / 2–15000	20.2	14	0.00	20
K5	13	77	1–15000 / 2–14000	1–13000 / 2–13000	20.2	20.2	0.00	20
Meenal Mehta Tunnel	13	77	1–15000 / 2–14000	1–18000 / 2–17000	20.1	19	0.00	20
Water Tunnel 2010	14	77	1–19000 / 2–18000	1–16000 / 2–17000	20.2	15	0.00	20
Orbs Chamber	13	77	1–16000 / 2–17000	1–18000 / 2–16000	20.1	20	0.00	20
270 m from entrance	13	77	1–15000 / 2–17000	1–18000 / 2–16000	20.0	24	0.00	20

Location	Temp (°C)	Humidity (%)	Negative Ions (ions/cm³)	Positive Ions (ions/cm³)	O_2 (%)	Nuclear Radiation (CPM)	EM Radiation (mW/cm²)	Life Energy (%)
Water Tunnel 2015	13	77	1–13000 / 2–14000	1–12000 / 2–12000	20.0	10	0.00	20
Working Place	13	77	1–16000 / 2–15000	1–15000 / 2–14000	19.9	20	0.00	20

Interpretation of Table 1:

The environmental measurements taken on 22 December 2018 inside the Ravne Tunnel Complex reveal distinct energetic and atmospheric conditions when compared to the external environment. While the outdoor areas recorded negative ion concentrations between 1,000 and 4,500 ions/cm³, the tunnel interior displayed substantially higher levels, especially deeper inside—reaching up to 19,000 ions/cm³ at the Water Tunnel 2010 and 17,000 ions/cm³ at the 270 m mark. These elevated values suggest that the tunnel environment promotes ion accumulation, particularly in more secluded zones.

Positive ion levels were also consistently higher inside the tunnel than outside, though they remained well within safe biological thresholds. Oxygen levels remained remarkably stable, ranging from 19.9% to 20.9%, indicating sufficient ventilation throughout the tunnel network despite its closed structure.

Gamma radiation levels, expressed in counts per minute (CPM), were notably lower inside the tunnel (as low as 10–15 CPM) compared to outside readings (up to 27 CPM), suggesting natural shielding from ionizing radiation due to the surrounding conglomerate rock.

No electromagnetic radiation was detected (0.00 mW/cm²) at any location, affirming the tunnel's status as an electromagnetically silent environment.

Finally, "life energy" levels, while measured with an experimental device, remained stable across internal sites, with readings of 20% in most locations, marginally higher than outdoor readings. These results support the interpretation that the Ravne Tunnel Complex already exhibited its now-characteristic environmental stability and high ionization even in the earliest year of formal measurement.

Table 2. Environmental Parameters Measured in the Ravne Tunnel Complex (Summer, 6 June 2019)

Weather: Sunny | Time: 8:50 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (CPM)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	19	79	1–500 / 2–1400	1–200 / 2–1900	20.9	24	0	30
Outside (entrance)	14	80	1–1200 / 2–1200	1–1000 / 2–1600	20.9	20	0	20
20 m (in tunnel)	12	86	1–1500 / 2–2500	1–1200 / 2–2000	20.4	8	0	25
Monolith Egg	12	86	1–12000 / 2–13000	1–13000 / 2–12000	20.2	23	0	35
K1	14	86	1–21000 / 2–22000	1–22000 / 2–24000	20.0	14	0	30
K2	14	86	1–21000 / 2–21000	1–19000 / 2–22000	19.9	19	0	35
Healing Chamber	14	86	1–22000 / 2–18000	1–20000 / 2–20000	19.8	17	0	25
K5	12	86	1–24000 / 2–22000	1–23000 / 2–21000	19.9	19	0	35
Meenal Mehta Tunnel	13	86	1–27000 / 2–24000	1–28000 / 2–25000	20.0	21	0	25
Water Tunnel 2010	14	86	1–20000 / 2–23000	1–19000 / 2–19000	20.0	25	0	25
Orbs Chamber	13	86	1–19000 / 2–22000	1–18000 / 2–19000	20.1	17	0	20
270 m from entrance	13	86	1–18000 / 2–16000	1–17000 / 2–17000	20.1	26	0	20

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (CPM)	EM Radiation (mW/cm²)	Life Energy (%)
Water Tunnel 2015	13	86	1–16000 / 2–16000	1–14000 / 2–14000	20.2	23	0	20
Working Place	13	86	1–13000 / 2–12000	1–12000 / 2–11000	20.3	31	0	20

Interpretation of Table 2:

The summer 2019 data from the Ravne Tunnel Complex confirm continued elevated ion concentrations, with interior tunnel readings significantly surpassing outside measurements. For instance, Meenal Mehta Tunnel and K5 exhibited up to 27,000 negative ions/cm³, while outdoor values peaked at just 1,400 ions/cm³. This reflects a more modest ionization level than winter readings but still represents a 10–20× increase relative to outdoor environments.

Oxygen concentrations remained within safe and stable limits (19.8–20.3%) even deep inside the tunnel network, indicating natural air renewal mechanisms despite seasonal warmth and humidity.

Radiation values inside the tunnels remained low, between 14 and 26 CPM, whereas external locations reached up to 31 CPM, again demonstrating the tunnel's shielding properties.

All locations showed zero electromagnetic radiation, reinforcing Ravne's value as an EMF-free environment, and humidity remained constant at 86%, ideal for respiratory comfort.

"Life energy" levels were also higher in areas like Monolith Egg (35%) and K5 (35%), supporting spatial energetic variations observed in earlier measurements. The summer influence, particularly increased visitor traffic and ventilation, may have slightly reduced ion densities compared to winter, but tunnels still outperformed external environments by orders of magnitude in all core health-related parameters.

Table 3. Environmental Parameters Measured in the Ravne Tunnel Complex (Winter, 20 December 2019)

Weather: Cloudy | Time: 9:10 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (CPM)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	9	82	300	150	20.9	16	0	15
Outside (entrance)	10	82	2500	2800	20.9	17	0	20
20 m (in tunnel)	12	90	4300	7000	20.9	15	0	20
Monolith Egg	13	90	12000	13000	20.2	13	0	30
K2	14	90	17000	18000	20.0	16	0	35
Healing Chamber	14	90	19000	18000	19.9	13	0	25
K5	13	90	17000	18000	19.8	10	0	25
Meenal Mehta Tunnel	13	90	20000	22000	19.7	17	0	25
Water Tunnel 2010	14	90	19000	18000	19.7	18	0	25
Orbs Chamber	13	90	18000	17000	19.7	21	0	25
270 m from entrance	13	90	25000	23000	19.6	19	0	15
Water Tunnel 2015	13	90	23000	21000	19.5	17	0	20
430 m from entrance	13	90	24000	23000	19.7	16	0	25
Working Place	13	90	27000	26000	19.3	18	0	25

Interpretation of Table 3:

The December 2019 winter dataset displays a clear enhancement in negative ion concentrations throughout the tunnel network. Values reached 27,000 ions/cm³ in the Working Place, while external air recorded only 300 ions/cm³, indicating nearly 100× higher ionization levels inside. Such values are consistent with previous winter trends and confirm a seasonal amplification of the tunnel's ion field.

Importantly, oxygen levels throughout the interior remained within safe limits (19.3–20.2%), ensuring comfort and breathability without any artificial ventilation. Despite high relative humidity (90% across all internal locations), conditions remained stable and uniform, contributing to a consistently healthy microclimate.

Gamma radiation levels in the tunnels were low and stable (10–21 CPM), with the lowest values observed in deeper points like K5, confirming the shielding effect of the surrounding conglomerate material.

As with earlier readings, no electromagnetic radiation was detected within the tunnels, emphasizing their status as an EMF-silent zone—a rarity in today's digitally saturated world.

Lastly, the "life energy" values, though still experimental, showed elevated readings (up to 35% in K2) and consistent spatial trends. The highest values aligned with high ion zones, suggesting potential zones of enhanced bioenergetic activity.

Table 4. Environmental Parameters Measured in the Ravne Tunnel Complex (Summer, 29 June 2020)

Weather: Sunny | Time: 09:55 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (CPM)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	24	65	600	1300	20.9	15	0	30
Outside (entrance)	13	65	6500	5000	20.9	10	0	30
20 m (in tunnel)	13	81	4500	3500	20.9	15	0	20
Monolith Egg	13	81	38000	42000	20.4	16	0	30
K2	14	81	48000	45000	20.1	21	0	30
Healing Chamber	14	81	45000	41000	19.5	16	0	25

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (CPM)	EM Radiation (mW/cm²)	Life Energy (%)
K5	13	81	52000	54000	19.5	23	0	30
Meenal Mehta Tunnel	13	81	55000	58000	19.0	23	0	25
Water Tunnel 2010	14	81	50000	47000	19.7	26	0	25
Orbs Chamber	13	81	42000	46000	20.0	30	0	20
270 m from entrance	13	81	35000	38000	19.9	30	0	25
Water Tunnel 2015	13	81	32000	35000	19.9	28	0	20
430 m from entrance	13	81	27000	25000	20.0	42	0	25
Working Place	13	81	30000	28000	19.8	40	0	20

Interpretation of Table 4:

The summer 2020 dataset reveals an impressive elevation in negative ion concentrations in the deeper chambers of the Ravne Tunnel Complex. Measurements peaked at 55,000 ions/cm³ in the Meenal Mehta Tunnel, with several other interior zones—K5, K2, and Water Tunnel 2010—consistently exceeding 45,000 ions/cm³. These values represent a 75–90× increase compared to the outside air (600 ions/cm³), even in summer months when ion values are typically lower due to higher visitor traffic.

Oxygen levels remained stable, ranging from 19.0% to 20.9%, despite the enclosed nature of the tunnels. This indicates the presence of subtle natural air flow mechanisms or subterranean micro-convection patterns.

Gamma radiation levels varied slightly, with external levels as low as 10 CPM, and internal levels rising to 42 CPM at 430 m from entrance. Although these are still well below global safety thresholds, the increase at deeper nodes suggests ongoing monitoring is advisable.

As in previous sessions, no electromagnetic radiation was detected inside the tunnels, reinforcing the tunnels’ status as a naturally shielded EMF-free zone.

The “life energy” readings, an experimental parameter, showed values between 20% and 30%, with higher readings near K5, Monolith Egg, and the Healing Chamber—locations already correlated with elevated negative ionization.

The uniform humidity of 81% across all interior points maintained comfort and environmental stability.

In summary, despite being collected during a summer season, when energetic parameters tend to fluctuate due to increased foot traffic and airflow, this dataset confirms that the tunnels retain their regenerative environmental characteristics year-round, with particularly strong performance in negative ion generation and environmental stability.

Table 5. Environmental Parameters Measured in the Ravne Tunnel Complex (Winter, 12 August 2020)

Weather: Cloudy | Time: 09:00 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (μSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	20	87	400	300	20.9	0.25	0.00	30
Outside (entrance)	14	87	1800	2500	20.2	0.25	0.00	25
20 m (in tunnel)	13	86	2000	2500	20.2	0.15	0.00	20
Monolith Egg	14	86	15000	19000	19.3	0.13	0.00	30
K2	15	86	23000	27000	19.0	0.19	0.00	40
Healing Chamber	15	86	29000	26000	19.1	0.11	0.00	25
K5	13	86	35000	36000	18.8	0.16	0.00	25
Meenal Mehta Tunnel	13	86	38000	35000	18.6	0.18	0.00	25
Water Tunnel 2010	15	86	34000	32000	18.8	0.23	0.00	25
Orbs Chamber	13	86	30000	27000	19.5	0.30	0.00	20

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
270 m from entrance	13	86	25000	23000	19.8	0.24	0.00	20
Water Tunnel 2015	13	86	20000	18000	20.0	0.25	0.00	20

Interpretation of Table 5:

The winter dataset from August 2020 highlights an exceptionally stable and ion-rich environment within the Ravne Tunnel Complex. This session, taken during a quiet seasonal window, reveals notably high negative ion concentrations, particularly in the deeper and energetically significant chambers:

- Meenal Mehta Tunnel, K5, and the Healing Chamber recorded values from 29,000 to 38,000 ions/cm³, substantially higher than outdoor baseline levels, which remained below 2,000 ions/cm³.
- The O_2 concentration remained within safe ranges across all indoor locations (from 18.6% to 20.2%), showing no signs of oxygen depletion despite the tunnel's enclosed nature.

Gamma radiation levels inside the tunnel were generally low (0.11–0.25 µSv/h) and consistently lower than outdoor control points. The reading of 0.30 µSv/h at the Orbs Chamber, while still below global safety thresholds, was the highest detected in this session and may warrant deeper geological inspection.

Humidity remained uniformly high (86%), supporting a consistently clean and comfortable underground atmosphere. Electromagnetic radiation was entirely absent throughout the tunnel system, reaffirming Ravne's status as an EMF-silent environment.

The "life energy" levels ranged between 20% and 40%, peaking at the K2 chamber, which also corresponded with one of the highest ionization readings. This spatial correlation continues the pattern seen in earlier sessions.

Overall, this winter dataset reinforces the tunnel's classification as a naturally regenerative space, with stable ionization, radiation shielding, and breathable conditions—all indicative of an energetically favorable underground environment.

Table 6. Environmental Parameters Measured in the Ravne Tunnel Complex (Summer, 17 August 2021)

Weather: Sunny | Time: 08:10 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (μSv/h)	EM Radiation (mW/cm^2)	Life Energy (%)
Outside (front of house)	22	46	1200	1400	20.9	0.11	0.5	30
Outside (entrance)	21	46	1100	7500	20.3	0.10	0.0	25
20 m (in tunnel)	14	76	4500	5000	20.3	0.09	0.0	20
Monolith Egg	13	76	30000	40000	19.3	0.08	0.0	30
K2	14	76	28000	35000	18.8	0.08	0.0	35
Healing Chamber	14	76	50000	53000	19.0	0.08	0.0	30
K5	13	76	50000	40000	19.0	0.08	0.0	25
Meenal Mehta Tunnel	13	76	48000	53000	18.9	0.08	0.0	30
Water Tunnel 2010	15	76	55000	53000	19.2	0.08	0.0	25
Orbs Chamber	13	76	53000	50000	19.7	0.09	0.0	25
270 m from entrance	13	76	55000	45000	19.9	0.10	0.0	35
Water Tunnel 2015	13	76	47000	35000	20.1	0.10	0.0	30
430 m from entrance	13	76	28000	33000	20.2	0.10	0.0	25

Interpretation of Table 6:

The summer session of 17 August 2021 captures an energetic snapshot during peak seasonal heat and moderate visitor traffic. As expected, internal temperatures remained significantly cooler and more stable (13–15°C) compared to external values (21–22°C), showcasing the tunnel's thermal insulation properties.

Negative ion concentrations inside the tunnel were particularly high, with the Healing Chamber, Water Tunnel 2010, Orbs Chamber, and 270 m from entrance all exceeding 50,000 ions/cm³. These values contrast sharply with outdoor air, which measured below 1,500 ions/cm³, confirming the tunnel's unique internal ionization environment.

Positive ion concentrations, while elevated in certain zones (especially the Monolith Egg and K2), remained within biologically acceptable ranges and followed the same spatial pattern as negative ions. This reflects consistent air quality balance and likely points to geological or energetic sources rather than air stagnation.

Oxygen levels were uniformly within healthy limits (18.8–20.2%), showing only slight reduction at greater depths. This suggests efficient air exchange even during warm, active periods.

Gamma radiation remained low across all indoor sites (0.08–0.10 µSv/h) and slightly higher outside (0.10–0.11 µSv/h), aligning with trends observed in other seasonal measurements. Importantly, electromagnetic radiation was completely absent inside the tunnels, maintaining the electromagnetic silence recorded consistently since 2018.

Life Energy values peaked at K2 and 270 m from entrance (both 35%), reinforcing earlier observations that energy-sensitive zones overlap with the highest ion concentrations and deepest, quietest corridors.

In summary, this summer dataset from 2021 reaffirms the tunnel's classification as a thermally stable, ion-rich, and biologically favorable underground space—one that maintains its energetic properties even during seasonal and external climatic peaks.

Table 7. Environmental Parameters Measured in the Ravne Tunnel Complex (Winter, 1 December 2021)

Weather: Fog | Time: 09:05 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	-2	95	100–300	150–200	20.9	0.10	0.00	15
Outside (entrance)	8	95	300–300	200–200	20.4	0.09	0.00	20

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
20 m (in tunnel)	12.3	93	300–700	800–1100	20.0	0.09	0.00	20
Monolith Egg	14.4	93	15000–18000	14000–16000	20.1	0.09	0.00	30
K2	14.5	93	26000–27000	33000–35000	19.0	0.07	0.00	35
K5	13.4	93	22000–24000	32000–34000	19.6	0.07	0.00	20
Meenal Mehta Tunnel	12.5	93	32000–36000	39000–44000	19.1	0.07	0.00	20
Water Tunnel 2010	14.3	93	25000–30000	30000–33000	19.4	0.08	0.00	25
Orbs Chamber	13.3	93	34000–34000	36000–37000	19.3	0.08	0.00	25
270 m from entrance	13.0	93	41000–43000	46000–46000	19.0	0.08	0.00	15
310 m from entrance	12.8	93	49000–50000	52000–56000	19.0	0.09	0.00	20

Interpretation of Table 7:

This winter session on 1 December 2021 demonstrates one of the most ion-rich and environmentally stable datasets collected during the monitoring campaign. Notably, the temperature within the tunnels held steady between 12.3°C and 14.5°C, despite frigid external air at –2°C, emphasizing the Ravne Tunnel Complex’s robust thermal buffering capacity.

Negative ion concentrations rose sharply in the deeper sections, with values ranging from 26,000 to 50,000 ions/cm³, and peaking at K2, Meenal Mehta Tunnel, and 310 m from entrance. These measurements were 100× greater than those taken outside the tunnel, where ion counts barely exceeded 300 ions/cm³.

Similarly, positive ion concentrations inside the tunnels—while higher than outdoors—remained proportionate to negative ion levels, preserving ion balance. High readings at K5, Orbs Chamber, and Water Tunnel 2010 reinforce prior observations of these zones being energetically active.

Oxygen levels maintained a healthy and consistent range (19.0–20.1%), again with no indication of hypoxia, despite complete enclosure and foggy weather outdoors. The relative humidity remained stable at 93%, contributing to the tunnel's clean, particle-free air.

Radiation readings stayed well below global background averages, with internal gamma radiation ranging between 0.07–0.09 μSv/h, and no detectable electromagnetic radiation. This continued absence of EMF supports the tunnel's reputation as an electromagnetically silent space—ideal for energy-sensitive individuals and instrumentation.

Lastly, Life Energy readings were elevated at K2 (35%), Monolith Egg (30%), and Water Tunnel 2010 (25%), confirming earlier patterns of energetic amplification in key chambers and extended tunnel sections.

This dataset reinforces the hypothesis that winter conditions optimize the tunnel's regenerative potential, with lower external disruption allowing maximal ion accumulation and energetic equilibrium.

Table 8. Environmental Parameters Measured in the Ravne Tunnel Complex (Summer, 6 May 2022)

Weather: Cloudy | Time: 08:45 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (μSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	9	85	500–600	500–600	20.9	0.10	0.00	30
Outside (entrance)	9	85	1400–2000	2200–2500	20.9	0.08	0.00	20
20 m (in tunnel)	11.8	85	1500–2600	1300–3000	20.4	0.08	0.00	25
Monolith Egg	13.2	85	9000–13000	11000–14000	20.4	0.07	0.00	30
K2	14.3	85	45000–48000	44000–48000	19.3	0.08	0.00	40
Tunnel No. 7	13.2	85	56000–59000	54000–55000	19.2	0.08	0.00	25
K5	13.5	85	56000–72000	60000–71000	19.2	0.07	0.00	25

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm^2)	Life Energy (%)
Meenal Mehta Tunnel	13.2	85	60000–74000	64000–72000	19.3	0.08	0.00	20
Water Tunnel 2010	14.1	85	53000–55000	56000–57000	19.4	0.08	0.00	25
Orbs Chamber	13.5	85	58000–63000	50000–56000	19.2	0.07	0.00	20
270 m from entrance	13.3	85	58000–67000	60000–63000	19.3	0.07	0.00	25
310 m from entrance	13.3	85	56000–66000	53000–59000	19.3	0.07	0.00	25

Interpretation of Table 8:

The summer 2022 session presents a powerful continuation of the trends seen in winter, with exceptionally high ion concentrations measured in nearly all deeper tunnel chambers. Notably, Meenal Mehta Tunnel peaked at 74,000 ions/cm³, followed closely by K5 and Tunnel No. 7, reinforcing their status as energetically potent areas.

Despite being conducted in a warmer, potentially more ventilated season, negative ion values consistently surpassed 50,000 ions/cm³ in most deep locations—indicating the tunnel's self-regulating air quality remains effective year-round. Ion values outside were again minimal, between 500–2000 ions/cm³, highlighting the contrast with tunnel interiors.

Oxygen levels, though slightly reduced in the deepest chambers (as low as 19.2–19.4%), remained fully within safe physiological ranges, showing no cause for concern despite the tunnel's depth and enclosure. Meanwhile, humidity remained steady at 85%, ensuring clean, moist air that supports respiratory comfort.

All measurements of gamma radiation (0.07–0.10 µSv/h) stayed below global averages, and no EM radiation was detected, making this another confirmation of the tunnel's low-radiation and EMF-free status.

Life Energy values, measured with the LM4 device, were highest in K2 (40%) and Monolith Egg (30%), with stable mid-range readings elsewhere. These readings correlate closely with zones of elevated ionization and low radiation, reinforcing their classification as regenerative chambers.

This summer session demonstrates the Ravne Tunnel's ability to preserve energetic quality across seasonal conditions, highlighting its architectural and geological uniqueness.

Table 9. Environmental Parameters Measured in the Ravne Tunnel Complex (Winter, 30 December 2022)

Weather: Fog | Time: 09:20 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (μSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	0	100	200	100	20.9	0.15	0.00	20
Outside (entrance)	2	95	300	200	20.9	0.10	0.00	25
20 m (in tunnel)	11.4	81	1800	2500	20.9	0.08	0.00	20
Monolith Egg	13.0	81	32000	27000	19.5	0.08	0.00	40
K2	14.3	81	92000	87000	19.0	0.09	0.00	50
Tunnel No. 7	13.6	81	130000	126000	19.0	0.09	0.00	25
K5	14.1	81	134000	127000	19.0	0.08	0.00	20
Meenal Mehta Tunnel	13.8	81	150000	146000	18.5	0.07	0.00	25
Water Tunnel 2010	14.5	81	158000	160000	19.0	0.07	0.00	30
180 m from entrance	14.0	81	170000	174000	18.6	0.07	0.00	25

Interpretation of Table 9:

The December 2022 winter session reveals record-setting negative ion levels across the Ravne Tunnel Complex, with multiple locations surpassing 100,000 ions/cm³—a rare phenomenon in global subterranean or natural environments.

The Water Tunnel 2010 and Meenal Mehta Tunnel both exceeded 150,000 ions/cm³, while the area 180 m from entrance reached 170,000 ions/cm³. These exceptional values reinforce the hypothesis of the tunnel's role as a naturally enriched ionization chamber.

Meanwhile, outside air measurements remained minimal (200–300 ions/cm³), emphasizing the dramatic ionization gradient between surface and subterranean locations. Despite the closed underground nature, oxygen levels remained within a safe range (18.5–20.9%), with the lowest O_2 value (18.5%) still physiologically acceptable.

Gamma radiation levels throughout the tunnel were remarkably low (0.07–0.09 µSv/h), and EMF readings were again 0.00 mW/cm², maintaining the electromagnetically silent profile of the Ravne system.

Life energy readings, peaking at 50% in K2 and 40% in Monolith Egg, maintained spatial consistency with ion-rich, low-radiation zones. The slight decrease in oxygen in some deep chambers (like Meenal Mehta) did not coincide with decreased energetic quality.

This winter 2022 dataset exemplifies the tunnel’s peak regenerative conditions, particularly during cold months with minimal visitor traffic, offering insight into the self-contained energetics of this prehistoric complex.

Table 10. Environmental Parameters Measured in the Ravne Tunnel Complex (Summer, 2 June 2023)

Weather: Cloudy | Time: 09:10 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	16.0	95	1000	700	20.9	0.09	0.00	30
Outside (entrance)	15.0	95	3000	3500	20.3	0.10	0.00	25
20 m (in tunnel)	14.7	82	5500	6000	20.2	0.09	0.00	25
Monolith Egg	14.7	82	15000	16000	19.9	0.09	0.00	30
K2	15.6	82	25000	22000	19.6	0.09	0.00	40
Tunnel No. 7	14.8	82	20000	22000	19.7	0.09	0.00	20
K5	14.5	82	20000	19000	19.7	0.09	0.00	25

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Meenal Mehta Tunnel	14.0	82	26000	24000	19.2	0.08	0.00	20
Water Tunnel 2010	14.8	82	33000	36000	19.7	0.07	0.00	25
160 m from entrance	14.1	82	26000	28000	19.8	0.07	0.00	20
Working Place	13.7	82	16000	15000	19.6	0.07	0.00	20

Interpretation of Table 10:

This June 2023 summer session shows moderate to high negative ion concentrations within the Ravne Tunnel Complex, especially in deeper sections, although slightly reduced compared to winter peaks.

The Water Tunnel 2010 leads with 33,000 ions/cm³, followed by Meenal Mehta Tunnel (26,000) and K2 (25,000). These values remain exceptionally elevated in comparison to typical outdoor environments, which registered 1,000–3,000 ions/cm³ at the same time.

Gamma radiation remained within a low-background range (0.07–0.10 µSv/h), while electromagnetic radiation was undetectable at all tunnel locations. The oxygen concentration stayed between 19.2–20.2%, confirming safe and breathable conditions across the network.

Humidity averaged 82%, ensuring consistent microclimatic conditions beneficial for respiratory comfort and preservation of tunnel structures.

Although summer sessions typically show lower ion counts due to increased airflow from visitor activity, the data indicates the Ravne Tunnel Complex continues to function as a high-energy, low-radiation environment year-round, with minor seasonal variations.

The “life energy” levels, recorded between 20–40%, once again show elevation in high-ion zones, especially around K2 and Monolith Egg, maintaining spatial consistency observed in previous campaigns.

Table 11. Environmental Parameters Measured in the Ravne Tunnel Complex (Winter, 11 December 2023)

Weather: Fog | Time: 08:50 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (μSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	-1.0	90	300	200	20.9	0.11	0.00	20
Outside (entrance)	0.0	90	600	400	20.9	0.09	0.00	25
20 m (in tunnel)	10.3	87	8000	10000	20.4	0.07	0.00	20
Monolith Egg	12.3	87	75000	71000	20.4	0.07	0.00	35
K2	14.8	87	163000	155000	19.9	0.07	0.00	35
Tunnel No. 7	13.5	87	235000	230000	19.8	0.07	0.00	30
K5	13.7	87	255000	261000	19.8	0.06	0.00	25
Meenal Mehta Tunnel	13.0	87	269000	273000	19.4	0.08	0.00	20
Water Tunnel 2010	14.0	87	279000	288000	19.8	0.07	0.00	30
160 m from entrance	13.6	87	290000	299000	19.8	0.06	0.00	25

Interpretation of Table 11:

This winter 2023 session revealed the highest recorded levels of negative air ions across the entire seven-year monitoring campaign. The 160 m from entrance site reached an unprecedented 290,000 ions/cm³, while other deep tunnel locations such as Water Tunnel 2010 (279,000), Meenal Mehta Tunnel (269,000), and K5 (255,000) all reported values well above 200,000 ions/cm³.

By contrast, outdoor air ion levels remained extremely low, ranging from 300–600 ions/cm³, underscoring the tunnel's capacity for ion retention or generation.

Gamma radiation remained extremely low (0.06–0.08 μSv/h) inside the tunnel, indicating continued protection from ionizing radiation. Electromagnetic radiation was completely absent, preserving an EMF-free environment.

Oxygen levels remained consistently breathable (19.4–20.4%), while humidity averaged 87%, contributing to the tunnel's balanced microclimate.

The elevated "life energy" readings (20–35%) again mirrored the spatial concentration of negative ions, with peaks near K2, Tunnel No. 7, and Monolith Egg. These data strongly reinforce the Ravne Tunnel Complex's classification as a naturally regenerative, energetically distinct underground environment—especially during winter months when external influences are minimized.

Table 12. Environmental Parameters Measured in the Ravne Tunnel Complex (Winter, 25 December 2024)

Weather: Cloudy | Time: 09:40 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (μSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	0.0	93	1000	600	20.9	0.10	0.00	20
Outside (entrance)	0.0	93	1200	900	20.9	0.10	0.00	25
20 m (in tunnel)	11.0	82	1500	1100	20.9	0.09	0.00	30
Monolith Egg	13.6	82	11000	12000	20.4	0.07	0.00	45
K2	14.7	82	19000	17000	20.0	0.07	0.00	45
Tunnel No. 7	13.9	82	32000	35000	19.4	0.10	0.00	25
K5	13.5	82	43000	40000	19.8	0.07	0.00	35
Meenal Mehta Tunnel	13.5	82	43000	48000	19.6	0.07	0.00	25
Water Tunnel 2010	14.2	82	49000	51000	20.0	0.08	0.00	30
160 m from entrance	13.5	82	52000	55000	19.7	0.08	0.00	25

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Working place	13.1	82	51000	49000	19.6	0.09	0.00	25

Interpretation of Table 12:

The December 2024 measurement session confirmed the continuation of high-energy conditions in the deeper sections of the Ravne Tunnel Complex. Negative air ion concentrations reached up to 52,000 ions/cm³ at 160 m from entrance, while Water Tunnel 2010, K5, and Working Place each maintained ion values between 43,000–51,000 ions/cm³. These values are 25–50 times higher than ambient outdoor conditions.

The Monolith Egg and K2 zones also displayed strong "life energy" readings (45%), reinforcing earlier patterns of energetic peaks in structurally or spiritually significant zones.

Environmental stability remained high:

- Oxygen levels between 19.6–20.9%, despite the tunnel's enclosed nature.
- Humidity held steady at 82–93%, supporting respiratory ease and stable microclimate conditions.
- Gamma radiation remained low (0.07–0.10 µSv/h), below global natural averages.
- Electromagnetic radiation remained nonexistent throughout the tunnel network.

Taken together, the results reflect a stable, bioenergetically rich subterranean space with continued seasonal consistency in energetic and atmospheric parameters. The data further solidify the tunnel's standing as a safe, ion-rich, and low-radiation environment conducive to prolonged human presence.

Table 13. Environmental Parameters Measured in the Ravne Tunnel Complex (Spring, 24 March 2025)

Weather: Cloudy | Time: 10:00 | Location: Visoko, Bosnia-Herzegovina

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (front of house)	8.0	75	1100	900	20.9	0.14	0.00	20

Location	Temp (°C)	Humidity (%)	Negative Ions	Positive Ions	O_2 (%)	Nuclear Radiation (µSv/h)	EM Radiation (mW/cm²)	Life Energy (%)
Outside (entrance)	8.0	75	1200	900	20.9	0.10	0.00	25
20 m (in tunnel)	13.0	88	10000	17000	20.1	0.09	0.00	25
Monolith Egg	13.4	88	49000	64000	19.2	0.08	0.00	45
K2	14.5	88	85000	90000	19.1	0.07	0.00	45
Tunnel No. 7	13.8	88	85000	90000	19.1	0.07	0.00	25
K5	13.5	88	110000	103000	19.8	0.07	0.00	35
Meenal Mehta Tunnel	13.2	88	55000	48000	19.6	0.09	0.00	25
Water Tunnel 2010	14.2	88	104000	100000	19.4	0.08	0.00	30
160 m from entrance	14.0	88	90000	80000	19.2	0.07	0.00	25
220 m from entrance	13.1	88	110000	98000	19.2	0.07	0.00	25

Interpretation of Table 13:

The final dataset from March 2025 exhibits peak levels of negative air ion concentration for early spring, with values reaching 110,000 ions/cm³ at 220 m from entrance and K5. The Water Tunnel 2010, Tunnel No. 7, and K2 also maintained high levels (85,000–104,000 ions/cm³), reinforcing their status as energetically dominant zones within the Ravne Tunnel Complex.

Key microclimatic parameters remain highly favorable:

- Oxygen levels ranged between 19.1–20.9%, confirming that air quality remains breathable despite enclosed conditions.
- Humidity held at a consistent 88%, maintaining the tunnel's stable, moist atmosphere ideal for respiratory comfort.
- Gamma radiation levels remained low (0.07–0.09 µSv/h), continuing the long-term trend of minimal ionizing radiation in the tunnel.
- Electromagnetic radiation was again measured at 0.00 mW/cm² across all internal sites.

“Life energy” values were highest in the Monolith Egg and K2 chambers (45%), aligning with historical data from spiritually and energetically significant sites in the tunnel system.

This spring dataset reaffirms the longitudinal energetic and environmental stability of the Ravne Tunnel Complex, supporting its interpretation as a uniquely preserved, bioenergetically potent subterranean space.