

Analysis of the Influence of Urban Morphology and Environmental Atmospheres on the User Experience: The Mawlid in Beni Abbes (Algeria)

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Résumé

This contribution examines the influence of urban morphology and environmental atmospheres on users' phenomenological experience during a mass gathering in an arid region: the Mawlid commemoration in Beni Abbes (Algeria). In an extreme climate characterised by temperatures soaring to 43°C, this festival transforms the public space into a veritable arena of physical and sensory challenges. The primary aim of the research is to assess the environmental carrying capacity of the ritual route by correlating the constraints of the built environment with the subjective perceptions of the social actors. The methodological approach is based on a qualitative investigation using the 'go along' technique, supplemented by on-site measurements of temperature, noise and topography.

The analysis highlights structural and systemic congestion along the route, where the limited capacity of built infrastructure and the rugged terrain create major physical bottlenecks. These spatial constraints force participants to adopt deviant strategies and evasive tactics in order to escape the physical oppression and atmospheric pollution generated by gunpowder explosions (baroud). In contrast, the vernacular architecture of the old Ksar demonstrates exceptional thermal resilience, acting as a protective shelter against solar radiation. At the same time, cultural buildings and rest areas created through community solidarity play a fundamental regulatory role as places of refuge, thereby tempering the sensory and climatic stress experienced by users. In conclusion, the study emphasises that environmental viability is a prerequisite for the sustainability of the Mawlid. The preservation of this global heritage must necessarily include climate resilience and the liveability of transitional spaces in order to ensure the safety of participants.

Keywords: Environmental atmospheres, Thermal comfort, Arid environment, Urban morphology, Mawlid, Beni Abbes, go along.

1. INTRODUCTION

The Beni Abbes oasis lies at the bottom of the Saoura Valley, in the far south-west of Algeria. Due to its unique geographical location, this valley lies within a Saharan region where climatic conditions are extremely severe[1]. As such, Beni Abbes stands as a true model of human resilience in the face of an extremely arid environment[2]. Its territory covers a vast area of 112,000 km² and is populated by around 60,000 people, divided administratively into six districts and ten communities[3]. The city possesses a rich heritage of tourist attractions, combining a deep-rooted history, artistic expression and natural beauty.

Ben Abbes is renowned for its historical and tourist attractions, both nationally and internationally[4]. Exposed to a desert climate characterised by extreme temperature fluctuations, the spatial organisation of what is known as the 'Pearl of the Saoura' has evolved over the centuries in harmony with its natural ecosystem, comprising the palm grove, the *ksar* (vernacular housing) and the rocky plateau. This subtle and fragile balance between the morphological configuration of the built environment and the local microclimate defines what we refer to as a sensitive oasis-like environment.

Every year, the town is the scene of a religious and cultural event of global significance: the Mawlid. This celebration transcends social divides by bringing together the entire local population as well as a massive influx of visitors from many different geographical horizons. Believers and communities celebrate this event on the 12th day of the third month of the lunar calendar[5]. In recent years, this commemoration has coincided with the summer season, thereby exacerbating the physiological constraints associated with the scorching heat of the Saharan environment.

Although the festivities extend over several days, they reach their culmination on a major day characterized by a solemn procession. The multitude of participants then follows strictly codified, ancestral itineraries, forming a route that is both commemorative and spatial. The route begins at the town's amphitheatre and then winds its way towards the old *Ksar*, passing through the thick vegetation

of the oasis before reaching a corniche offering a panoramic view of the surrounding landscape. The procession continues on its way, returning to the palm grove and the *ksar*, before finally ending at its starting point, thus concluding a ritual cycle that already anticipates the coming year.

In this specific context, the urban landscape of Beni Abbes ceases to be a simply inert support and becomes a space of tension, where ritual practices and the city's physical form collide frontally. Consequently, the analysis of the interaction between the individual and their environment must not be reduced to detached physical measurements. It is essential to examine how this environment is perceived and experienced 'in the march and in action'. This is where the concept of urban atmosphere takes on its full analytical dimension: how do users cope with this sensory and thermal complexity during an event of such magnitude?

This route, though guided by tradition, takes travellers through a variety of environmental conditions. Passing from the confined, thermally sheltered space of the old *ksar* to the full exposure to the zenithal radiation on the corniche, the procession highlights the diversity of Saharan microclimates. Each section of the route requires the participants bodies to adapt in specific sensory ways, metamorphosing the walk into a phenomenological experience where thermal, light and sound atmospheres are juxtaposed. This dynamic transforms Beni Abbes into an outdoor laboratory for studying environments under extreme conditions, where few scientific studies have sought to elucidate the effectiveness of sensitive environments in guiding practical action[6].

The fundamental objective of this article is therefore to decipher the interaction between urban morphology and environmental atmospheres during a mass gathering in an arid climate. Through examining the ritual route of the Mawlid, this research aims to assess how the physical constraints of the urban environment (exiguity, gradients and nature of materials) and extreme atmospheric conditions influence the behaviour and experiences of users. Ultimately, the aim is to demonstrate that the sustainability of a major cultural event depends not only on its cultural depth, but also on its structural capacity to provide a liveable and safe environment for people on the move.

1. 1 Overview of the Mawlid procession route in Beni Abbes

The route of the Mawlid in Beni Abbes is not simply a linear progression, but rather a complex journey that makes the most of the morphological contrasts of this oasis town. This route (Figure 1) is organised around eight key stops, interconnected by road sections with vastly differing thermal and acoustic properties.



Figure 1. Global Mawlid procession in Beni Abbes. Source: Authors, based on Google maps.

The solemnity begins with a huge concentration of people at the urban amphitheatre (1), known as the *Masrya*. As soon as the procession forms, the participants proceed towards the old *Ksar* (2). This phase marks the transition from an open public space to an extremely dense vernacular urban fabric, characterised by the labyrinthine narrowness of its alleyways. Leaving this historic centre behind, the procession begins its ascent towards the Corniche, known locally as the *Chourrif* (3). This section marks the topographical peak of the route; the crowd moves along this overhanging path before beginning a descent back towards the central pivot point, the amphitheatre (4).

Following this initial movement, the procession moves towards the periphery of the inhabited area for a ritual pause at the Mhamdi family home: a symbolic stop where the traditional offering of dates and milk takes place. The procession then continues towards the oasis (6); it is here that the day's second major gathering takes place, in the heart of the vegetation. The final sequence involves a retreat: leaving the oasis, the crowd re-enters the walls of the old *Ksar* (7) for one last passage through, before returning to

the amphitheatre (8). This final convergence point marks the conclusion of the ceremony and the end of the annual itinerary.

2. METHODOLOGY

An investigation into the route of the Mawlid could not be limited to a simply static spatial analysis or a compilation of historical data. To understand how this route is actually experienced under extreme climatic conditions, we employed the method of go along, as theorised by Jean-Paul Thibaud. This methodology was introduced two decades ago as a tool for qualitative research[7]. Its primary purpose is to gain access to the sensory experience of the moving subject [6] and to enable the researcher to collect ethnographic field data relating to environmental factors[8]. This method encourages a much more fluid interaction than the traditional static interview[9] by inviting participants to verbalise their immediate sensations (visual, olfactory and auditory perceptions, as well as general impressions) as they proceed[10]. This approach is not limited to a census of factual data, but places people at the heart of the analysis by capturing the urban experience through the lens of ‘walking, perceiving and describing’ [6]. The aim here is to produce an assessment that is both technical and sensory, with the guided tour proving to be the ideal tool for identifying environmental issues. It provides privileged access to immediate impressions because, unlike a questionnaire administered after the event, it captures the emergence of weariness, stress caused by crowd density or glare at the precise moment they occur. As we follow the procession, we identify environmental problem areas, disruptions to the atmosphere, thermal disturbances and physical obstacles that undermines the value of the route.

2.1. Investigation protocol and sampling strategy

To ensure the reliability and representativeness of the assessment, the protocol was based on full immersion in the real world:

Context of the study: The investigation covered the entire duration of the procession, from 09:00 to 16:45. This longitudinal monitoring is crucial for observing changes in physical fatigue and thermal tolerance throughout the day.

The researcher’s approach: Equipped with a digital recording device, the researcher adopted a passive listening approach, scrupulously ensuring the anonymity of the participants and intervening only with open-ended questions such as: “How exactly do you perceive this place?”

Panel composition: We approached 20 participants using random sampling, In order to gain a critical perspective on the constraints, the sample consists mainly of tourists (75%), supplemented by local residents and organisers (25%).

Table 1: Panel characteristics and diagnostic sensitivity profiles

Age range	Staff numbers (n=20)	Sensitivity profile and diagnostic contribution
15 - 30 years old	7	Focus on the festive atmosphere: Particular attention was paid to acoustics (gunfire), urban aesthetics and group social dynamics.
31 - 50 years old	7	Focus on organisation: A critical analysis of crowd flow management, crowd density and the cadence of the procession’s progress.
51 years old and +	6	Focus on physical strain: Increased sensitivity to thermal stress (43°C), muscle exhaustion and the vital need for rest areas.

2.2. The investigative tool: the observation grid

With a view to systematising the collection of information, the 20 routes have been catalogued using a rigorous analytical framework:

Table 2: Observation themes and typology of data collected

Themes of analysis	Parameters observed	Nature of the data collected
The dynamics of walking	Route followed, stops marked, flow velocity.	Analysis of movements and points of blockage.
Visual perception	Architectural landmarks, shaded areas, visibility.	Identification of areas of interest and light stress.
The sound environment	The crack of gunpowder, liturgical chants, the murmur of the crowd.	Measurement of the degree of acoustic comfort or noise aggression.

Physical experience	Experiencing exhaustion, heat (43°C), physical effort.	Assessment of the site's ergonomics and habitability.
The verbatim corpus	Spontaneous remarks and comments from the walker.	Extracting meaning and affects related to spatiality.

2.3. Data processing and spatialisation phase

Once the audio recordings and field notes had been collated, the analytical process followed two key stages:

A. Frequency analysis of recurrences: Identifying key issues (for example, if the majority of participants report excessive heat in a particular area, that area is classified as a heat hotspot).

B. Verbatim mapping: Each significant verbal sequence has been geographically anchored to a specific location. This technique enables a shift from a theoretical cartographic representation to a 'map of lived experience', where each point of tension becomes a potential lever for future sustainable urban planning strategies.

4. RESULTS AND DISCUSSION

A comparative analysis of the 20 go along reveals that the Mawlid procession is not purely a spiritual journey, but rather a succession of points of saturation where the city's physical, climatic and sensory capacity is exceeded. This structural congestion profoundly alters users behaviour, transforming the use of space into a veritable strategy of survival and avoidance.

4.1. The lack of space at Masrya and the reflex anticipation of escape

From the very start of the gathering (at the *Masrya* Amphitheatre) (Figure 2), the assessment highlights a significant disproportion between the site's capacity and the actual number of attendees, a situation considered critical by 85% of participants. A detailed analysis of movement patterns reveals two distinct behavioural responses:

The fragmentation of flows: Whilst tourists suffer the congestion, local residents have devised alternative routes through the adjacent side streets to reach the coastal road more quickly.

The affordance reflex for escape: A revealing micro-spatial behaviour was observed towards the end of the event (4.50 pm): most visitors chose not to use the seating areas, preferring to remain standing near the exits. This choice reflects an anticipation of the stress experienced earlier in the day; participants deliberately sacrificed their thermal comfort (resting whilst seated in the shade) to preserve their freedom of movement, as highlighted by this account: "We don't sit down at the end, for fear of being blocked by the crowd... we prefer to stay on the lookout near the exit so we can make a smooth getaway."



Figure 2: Flow saturation in the amphitheatre. Source: author, 2025.

4.2. The effect of entrapment within the *Ksar* and the verticalisation of land uses

Upon entering the old *Ksar* (09:30), the crowd density reached an alarmingly high level. 90% of participants described a bottleneck effect at the narrow passage leading to the main entrance (Figure 3).

Respiratory saturation and sensory opacity: The physical confinement is amplified by the saturated sound environment and the air thick with sulphur particles from the gunpowder, making the atmosphere unbreathable.

Exceeding architectural limits: To compensate for the complete absence of visibility and the feeling of confinement on the ground, the young participants take to the vertical plane by climbing the wall structures. This practice, though perilous, is a direct response to a *Masrya* that has become too cramped for its role as an urban stage.



Figure 3: Saturation and verticality of use in the ksar. Source: authors, 2025.

4.3. Topographical constraints in extreme climates: from the *Chourrif* to the oasis funnel

The assessment shows that the paralysis of traffic flows is not confined to ritual stations, but extends to connecting routes, where the rugged morphology of the terrain exacerbates an already severe environmental precariousness.

4.3.1. Topographical saturation on the *Chourrif*

At around 10.35 am, on the corniche, the overcrowding took on a topographical dimension. The flow of people found itself trapped between the rock face and the steep slope (Figure 4). 70% of visitors reported having had to stray from the marked path to climb the surrounding rocks. This action was not driven by an aesthetic desire but by a functional necessity: the aim was to escape the stagnant cloud of smoke from the gunfire and find breathable air, far from the stifling crowd of the procession.



Figure 4: Topographic saturation on the *Chourrif*. Source: authors, 2025.

4.3.2. The paroxysm of the spatial funnel (The staircase of the oasis)

The most critical point of tension along the entire route occurs at 2.00 pm, during the descent towards the palm grove. The inadequacy of the dimensions is obvious here: the entire flow of people must converge onto a staircase less than a metre wide. In temperatures of 43°C, this narrow passageway leads to extreme crowding. 100% of those surveyed described this section as exhausting. This overcrowding

causes people to deviate from the path: the youngest visitors choose to run down the adjacent sandy slopes (Figure 5). Here, the physical risk of falling is perceived as negligible compared to the danger of heatstroke and exhaustion during the prolonged wait.



Figure 5: The flow descent towards the oasis. Source: authors, 2025.

4.3.3. Environmental aggression under the vegetation layer

Once they reach the oasis, spatial saturation gives way to a crisis of environmental habitability (Figure 6):

The competition for shade: The morphology of the oasis does not provide uniform shade. Whilst the first arrivals claim the shaded areas beneath the palm trees, the rest of the crowd remains exposed to the harsh, direct sunlight.

Respiratory insufficiency: The explosions of gunpowder send up clouds of dust and sand that become trapped beneath the canopy, creating a suffocating atmosphere. The accumulated exhaustion eventually breaks down the collective structure: the groups fragment according to individual levels of endurance. An elderly participant recounts: “The staircase drained us of our strength, and even here, the shade isn’t enough... our throats are burning and in this 43°C heat, we’re literally suffocating in our clothes.”



Figure 6: Spatial saturation at the oasis. Source : authors, 2025.

4.4. Sensory saturation and environmental vulnerability: the impact of the baroud

Beyond the physical overcrowding, the findings from the go along reveal acute sensory precariousness. The Mawlid is like an immersion in a hostile environment where visitors must negotiate with incessant sensory and climatic challenges.

A. The acoustic black spot: the mineral shockwave

The ambient sound is the most disruptive aspect of the route, particularly in the heart of the old *Ksar*.

Reverberation and the confinement effect: In this enclosed, stone-walled space, 80% of respondents describe the echo of gunfire as deafening. The architecture (narrow alleys, earthen materials) prevents sound waves from dissipating, transforming the celebration into a shockwave that saturates the sensory space (Figure 7).



Figure 7: The noise pollution problem in the ksar. Source: authors, 2025.

Crossfire phenomenon: Along the segment connecting the *Ksar* to the *Chourrif*, the crossfire between the groups creates a sense of disorientation that is both auditory and visual. The user is no longer strolling through the oasis, but through an opaque environment where visibility is drastically reduced (Figure 8).



Figure 8 : The crossfire between the *ksar* and the *corniche*. Source: authors, 2025.

B. Respiratory saturation and additional thermal stress

The extensive use of gunpowder has a direct impact on the ergonomics of the journey:

The cloud of powder: The air becomes saturated with residual sulphur that lingers at ground level, causing physical discomfort and a sense of disorientation.

Proximity heating: On the *Chourrif* plateau, the density of the crowd forces walkers to rub shoulders with the gunmen, exposing them to the heat generated by their proximity, which adds to the already unbearable 43°C heat from the sun (Figure 9).



Figure 9: Powder cloud and the heat of proximity at the *corniche*. Source: authors, 2025.

C. Lack of services and water vulnerability

The assessment highlights a gap between the event's reputation and the poor state of public facilities. Community solidarity serves as a stopgap for the lack of infrastructure: the complete absence of drinking water points forces visitors to rely on the generosity of local residents. The breaks spent at the Mhamdi and Ben Rahou families' homes are identified by 100% of participants as the only moments of remission. Without these informal havens, the journey would lose all basic livability. This sensory saturation is corroborated by the account of an elderly participant, who highlights the lack of breathing space: "You feel trapped between the gunfire and the radiating heat from the walls; there is nowhere to take refuge to give your ears a rest or let your lungs breathe."

5. Potential and resilience: vernacular architecture as a bioclimatic regulator

If the investigation has highlighted major dysfunctions, a cross-analysis of the sites also reveals areas of high environmental performance. This potential constitutes the spatial capital on which any future heritage enhancement strategy must be based.

5.1. The *Ksar* Mosque: a sanctuary of tranquillity and coolness

Entering the mosque in the old *Ksar* offers the most significant sensory experience of the tour.

Isolation with earth-based material: 95% of users describe a feeling of complete acoustic comfort. The thermal mass of the thick walls and the relative darkness create a stark contrast with the chaos outside. The transition from a noise-saturated space to an atmosphere of tranquillity is immediate.

The quality of calm: One elderly participant remarked: "Crossing the entrance instantly silences the commotion... the sound here is enveloping; it no longer overwhelms us." This observation demonstrates that the religious building acts as a vital stress regulator for the psychological well-being of the procession.

5.2. The thermal resilience of the architectural labyrinth

The return to the old *Ksar* at the end of the route highlights an architectural paradox: the labyrinthine structure, often seen as an obstacle to smooth movement, becomes a climatic asset. 90% of participants consider the return to the *Ksar* to be the most rewarding part of the tour.

Bioclimatic efficiency: The data collected confirms a decrease in the perceived temperature of between 7°C and 9°C compared with the outskirts of the oasis. The shade cast by the trees and the coolness stored in the adobe walls transform exhaustion into a feeling of relief.

Prioritising atmosphere over readability: For the experienced user, the loss of spatial orientation becomes negligible in the face of the climate benefits provided by the building. The bioclimatic efficiency of traditional buildings seems to overshadow the constraints of spatial clarity, as one participant points out: 'despite the disorientation felt within this labyrinth, the sensation of coolness is so intense that it ultimately erases the anxiety of getting lost. The use of local materials (adobe bricks, palm leaves) confirms the thermal efficiency of these ancient architectural structures. These architectural elements served not only a defensive purpose, but also contributed to the environmental conditions [11].

The cross-analysis of the described routes and the bioclimatic assessment shows that the Mawlid event in Béni Abbès rests on a fragile balance. Whilst spiritual fervour remains intact, the physical reality of the route is reaching its structural limits. The extreme hardship is the result of the convergence of three factors: morphological (exiguity), climatic (43°C) and sensory (gunfire).

- **Morphological constraints:** The narrowness of the historic urban fabric (*Ksar*, corniche, steps leading to the oasis, amphitheatre), which can no longer accommodate large numbers of people, leading to saturation, crowding and physical risks (Figure 10).



Figure10: map of morphological constraints and flow saturation. Source: authors, based on Google maps, 2025.

- **Climate constraints:** Prolonged exposure to extreme temperatures (43°C) without any protective measures (the walk to the corniche, the corniche itself, the walk and steps to the oasis, and the oasis) (Figure 11).



Figure11: map of climate stress points. Source: authors, based on Google maps, 2025.

- **Sensory constraints:** Acoustic and respiratory saturation linked to the intensive use of gunpowder in confined or rocky spaces (*ksar*, towards the corniche, the corniche, the oasis) (Figure 12).



Figure 12: map of points of sensory constraints and respiratory saturation. Source: authors, based on Google maps, 2025.

The paradox lies in the fact that traditional building fabric, whilst spatially restrictive, remains the only effective means of regulating the temperature along the route, offering a reduction in perceived temperature of up to 9°C. This vernacular resilience demonstrates that heritage conservation must not be solely historical, but also functional and climate-related.

6. CONCLUSION AND RECOMMENDATIONS

This study examined the sustainability of the Mawlid route in Béni Abbès from the perspective of urban environments and environmental comfort. Using a qualitative methodology based on 20 go along, we compared the built environment with users' experiences under extreme weather conditions (43°C). The results highlight a systemic saturation of the route, where the narrowness of the vernacular fabric and the sensory overload caused by the heat drive participants to deviant behaviour in order to safeguard their physical well-being and ensure their thermal survival. Nevertheless, the study confirms the remarkable bioclimatic performance of the old *Ksar*, whose labyrinth offers a lifesaving refuge with a perceived temperature drop of between 7°C and 9°C compared to the outside. Whilst the sensory intensity is the Mawlid's strength, the comfort of its visitors is an essential prerequisite for its future success. The development of public spaces in Beni Abbes must integrate climate considerations as a key component of urban design.

To ensure the long-term viability of this event, the article recommends three areas of focus:

The creation of refreshment stations and quiet zones: Install shade structures and public fountains along the *Chourrif*, oasis.

Regulating traffic flow through environmental signage: Prevent traffic congestion by marking out safe diversion routes.

Logistical support for social solidarity hubs: To institutionalise and equip the private rest stops those form the very foundation of the resilience of this centuries-old route.

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