# Climate Variability, Seasonality, and Social Adaptation in Pre-Oil Saudi Arabia: An Environmental Anthropological Perspective

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**Abstract**
This article examines how climate variability and seasonality structured social adaptation in pre-oil Saudi Arabia through an environmental anthropological and historical lens. Moving beyond deterministic interpretations that treat aridity as a limiting backdrop, the study conceptualizes climate as a culturally mediated force embedded in everyday practices, moral systems, and social organization. Drawing on environmental anthropology, historical ecology, and climate history, the article analyzes how Saudi society integrated climatic uncertainty into flexible temporal rhythms, socially regulated mobility, informal water governance, and ethical norms of cooperation.

The analysis foregrounds everyday life—work, rest, movement, and social interaction—as the primary site of adaptation, demonstrating how seasonal heat, irregular rainfall, and water scarcity shaped daily routines without producing social rigidity or collapse. By examining water access through wells, informal authority, and moral economy, the study highlights non-state mechanisms of governance grounded in custom, responsibility, and reputation. Comparative reflections with arid societies in the Sahara and Central Asia further situate the Saudi case within broader patterns of non-technological climate adaptation.

The article advances a conceptual model of social adaptation based on temporal flexibility, moral embedding of survival, and decentralized resource regulation. In doing so, it contributes to environmental history and anthropology by offering a transferable framework for understanding cultural resilience in arid environments. The findings underscore the importance of social organization and ethical systems in managing environmental uncertainty, providing historical insight relevant to contemporary debates on climate adaptation beyond technological solutions.

**Keywords:** Environmental History; Saudi Arabia; Climate Variability; Seasonality; Social Adaptation; Arid Environments

## 1. INTRODUCTION

Historical narratives of Saudi Arabia have traditionally emphasized political unification, tribal dynamics, or religious movements, often marginalizing the role of environment beyond general references to desert conditions. Yet for centuries prior to oil discovery, climate constituted one of the most persistent and formative forces shaping social life in the Arabian Peninsula. Extreme aridity, seasonal rainfall variability, and chronic water scarcity structured patterns of settlement, mobility, and social interaction long before the emergence of the modern state.

This article argues that climate and seasonality were not merely constraints but organizing principles that shaped social adaptation in pre-oil Saudi Arabia. Drawing on anthropological and historical scholarship, it conceptualizes adaptation as a culturally mediated process rather than a purely

economic or technological response. Social institutions, moral norms, and temporal practices evolved in close dialogue with environmental conditions, producing a resilient yet flexible social order.

By adopting an anthropological–historical perspective, the study shifts attention from state formation to everyday life, examining how climate shaped rhythms of work and rest, patterns of movement, and systems of social obligation. In doing so, it contributes to broader debates in environmental history and cultural anthropology concerning human adaptation in arid environments.

This article contributes to anthropological and historical scholarship in three principal ways. First, it reconceptualizes climate not as an external constraint but as a culturally embedded force shaping everyday practices and social organization in pre-oil Saudi Arabia. Second, by integrating environmental anthropology, historical ecology, and climate history, it offers a conceptual framework for understanding adaptation as a social and ethical process rather than a technological one. Third, through comparative reflection with other arid regions, the study situates the Saudi case within a broader pattern of non-technological climate resilience, thereby extending its relevance beyond regional history.

**Research Contribution**

This article makes three principal contributions to environmental history and environmental anthropology. First, it provides one of the few historically grounded analyses of climate–society interaction in pre-oil Saudi Arabia, shifting attention from macro-political narratives to everyday adaptive practices shaped by environmental variability. Second, it develops a culturally embedded model of social adaptation that integrates temporal flexibility, informal resource governance, and moral economies as interconnected mechanisms of resilience in arid environments. Third, by situating the Saudi case within a structured comparative framework alongside Saharan and Central Asian societies, the study advances a transferable conceptual approach to non-technological climate adaptation that emphasizes social coordination rather than infrastructural control.

## 2. METHODOLOGY AND SOURCES

This study adopts a qualitative historical–anthropological methodology grounded in environmental history to examine climate variability and social adaptation in pre-oil Saudi Arabia. The research draws on historical travel accounts, regional chronicles, and ethnographic descriptions produced during the late nineteenth and early twentieth centuries (Facey, 1997; McCorriston, 2011). These materials are analyzed as socio-environmental narratives that document how communities historically interpreted and managed rainfall variability, seasonal heat, and water scarcity.

The analytical strategy follows a thematic case-oriented approach focusing on three empirically observable domains of adaptation: (1) customary regulation of water access in Najd and oasis settlements; (2) rainfall-dependent pastoral and trading mobility linking central Arabia with Hijazi trade centers; and (3) daily and seasonal organization of labor in response to thermal stress. These domains are examined through close textual analysis of documentary descriptions of settlement clustering around permanent wells in Al-Qassim, seasonal caravan route timing, and observed adjustments in work–rest rhythms during summer months.

Comparative secondary literature on arid societies in the Sahara and Central Asia is employed to contextualize these findings analytically. The purpose of comparison is not to generalize across regions but to identify recurring adaptive logics that emerge under conditions of climatic uncertainty.

## 3. THEORETICAL FRAMEWORK: ENVIRONMENTAL ANTHROPOLOGY AND SOCIAL ADAPTATION

Environmental anthropology and historical ecology offer critical perspectives for understanding how societies respond to climatic constraints without reducing culture to environmental determinism. Rather than viewing climate as an external force that mechanically shapes social outcomes, these approaches emphasize the dynamic interplay between environmental conditions, cultural practices, and social organization (Steward, 1955; Crumley, 1994). In this framework, adaptation is understood not simply as survival, but as the culturally mediated organization of life under conditions of environmental uncertainty.

Cultural ecology, as originally articulated by Julian Steward, highlights how social institutions, subsistence strategies, and belief systems evolve in dialogue with specific ecological contexts (Steward, 1955). Importantly, Steward's model rejects simplistic causal chains, instead proposing that cultural patterns emerge through selective adaptation to environmental pressures. Applied to pre-oil Saudi Arabia, this perspective allows climate to be understood as a structuring condition that shaped social norms, mobility patterns, and temporal organization without determining them outright.

Subsequent developments in environmental anthropology have further emphasized the role of perception, practice, and meaning in shaping human–environment relations. Ingold (2000) argues that environments are not passive settings but are actively inhabited and interpreted through daily practices. From this standpoint, climatic conditions in Arabia—aridity, heat, and seasonal variability—were not abstract data points but lived experiences that structured how time was perceived, how space was navigated, and how social obligations were enacted.

Historical ecology extends this analysis by situating adaptation within long-term temporal frameworks. Rather than focusing on short-term responses to environmental stress, historical ecology examines how social systems accumulate adaptive strategies over generations, producing culturally embedded forms of resilience (Crumley, 1994). In arid regions, such resilience often manifests as flexibility rather than permanence: mobility over sedentarism, social networks over infrastructure, and moral norms over technological control. These characteristics are central to understanding pre-oil Saudi society.

Climate history further complements this framework by emphasizing variability rather than averages. As Parker (2013) and White et al. (2018) demonstrate, it is not mean climate conditions but fluctuations—droughts, irregular rainfall, and seasonal unpredictability—that exert the greatest social pressure. In the Arabian Peninsula, where rainfall was both scarce and unevenly distributed, climatic variability intensified social dependence on cooperation, reciprocity, and adaptive timing. These pressures did not produce social collapse but rather encouraged the development of cultural systems capable of absorbing uncertainty.

Within this combined theoretical framework, adaptation is conceptualized as a social process that integrates environment into cultural practice. Seasonality structured time; mobility structured space; moral economy structured social relations. Rather than responding to climate through technological

domination, pre-oil Saudi society developed adaptive strategies grounded in social organization, ethical norms, and flexible temporal rhythms. This approach avoids environmental determinism while foregrounding climate as a central factor in shaping social life.

By adopting this framework, the present study positions pre-oil Saudi Arabia as a historically grounded case of cultural adaptation to arid environments. The analysis moves beyond descriptive accounts of desert life to examine how climate became embedded in social institutions, moral values, and everyday practices. In doing so, it contributes to broader debates in environmental anthropology and history concerning resilience, adaptation, and the cultural management of environmental uncertainty.

**Climate Variability and Social Life in Pre-Oil Saudi Arabia**

*In pre-oil Saudi Arabia, environmental conditions were mediated through social relations rather than experienced as abstract climatic variables.* While aridity and heat constituted enduring features of the landscape, it was climatic variability—irregular rainfall, uneven seasonal distribution, and localized drought—that most directly shaped everyday life. From a social–cultural perspective, climate operated less as a background condition and more as a continuous presence structuring expectations, behaviors, and moral obligations.

Rainfall in the Arabian Peninsula was not only scarce but socially unpredictable. Communities could not rely on stable seasonal patterns; instead, they navigated a landscape in which abundance and scarcity alternated irregularly across space and time. This uncertainty fostered a social orientation toward anticipation rather than accumulation, encouraging flexibility in labor organization, mobility, and consumption. As environmental historians emphasize, societies facing high climatic variability tend to develop adaptive cultures oriented toward social coordination rather than infrastructural control (White et al., 2018).

In central Arabia, particularly in Najd, climatic variability shaped a social rhythm marked by readiness and restraint. Agricultural and pastoral activities were organized around conditional opportunity: planting, grazing, and movement occurred not according to fixed calendars but in response to environmental cues and collective assessment. These practices required constant communication and mutual awareness, reinforcing social interdependence. Climate, in this sense, acted as a catalyst for social cohesion rather than isolation.

Regional variation further illustrates the cultural mediation of climate. In the Hijaz, proximity to pilgrimage routes and coastal trade moderated environmental risk through external exchange, allowing for relatively denser settlement and more diversified livelihoods. In contrast, interior regions experienced greater exposure to climatic uncertainty, intensifying reliance on kinship networks and reciprocal obligations. These differences did not reflect varying degrees of "development" but distinct cultural adaptations to shared environmental pressures.

Crucially, climate was interpreted through moral and social frameworks rather than perceived as a purely natural force. Periods of drought were understood as collective conditions requiring shared endurance, not individual failure. This perspective reinforced ethical norms emphasizing patience (*ṣabr*), moderation, and generosity. Anthropological studies of arid societies note that such values function as cultural technologies for managing scarcity by embedding survival strategies within moral discourse (Scott, 1976; Sillitoe, 2022).

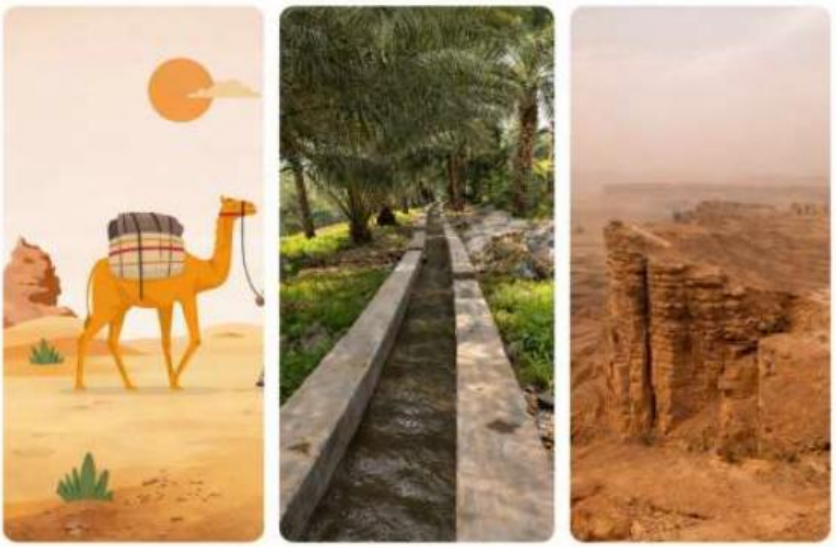

Figure 1. Climatic Variability and Social Adaptation in Pre-Oil Saudi Arabia
*Localized rainfall, dependence on wells and oases, and seasonal mobility shaped socially embedded strategies of adaptation (see Fig. 1).*

Seasonal scarcity also influenced patterns of social interaction. Hospitality increased in significance precisely because environmental uncertainty rendered travel risky and survival contingent on social support. Welcoming strangers and travelers was not an optional virtue but a practical response to climatic vulnerability, transforming moral obligation into a form of distributed resilience. Climate thus shaped social ethics by embedding environmental risk within systems of mutual responsibility.

Importantly, these adaptations did not imply resignation to environmental hardship. Rather, they reflect a cultural orientation that normalized uncertainty and incorporated it into social life. By avoiding rigid dependence on fixed schedules or permanent infrastructure, pre-oil Saudi society maintained adaptive capacity in the face of climatic fluctuation. This flexibility stands in contrast to modern assumptions that stability requires control; historically, resilience often emerged from social elasticity rather than environmental mastery.

Viewed through this lens, climate variability functioned as a formative social force. It shaped how time was perceived, how relationships were maintained, and how moral values were enacted in daily life. The social experience of climate in pre-oil Saudi Arabia was thus not one of passive endurance but of active cultural engagement, in which uncertainty was managed through cooperation, ethical norms, and flexible organization.

**Water, Wells, and Informal Authority: Social Control in Arid Environments**

In arid societies, water is never merely a physical resource; it is a social relationship, a moral obligation, and a locus of authority. In pre-oil Saudi Arabia, where rainfall was scarce and surface water virtually absent, access to wells and seasonal water sources constituted one of the most significant axes of social organization. Rather than being governed primarily through centralized institutions, water access was regulated through customary norms, kinship ties, and locally recognized authority.

Historical accounts from central Arabia consistently emphasize the social centrality of wells. Wells were not anonymous infrastructure but named places embedded in collective memory, lineage history, and territorial identity. Control over a well conferred neither absolute ownership nor unrestricted

power; instead, it entailed responsibility. Anthropological studies of arid regions suggest that such responsibility-based control systems emerge where environmental uncertainty makes exclusion socially dangerous (Wilkinson, 2014). In this context, denying water could destabilize alliances and provoke conflict, while regulated access reinforced cooperation and mutual dependence.

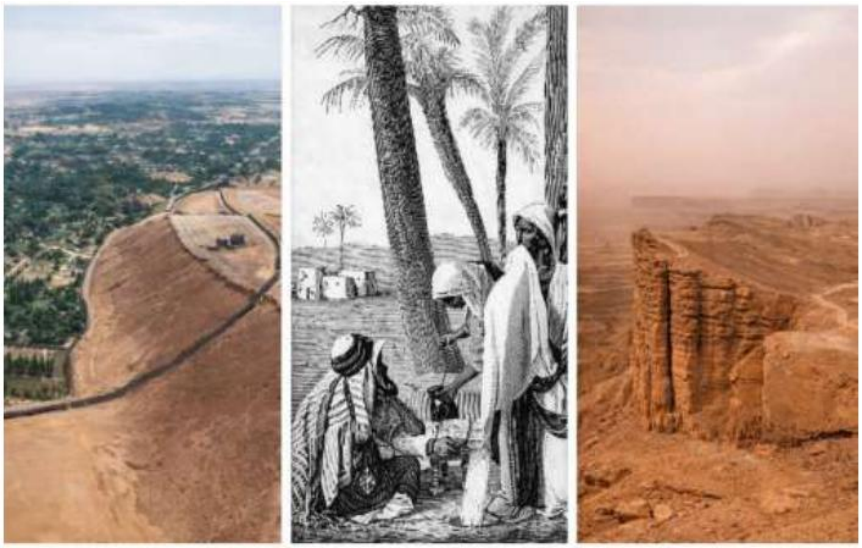

Figure 2. Wells, Water Access, and Informal Authority in Pre-Oil Saudi Arabia
*Water access through wells functioned as a socially regulated system of authority grounded in custom, responsibility, and collective survival (see Fig. 2).*

From a documentary perspective, travel accounts and regional chronicles describe wells as focal points of settlement and negotiation. Seasonal movement often followed established routes linking reliable water sources, transforming wells into nodes within broader social landscapes. Authority over these sites was typically vested in families or groups recognized for their ability to mediate access fairly rather than enforce exclusion. This form of authority was informal yet durable, resting on reputation, moral standing, and accumulated trust rather than coercive power.

Anthropologically, such arrangements exemplify what scholars describe as embedded governance—systems of regulation inseparable from social relations and ethical norms (Scott, 1976; Sillitoe, 2022). Water-sharing practices were governed by custom (*ʿurf*), which balanced individual claims with collective necessity. These norms did not eliminate conflict but provided culturally intelligible mechanisms for its resolution. Disputes over water were addressed through mediation and negotiation rather than formal adjudication, reflecting a social order adapted to environmental vulnerability.

Importantly, water access also structured social hierarchy without producing rigid stratification. Families associated with key wells enjoyed prestige and influence, yet this status was contingent upon continued adherence to norms of generosity and restraint. Failure to uphold these expectations could rapidly erode authority. In this sense, power remained conditional, continually renegotiated through practice. Environmental anthropology highlights this conditionality as a hallmark of societies where ecological dependence discourages monopolization of critical resources.

The relationship between water and authority further illuminates the broader moral economy of pre-oil Saudi society. Providing water to travelers, pastoralists, and neighboring communities was not only an ethical duty but a pragmatic investment in social stability. In an environment where future scarcity

was always possible, generosity functioned as a form of risk distribution. By embedding survival within networks of obligation, society transformed environmental uncertainty into social insurance.

Historically, the absence of large-scale hydraulic infrastructure reinforced reliance on these social mechanisms. Unlike regions where irrigation states centralized water control, Arabia's environmental conditions favored decentralized systems grounded in flexibility and negotiation. This distinction underscores a critical insight: adaptation does not require infrastructural complexity, but rather culturally appropriate forms of governance aligned with environmental realities.

Viewed collectively, wells in pre-oil Saudi Arabia were not simply points of extraction but arenas of social life where climate, ethics, and authority intersected. Water management operated through a hybrid system combining environmental knowledge, historical precedent, and moral expectation. This system exemplifies how arid societies transform environmental constraint into socially productive order, maintaining cohesion without centralized enforcement.

**Seasonality and Everyday Life: Work, Rest, and Social Rhythm**

In pre-oil Saudi Arabia, climate and seasonality were not experienced episodically through exceptional events alone but were woven into the fabric of everyday life. Daily routines— work, rest, movement, and social interaction—were structured in continuous dialogue with heat, light, and environmental constraint. Rather than imposing rigid schedules, society developed flexible rhythms that allowed individuals and groups to adjust activity to changing conditions throughout the day and across seasons.

The organization of work provides a clear illustration of this adaptive rhythm. Productive activities such as herding, cultivation, construction, and travel were concentrated in the cooler hours of the early morning and late afternoon. Midday, particularly during the summer months, was widely recognized as a period of physical vulnerability. Rest during these hours was not interpreted as idleness but as a necessary form of bodily and social preservation. This temporal segmentation of the day represented a culturally shared understanding of the limits imposed by climate and the need to align labor with bodily endurance.


Figure 3. Climate, Daily Work, and Rhythms of Rest in Pre-Oil Saudi Arabia

*Everyday activities were organized around heat, daylight, and bodily endurance, producing flexible rhythms of work and rest (see Fig. 3).*

Seasonality further shaped patterns of everyday movement. During cooler months, mobility increased as travel became safer and less physically demanding. Trading journeys, visits between kin groups, and pastoral movement expanded in scope, reinforcing social ties across space. Conversely, during periods of intense heat or drought, daily life contracted. Activities became localized, and social interaction concentrated around shaded spaces, wells, and domestic settings. These seasonal contractions and expansions were not disruptive anomalies but anticipated phases within the social calendar.

Domestic life also reflected environmental adaptation. Housing forms—tents, courtyard houses, and seasonal shelters—were designed to facilitate airflow, shade, and thermal moderation. Social practices within these spaces, such as communal sitting, shared meals, and storytelling, often intensified during periods when outdoor activity was limited. In this way, climate indirectly shaped social intimacy by reorganizing where and how people gathered throughout the day.

Crucially, everyday time was not measured through abstract units but through relational markers: the position of the sun, the call to prayer, the completion of tasks, and the onset of heat or coolness. These markers provided a shared temporal vocabulary that synchronized individual routines without formal coordination. Anthropological studies of non-industrial societies emphasize that such temporal systems prioritize responsiveness over precision, enabling adaptation to environmental fluctuation (Zerubavel, 1981; Ingold, 2000).

The rhythms of rest were particularly significant. Rest was socially recognized and morally legitimate when aligned with climatic necessity. Seeking shade, pausing labor, or delaying travel during extreme conditions were collective practices rather than individual choices. This normalization of rest functioned as a form of environmental intelligence, preventing exhaustion and preserving long-term productivity. By embedding bodily limits within social norms, society transformed climate constraint into an organizing principle of daily life.

Social interaction itself followed these rhythms. Visits, negotiations, and communal gatherings were timed to coincide with periods of physical comfort. Evening hours, when temperatures declined, often became the most socially active part of the day. Storytelling, poetry, and informal discussion flourished during these hours, reinforcing social cohesion while respecting environmental limits. Leisure and sociability thus emerged not in opposition to work but as integral components of a daily rhythm shaped by climate.

Viewed holistically, everyday life in pre-oil Saudi Arabia exemplifies a mode of adaptation grounded in temporal flexibility rather than control. Instead of attempting to overcome environmental conditions, society aligned daily practices with them, producing rhythms that balanced productivity, health, and social cohesion. Climate, in this sense, was not an external adversary but a continuous interlocutor shaping how life was lived from hour to hour.

**Discussion: Climate, Social Adaptation, and Cultural Resilience in Arid Societies**

This study has examined climate and seasonality in pre-oil Saudi Arabia not as external constraints but as culturally embedded forces shaping everyday life, social organization, and moral systems. Synthesizing insights from environmental anthropology, historical ecology, and climate history, the analysis advances a conceptual model in which social adaptation emerges through the integration of environmental variability into cultural practice rather than through technological domination or centralized control.

At the core of this model is the proposition that **resilience in arid environments is primarily social rather than infrastructural**. In pre-oil Saudi Arabia, adaptation to climatic uncertainty was achieved through flexible temporal rhythms, socially regulated mobility, moral economies of generosity, and informal systems of resource governance. These elements functioned together as an integrated adaptive system, transforming environmental risk into shared social responsibility. Climate, in this sense, was not an episodic threat but a continuous organizing principle embedded in daily life.

The Saudi case illustrates how seasonality structured time in ways that privileged responsiveness over precision. Work and rest followed bodily endurance rather than mechanical schedules; mobility expanded and contracted with climatic conditions; and social interaction intensified during periods of environmental limitation. Such temporal flexibility contrasts sharply with modern assumptions that stability requires standardization. Historically, resilience often depended on the ability to accommodate uncertainty rather than eliminate it.

Importantly, this adaptive model was underpinned by ethical norms that translated environmental necessity into moral obligation. Practices of hospitality, water sharing, and collective restraint were not symbolic residues of tradition but functional responses to chronic scarcity. By embedding survival strategies within moral discourse, society ensured their durability across generations. This observation supports broader anthropological arguments that moral systems in subsistence-oriented societies frequently function as ecological adaptations (Scott, 1976; Sillitoe, 2022).

**Comparative Implications: Arabia, the Sahara, and Central Asia**

A more grounded comparative perspective further clarifies the adaptive significance of the Saudi case. In the Sahara, pastoral and oasis-based communities historically relied on socially regulated access to water sources such as gueltas and seasonal wells. Ethnographic accounts of Tuareg societies document how authority over water points was conditioned by expectations of generosity and mediation rather than exclusive ownership, mirroring responsibility-based well governance observed in Najd (Crate and Nuttall, 2016).

Similarly, caravan mobility in central Arabia followed rainfall-dependent grazing patterns and temperature-sensitive travel windows linking Al-Qassim and Hijazi trade centers. These seasonal adjustments resemble transhumant migration practices documented among Saharan pastoralists, where movement between grazing zones was organized through kinship coordination rather than centralized planning.

Comparable adaptive logics are evident in Central Asian steppe societies, where nomadic groups historically regulated access to pastures and water through customary norms. Seasonal migration patterns among Kazakh pastoralists were timed according to snowmelt and summer drought risk, reflecting a temporal flexibility structurally similar to work–rest rhythms documented in pre-oil Saudi settlements.

Across these regions, environmental uncertainty appears to have favored decentralized governance, conditional authority, and socially embedded risk distribution. While ecological conditions differ in detail, the convergence of mobility-based subsistence, informal regulation of critical resources, and climate-sensitive temporal organization suggests a shared adaptive logic characteristic of arid environments.

This comparison reinforces the analytical value of the Saudi case, positioning it within a broader historical pattern of non-technological climate adaptation grounded in social coordination rather than infrastructural control.

**Toward a Conceptual Model of Social Adaptation**

Based on the analysis presented here, social adaptation to climate variability can be conceptualized as a triadic system consisting of:

1. **Temporal Flexibility** – adaptive organization of daily and seasonal time aligned with environmental conditions;
2. **Social Regulation of Resources** – informal governance of critical resources such as water through moral norms and customary practice;
3. **Ethical Embedding of Survival** – translation of environmental necessity into shared moral obligation.

These components operate synergistically, producing resilience through cultural integration rather than technological control. This model challenges deterministic narratives that portray arid environments as inherently limiting or socially regressive. Instead, it highlights the capacity of human societies to transform environmental constraint into socially productive order. Crucially, this framework underscores the importance of everyday practices as sites of adaptation. Rather than focusing solely on exceptional events such as droughts or famines, the analysis demonstrates how routine behaviors—when to work, when to rest, how to share, how to move—constitute the primary mechanisms through which climate is managed socially. *This perspective aligns with recent developments in environmental history that advocate shifting analytical attention from episodic crises to long-term adaptive processes.* (White et al., 2018).

**Broader Significance**

The implications of this study extend beyond historical inquiry. In contemporary discussions of climate adaptation, emphasis is often placed on technological solutions and infrastructural resilience. The historical experience of pre-oil Saudi Arabia suggests an alternative perspective: that cultural systems of cooperation, ethical obligation, and temporal flexibility can play a critical role in managing environmental uncertainty. While modern societies differ fundamentally in scale and complexity, the underlying principle—that resilience emerges from social organization as much as from technology—remains relevant.

By foregrounding climate as a culturally mediated force, this study contributes to environmental anthropology and history by offering a model that bridges micro-level everyday practices and macro-level environmental dynamics. The Saudi case demonstrates that adaptation is not merely a response to environmental stress but an ongoing cultural process embedded in how societies structure time, space, and social relations.

## 4. CONCLUSION

This study has demonstrated that climate and seasonality were not peripheral constraints in pre-oil Saudi Arabia but central organizing forces embedded within social life. By examining everyday practices, water governance, mobility, and moral economy, the article has shown how Saudi society

developed culturally grounded strategies of adaptation that transformed environmental uncertainty into social cohesion rather than instability. Climate variability shaped not only where and when people worked or moved, but also how they understood obligation, generosity, and responsibility toward others.

The findings challenge deterministic narratives that portray arid environments as inherently hostile to social complexity. Instead, the Saudi case illustrates how resilience emerged through flexibility, ethical embedding, and informal governance rather than technological control or centralized authority. Temporal rhythms aligned with bodily endurance, water access regulated through custom, and hospitality functioning as social insurance together constituted an integrated adaptive system capable of absorbing climatic fluctuation over the long term.

Comparative reflections with the Sahara and Central Asia reinforce the broader significance of these findings. Across arid regions, societies facing environmental uncertainty have often privileged social elasticity, mobility, and moral obligation over rigid infrastructures. The Saudi experience thus contributes to a wider understanding of non-technological adaptation, highlighting the role of culture in managing climate risk.

In the context of contemporary climate debates, this historical analysis offers an important corrective. While modern adaptation strategies frequently emphasize engineering and technological solutions, the pre-oil Saudi case underscores the enduring relevance of social organization, ethical norms, and everyday practices in fostering resilience. Recognizing climate as a culturally mediated force invites a more holistic approach to adaptation—one that values social cohesion and moral responsibility alongside material innovation. By foregrounding the lived experience of climate, this study enriches environmental history and anthropology and opens pathways for future comparative research on human adaptation in a changing world.

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