

Chapter 2

The Evolution of Courtyard Architecture

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Introduction

This chapter examines how courtyard architecture across Persian, Ottoman, and Andalusian traditions embodies principles of resilient heritage and adaptive urbanism, forging sustainable microclimates and vibrant social spaces. Drawing on typological analysis and cultural studies, I explore iconic examples—such as the chahār-bāgh gardens of Isfahan, the sequential courts of Topkapı Palace, and the sensory-rich patios of the Alhambra—to illustrate how water, geometry, and enclosure shape human experience. By integrating nature, light, and social priorities, these courtyard systems anticipate contemporary imperatives for urban resilience. Adaptive heritage strategies, far from being static relics, offer dynamic models for innovative urban design.

I begin by situating courtyard architecture within the discourse of heritage resilience and urban adaptability, then synthesize key theoretical constructs that reveal how inner-court systems endure and adapt. Next, I conduct a comparative typological analysis—framed by black-and-white analytical diagrams—across the three traditions. Drawing sensory narratives of temperature, sound, and light, I demonstrate how these spatial matrices mediate climate and culture. Finally, I discuss implications for contemporary practice, proposing a framework for embedding courtyard principles into modern dense-city interventions, addressing the urgent need for climate-responsive, socially inclusive, and culturally grounded urban design.

Theoretical Framework: Resilient Heritage & Adaptive Urbanism

Resilient heritage refers to the capacity of historic architectural forms to absorb, adapt to, and recover from environmental, social, and political disturbances (Folke, 2006). Adaptive urbanism describes the iterative processes by which built environments evolve in response to changing needs and constraints (Conzen, 1960). Integrating these perspectives positions courtyard architecture as a living archive of ecological intelligence and social negotiation—a repository of spatial solutions that continually recalibrate to new pressures.

Courtyard geometries—whether the quadripartite chahār-bāgh, the cascading sequence of Ottoman courts, or the radial symmetry of Andalusian patios—enact legible spatial orders that reinforce collective memory and place identity (Vale, 2014). Such continuity ensures that successive generations inherit a coherent framework, facilitating reinterpretation rather than wholesale reconstruction.

Inner courts function as self-regulating microclimates. Evaporative cooling from fountains or shallow pools lowers ambient temperatures through latent heat transfer; high walls and vegetative shading reduce solar gain while channeling wind (Givoni, 1998). Light is diffused through latticework and reflective water surfaces, tempering glare and animating interiors with dynamic patterns.

Courtyards are semi-public commons where social norms, rituals, and resource management converge. Extended families in Persian homes collectively governed water distribution, upkeep of vegetation, and communal gatherings, embodying collective-action principles (Odendaal, 2011). Ottoman palace courts mediated protocol, privacy, and processional hierarchies, codifying social agency in spatial sequencing. Andalusian patios integrated artisanship and civic life, hosting festivals and markets under the shade of orange trees.

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Comparative Analysis

• Persian Courtyards

Persian courtyard architecture is distinguished by its strict symmetry, axial geometry, and emphasis on water. In the classic *chahār-bāgh* layout, the space is divided into four equal quadrants by two perpendicular water channels converging at a central pool (Ruggles, 2008). This design – evident in famous examples like the Fin Garden of Kashan and the Hasht Behesht pavilion in Isfahan – embodies the idea of paradise: a serene enclosed garden in miniature. Ruggles (2008) observes that the traditional Islamic garden is “divided into four equal parts surrounding a central design element”, and that “water provides a counterpoint to the portioned green sections.” In Persian courtyards, flowing water serves both a practical cooling function and a spiritual symbol of purity (Necipoğlu, 2015; Ruggles, 2008). Surfaces of water reflect light into the courtyard and moderate temperature, while fountains and qanat-fed pools underline cosmological imagery (Ruggles, 2008; 6 Necipoğlu, 2015).

Courtyard houses in Iran typically feature high opaque walls and limited exterior openings, directing views inward. As Michell (1995) describes, traditional Muslim houses are “organized around an inner courtyard” with “high windowless walls... interrupted only by a single low doorway”. This inward orientation reinforces privacy and frames the garden as an oasis hidden from public view. Hosseini et al., (2015) classify several Persian house typologies (centralized, corner, partially-enclosed) all of which place the courtyard at the spatial core of the dwelling. Interiors open onto the courtyard via colonnades or iwans (vaulted halls), creating a layered transition from entrance to innermost sanctum (Petersen, 1996). Decorative geometry – tile patterns, *muqarnas*, and chiseled wood – further reflect the garden’s order. In summary, Persian courtyards marry rigorous geometric planning with lush vegetation and water, expressing an idealized vision of nature (Necipoğlu, 2015; Ruggles, 2008).

• Ottoman Courtyards

Ottoman courtyard design shares the inward focus of the Persian model but diverges in its social and climatic strategies. In Ottoman cities such as Istanbul, domestic and palatial complexes often consist of multiple pavilions arranged around an open courtyard garden (Michell, 1995). For instance, the Topkapı Palace is not a single building but “a series of separate units, with different functions, strewn around a beautiful garden”. Courtyards thus act as organizing hubs connecting reception halls, living quarters, and service areas. Water features remain important – fountains and shallow pools provide evaporative cooling – but their layout is typically less formal than the four-part Persian scheme, reflecting Ottoman preference for graduated enclosures and merging indoor/outdoor thresholds. Social hierarchy and privacy are key in Ottoman courtyard planning. Residences often distinguish public-facing spaces (such as the *selâmlık*, a reception wing) from family quarters (*harem*) with a sequence of courtyards (Petersen, 1996). Each successive courtyard or iwan effectively filters and controls access. Ottoman architects also employed extended colonnaded porticos (e.g. the arcaded peristyles around Topkapı’s courtyards) to provide shade and transition from exterior to interior (Michell, 1995). In the end, Ottoman courts serve dual roles: as buffer zones regulating visibility and as microclimates. They address pragmatic concerns (privacy, social order, ventilation) while still utilizing natural elements. The emphasis on segmented, multi-courtyard layouts with covered galleries reflects the empire’s administrative complexity and the Anatolian climate (Sluglett, 2008; Petersen, 1996).

• Andalusian Courtyards

Andalusian (Moorish Spanish) courtyard architecture represents a unique synthesis of Islamic and classical Mediterranean influences. In regions such as Al-Andalus, Muslims adapted Roman villa and Visigothic courtyard precedents to Islamic cultural norms. The most celebrated examples are in the Alhambra of Granada: the Court of the Lions and Court of the Myrtles. Michell (1995) describes the Alhambra as “a maze of rooms and courtyards... of water basins and canals that link the open and covered spaces”, highlighting its complex interweaving of gardens and architecture. Andalusian courtyards retain the formal symmetry of Persian antecedents but often incorporate long axial pools and reflective basins to maximize evaporation in the hot Iberian summer (Ruggles, 2008).

Gardens in Andalusia are typically inward-facing green courts with fruit trees, myrtle hedges, and rills (narrow water channels). Conan’s study of Andalusian gardens (2007) emphasizes their role in controlling temperature and privacy: tall walls shield courtyards from harsh sun and prying eyes, while fountains aerate the air. The spatial logic is evident in traditional Andalusian houses (*riads*), where an entrance leads directly into a courtyard rather than street-facing rooms (Petersen, 1996). The layout often features a central rectangular pool or multiple small basins along the axes. Decorative tiles and carved stucco ornamentation, as in Granada’s *efrènes* and *azulejos*, merge with the landscape to create a sensorially rich environment. To sum up, Andalusian courts balance functionality with aesthetics: they solve environmental challenges (cooling, light management) while manifesting ideals of order and harmony (Ruggles, 2008; Conan, 2007).

Findings and Discussion

The comparative study reveals that Persian, Ottoman, and Andalusian courtyards, while culturally distinct, converge on a shared design vocabulary centered on water, light, and geometry. All three traditions create inward-looking sanctuaries where nature and architecture interlock: water channels and gardens mediate heat and light, while symmetrical layouts imply cosmic order (Ruggles, 2008; Necipoğlu, 2015). For example, Persian *chahār-bāgh* gardens and Andalusian *riads* both use cruciform water patterns to symbolize paradise. Ottoman designs, though more pragmatic, still prioritize courtyards as framed landscapes that organize building complexes (Michell, 1995). This unity aligns with Rabbat's assertion that the courtyard house retains "universal relevance" beyond any single culture (Rabbat, 2010). In each case, the courtyard serves as a microcosm of order in an otherwise dense urban environment.

Our findings reinforce and extend prior scholarship. Ruggles (2008) argued that Islamic gardens are "earthly reflections" of paradise, and our analysis confirms this metaphor across Persian, Ottoman, and Andalusian contexts. We also corroborate Michell's (1995) characterization of the Alhambra's labyrinthine courtyards. In the Persian context, Hosseini et al.'s (2015) typological classifications are borne out by numerous case studies: central, axial courtyards are repeatedly identified as organizing principles. Ottoman sources (e.g. Petersen, 1996) emphasize privacy and hierarchy, which we observed in courtyard sequences. The interdisciplinary approach – combining architectural history and environmental studies – aligns with methods used by Petruccioli & Pirani, 2013 and Jani et al. (2015) in examining Islamic design principles.

This study's strength lies in synthesizing disparate traditions under common analytical categories. By coding design elements (water, geometry, enclosure) across regions, we elucidate a shared symbolic lexicon that transcends geography (Necipoğlu, 2015; Ruggles, 2008). It also highlights differences: for instance, Persian and Andalusian designs prioritize static symmetry and garden ornament, while Ottoman layouts emphasize modular units and human traffic. These differences reflect distinct social contexts – theocratic courts in Persia, bureaucratic palaces in Turkey, and frontier cities in Spain (Sluglett, 2008; Michell, 1995). The comparative framework thus deepens understanding beyond isolated studies.

Limitations of this research include its reliance on existing literature and interpretations. Vernacular variations and undocumented modifications – such as local adaptations of courtyard houses in rural Iran or Anatolia – may not be fully captured (Hosseini et al., 2015). Also, the symbolic interpretations (of water or geometry) are drawn from theoretical sources; archaeological or ethnographic validation would strengthen these claims. Future work could apply digital modeling (e.g. GIS or 3D simulation) to empirically test how these designs perform in climate control, as suggested by contemporary researchers (Petruccioli & Pirani, 2013; Jani et al., 2015). Likewise, comparative field studies of surviving courtyard houses could reveal how living traditions have evolved since the historical periods considered.

Conclusion

This study demonstrates that Persian, Ottoman, and Andalusian courtyard architectures, while regionally unique, share enduring principles that integrate symbolism and function. All three traditions valorize water, light, and geometric order: Persian *chahār-bāgh* gardens evoke paradise through formal axial layouts and fountains; Ottoman courts organize social space through layered enclosures that address privacy and climate; Andalusian courts synthesize these approaches into harmonious patios framed by Islamic artistry (Michell, 1995; Ruggles, 2008). Each tradition thus offers a distinct solution to similar challenges. As Rabbat (2010) and Ruggles (2008) suggest, the courtyard house persists as a universal archetype, adaptable across cultures.

Practically, these findings illuminate how historic courtyards meet modern needs. The same passive design elements – inward-facing green spaces, evaporative cooling, shaded galleries – can inform sustainable architecture today (Petruccioli & Pirani, 2013; Jani et al., 2015). By learning from Persian and Andalusian emphasis on garden geometry and from Ottoman spatial sequencing, contemporary planners can create dense yet humane urban environments. In conclusion, the evolution of courtyard design in Islamic architecture reflects an ongoing dialogue between nature, culture, and the built form. This dialogue endures, offering a template for architecture that is both aesthetically rich and ecologically responsive (Ruggles, 2008; Necipoğlu, 2015).

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Conflict of Interests

The author(s) declare(s) no conflict of interest.

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