Making Desert Cities

Figure 1 City of Shibam in the Yemen

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Introduction

Modern desert cities, such as Phoenix, Albuquerque, Tucson, Las Vegas, even Riyadh and Dubai, are being made in ways that reflect the capacity of post-industrial technology to overwhelm the limitations that constrained the forms of older, pre-industrial, desert cities. This chapter questions whether both the technology and the living patterns that typify such modern desert cities are sustainable. It also looks at some older desert cities to see if they have much to teach us about how to live well in desert cities without an excessive dependence on non-renewable resources, and without placing so much stress on the environment. At the same time, as Amos Rapoport and Besim Hakim have suggested, we must recognize that the forms in which cities are made respond as much, or more, to cultural imperatives, as to issues of climate and technology. We need to be cautious, therefore, as we derive these lessons and attempt to apply them. Nonetheless, many of these older cities, such as Yazd in Iran, Shibam in Yemen, Jaisalmer in India, and Marrakesh in Morocco, have evolved in response to their desert contexts over extended periods of time. Some have even survived significant cultural shifts, such as in Sana’a in Yemen, with the arrival of Islam after many centuries of growth. It is argued that they may provide valuable models, regarding compact urban form, alternative house forms, climate control and its optimization, water usage and its celebration, low-energy construction materials and methods, even the nature of windows, in the making of modern desert cities.

Desert cities in the United States, such as Phoenix or El Paso, even Los Angeles and San Diego, face a unique responsibility as they provide models for what it means to live a “modern” life in a desert environment. Following these models can multiply by many times the stresses placed on other ecological and political systems as they are emulated, partially or wholly, throughout the world -- first by the
wealthy in their suburban villas, and then, over time, by others in the population -- abandoning the old dense city centers as they seek the benefits of a life that begins to match their images of twenty-first century urbanism.

This chapter aims to address a growing concern by many regarding the long-term prospects of cities, such as the rapidly growing cities of the American Southwest, with both an urban form and an array of building types that have largely ignored their desert settings. It also is a response by the author based on extensive travel to desert cities around the world, particularly, but not solely, to older cities whose cores were built in a pre-industrial era, in search of lessons indicating more appropriate ways of living in a desert context. This work is not informed by nostalgia or cultural conservatism, although these are certainly forces staying the hands of those who would destroy, indeed in some places have already destroyed, the patrimony of ancient cultures in the name of “modernization”, and in response to the ineluctable forces of the marketplace. It is informed by a deep commitment to what Vitruvius called “propriety”; by a belief that the best way to live is not by dominating the context but by optimizing its benefits and gently ameliorating its challenges; that the power of modern technology should be used only as a last resort when all other means cannot meet the demands of twenty-first century life.

**Background.** The advent of twentieth century technology has radically changed the nature of desert city living in many parts of the world. Widespread use of automobiles, increased access to large scale urban water and sewage systems, almost universal access to electrical power and, in some cases, full climate control through air-conditioning have eroded the need for a careful relationship with both the social and physical environment. Satellite receivers, powered by that electricity, have infiltrated almost every household with images of ways of life that challenge indigenous cultural norms of both behavior and artifacts. This barrage of images, reinforced by the communications from international commerce, has promoted the uses of the new technologies as a means to “modern” life patterns.

There are still many desert settlements in the world where access to all of these modern technologies is very limited. Automobility is at best a motorcycle, and much travel is done in mini-buses or shared taxis. Although electricity may be available via a tangle of overhead wires, water may be available only for a few hours a day or a few days a week, or has to be brought in containers from communal taps or wells. The building of sewer systems often has been less than satisfactory in some desert cities, as leaking pipes have both polluted the ground and dissolved the foundations of older buildings. Further, the effluent is often left untreated as it leaves the system. But these transitions to “modern” living, even when incomplete, have still been eroding ways of making desert cities that evolved over centuries and were adapted to the physical demands and opportunities of their physical and cultural contexts.

Is this process reversible? There have been political and religious leaders who have attempted to resist this tide of “modernization”. Countries such as North Yemen had rulers who refused to let their
community participate in twentieth century developments throughout the first two thirds of that century. The resistance to this western model of modernization may be reflected in some of the political turmoil in the world today among those who value the traditional ways of life and fear their destruction under the wheels of the juggernaut of western modernization. However, even in countries that profess a cultural hostility to the west, many of the forces of “modernization” seem to be irresistible. What is needed is an alternative model that retains much of what is valuable from the past but that also accommodates with a new sensibility the demands of the present.

Figure 2   Housing expanding into the desert in Scottsdale, Arizona

**Modern Desert Cities.** Greater Phoenix is a prototypical modern desert metropolis in the American Southwest. It is a city that anticipates achieving its full realization as a major urban center in the twenty-first century and is accumulating the necessary elements of a metropolis. It is becoming a “major league” city more than simply in terms of sports. At the beginning of this century the population of the metropolitan area of Phoenix already had exceeded three and a half million, with a land area of more than twelve hundred square miles. The population by 2050 has been projected to be between nine and twenty-eight million, depending on which previous growth trend is extrapolated. Phoenix has had most of its growth as an automobile city. As in other automobile dependent cities, its population density has been low, averaging about 2,750 people per square mile.

What could be the model for a different urban density in a desert city? Older American cities such as Boston, New York, and San Francisco have much higher densities and more urbane life-styles, and are among the most desirable places to live. But they are not desert cities.

This chapter looks at lessons for making successful desert cities. It explores examples in Israel, Iran, Tunisia, Morocco, Rajasthan, Egypt, Yemen, Australia, Chile and Peru. This is not a comprehensive array. Rather, it is a survey of a diverse set of long enduring desert cities. Each has its own lessons, not
only at the urban scale, but also at the scale of the building types. Within this survey, some shared characteristics were identified.

Among them are: shade, pedestrian scale and mass transit, courtyards, efficiency in water and energy use, natural ventilation and evaporative cooling, and enduring building materials; but most of all they share the characteristic of compactness. A brief description of these follows:

Figure 3  Arcades onto the main Plaza in Cuzco, Peru

Shade is an essential component of desert living, particularly for the pedestrian. When one consults early photographs of the centers of cities like Phoenix, and of older Hispanic cities, porches and arcades (portales) are in front of almost every building, and awnings often shade the windows. In older cities in Australia, such as Adelaide, such “portales” are still to be found, somewhat like the cast-iron arcades of the French Quarter of New Orleans. In newer parts of cities such as Brisbane, high steel arcades have

Figure 4  Shade structures Brisbane, Australia
been constructed upon which shading plants climb. Major city streets are often lined with shade trees. Sometimes, as in Isfahan and Yazd in Iran, they are growing directly out of the irrigation ditches that flow alongside the sidewalks. In other North African desert cities, water is too scarce for all but the occasional street drinking fountain, often built as a philanthropic gift to the community by some well-to-do citizen. Here, the buildings themselves are the source of shade as they form the edges of the often-narrow pedestrian alleyways. In cities such as Shibam in the Hadramawt of South Yemen, the tower houses that line the street are so high that a great deal of shade is created, and the narrow city streets are noticeably cooler than the surrounding countryside.

Figure 5 Narrow shady street in Sana’a, Yemen

Shade is particularly difficult to achieve at the scale of the typical automobile dominated street. The roadway is almost inevitably going to be exposed to long-term solar radiation and will itself become a radiant heat source. This can, of course be reduced by substantial shade trees along the sidewalks and in the medians, but such trees are rarely water conservative and would not meet the requirements for indigenous xeriscape plants often adopted by desert cities like Phoenix. This suggests that the higher density, pedestrian dominated parts of the desert city should be served, not by streets predominantly conceived of as vehicular roadways with pedestrian sidewalks, but as relatively narrow shaded pedestrian ways, with limited access for service and emergency vehicles as well as purely local traffic. This is the arrangement for many of the streets of older desert cities. Physical conditions limit vehicular traffic to
small service and public safety vehicles, or two-wheeled vehicles such as bicycles or mopeds. The widths of streets in the “medinas” of Morocco or Tunisia were often thought of in terms of the required number of laden donkeys or camels walking side-by-side. In a modern desert city, the dimensions could follow the minimums required for specially designed or selected essential vehicles, while recognizing the priority of the pedestrian, as do the malls on many of our university campuses.

**Pedestrian scale** creates a very different built form than the scale of the automobile. Pedestrians need an intimacy of encounter with the environment, whether natural or man-made. They also need short-range destinations. This leads not only to a smaller scale environment but also to the possibility of a more varied geometry. Since the time of the 1785 Jeffersonian Land Ordinance that established a neo-classical subdivision of land west of the Appalachians the plans of most American cities have been dominated by the rectilinear mile-square grid. The interest in the picturesque that emerged in the mid-nineteenth century introduced the curvilinear street pattern, originally in our cemeteries and parks and eventually in our suburbs. The desert city, however, in providing for pedestrians, will often have an even more complex geometry in its pattern of major and minor streets. There are a few examples in history of desert cities planned for princes, such as Jaipur in Rajasthan, that are almost completely on a rectilinear grid, but the majority do not respond to a single dominant geometric concept. This is not to suggest that they are illogical, but that the logic is not that of a simple geometry. Rather, as Besim Hakim and others have suggested, it is often the logic of religiously derived and legally enforced social relationships, and, as Norbert Schonauer has identified as worthy of emulation, the creation of a hierarchy in street networks linking small communities to the larger city.

The dense network of intimate shady streets typically will lead to a major communal space. In the Hispanic colonial cities of South or North America, built under the influence of the Laws of the Indies, this will be a formal plaza, focused on a major fountain, flanked by arcades and framed by the buildings of government and religion. In Isfahan in Iran, there is an enormous central square, or “maidan”, whereas in cities such as Marrakesh in Morocco the major open space lacks such geometric clarity, but comes to
life in the cooler evenings with food stalls and crowds clustering around story-tellers, snake charmers, tribal bands, acrobats, and even dentists. In most Islamic countries, formal geometry is reserved for the paradise gardens of palaces or mosques not for urban spaces. Nonetheless, the central plaza is the focus of the community. The major Friday Mosque also will be nearby, and at dusk the air will be filled with the electronically amplified and distorted wail of the call to prayer from the loudspeakers mounted on its minaret. The vitality and identity of the city is relished by both its citizens and its visitors in such places. In the modern city similar public places are still necessary, and could relate to the transit systems that bring people from the further reaches of the city, thereby reducing the necessity for the major roads and parking garages that erode the intensity and thermal comfort of urban life in the desert.

In the ancient desert cities it is often from such places that the market, bazaar, or souk heads off as a shaded linear pedestrian passageway, burrowing its way through the fabric of the city. Typically this linear market will be flanked by occasionally fountained service courts, workshops and storerooms from which laden trolley carts head off to refill the emptying shelves of the small stores that line the pedestrian way, and also by the fondouks or inns that accommodate the visiting merchants. Bazaars or souks are often vaulted or domed, and illuminated and ventilated from oculi that let narrow shafts of sunlight in and the heated air out. Such spaces, neither interior nor exterior, shaded but open to the fresh air, are crucial to the success of desert city buildings. Whether such a form of retail would work in the modern world may be questioned but it certainly has its parallels in cities such as Scottsdale in Arizona that has a naturally day-lit, and in certain seasons naturally ventilated, shopping mall a half-mile long. The major difference is that the means of access via the automobile has isolated the modern mall from the rest of the city behind a moat of parking. With increased access provided by mass-transit, and a higher density of residences within walking distance, such physical isolation of shopping from the surrounding community can be significantly reduced.

Courtyards have been the focus of buildings in compact cities for millennia, but particularly in desert cities. The central courtyard allows the building to be constructed out to the very edges of its site, gaining most of the necessary light and air from within, rather than depending on a wasteful buffer around it of often relatively useless space. That courtyard becomes the focus of the building from which the major rooms are reached directly, and into which those rooms may generously open at cooler times of day or season. In very hot desert cities, as in Fez or Marrakesh in Morocco, the courtyard will have provision to be shaded when necessary with sheets of fabric stretched on ropes, or by open weave mats laid across a metal grille that protects the courtyard from invasion from above. Typically, within the courtyard there will be a fountain or pool and leafy plants that provide both physical and emotional cooling.
Buildings of this courtyard type were designed in the late 1950’s for the campus of Arizona State University. The Farmer Education Building and the Social Science Building there have central fountains and planted courtyards around which the open-to-the-air circulation of the building, both stairs and galleries, is located. These stairs and galleries share the shade of the light mesh canopy over the courtyard. It is only on entering the rooms off that circulation that one experiences full mechanical climate control. The courtyard also becomes the major social focus for the inhabitants of the building. In some courtyards in Iran, for example in the desert city of Yazd, the pool in the courtyard may have a wooden platform straddling it on which a family and friends may gather in the evening to eat and converse. The courtyard will have on its southern edge, facing north, an open porch or iwan for use in the summer, and on its northern edge, facing south, a winter space, that in the nineteenth century may have been furnished with moveable windows glazed with colored glass. The air movement through these courtyards and iwans is stimulated by windtowers, or baudgir, which climb above the rooftops and channel air from all directions down into the houses, iwans, and courtyards. In many older desert cities there is also space below ground to which people may retire in the heat of the day for rest, quiet, and contemplation.
Such below ground space in Iran often surrounded a small pool through which the water from the qanats flowed. The qanats are underground channels hand-tunneled from the base of the distant mountains to bring water to the city. The residents of major institutions and the important houses of the city were served directly by these qanats. Others had to go to a communal cistern into which water would flow from the qanats. This space is covered by a dome and ventilated by an array of windtowers. Qanats are also found in North Africa, although there they are called khettaras.

Water is obviously crucial to the survival of desert cities. Many were built on rivers that brought the water from far beyond the sparsely precipitated desert context. Cairo is the most extreme example of this, but there are many other desert cities -- such as Lima, in Peru, where the local rainfall is almost zero -- but which are served by rivers fed from distant mountain watersheds. In the Chilean Atacama Desert, one of the driest in the world, there are richly vegetated fissures in the arid desert surface through which streams flow from the distant volcanic mountain ranges. Small oasis towns, such as Toconao, capture that water and guide it in narrow channels through their orchards, much as with the acequias in New Mexico and the great date palm groves of North Africa.
Another source of water has been groundwater in aquifers built up over millennia and replenished by seasonal rains. Sadly, in many ancient desert cities, such as Sana’a in North Yemen, the wells that almost every house had in its basement no longer reach the aquifer. This source of water has retreated beyond the reach of those wells because of profligate mechanical pumping caused by increased per capita use multiplied by rapid population growth. Water is now piped into Sana’a, as is the case in most of the smaller towns and villages of Yemen where it is usually connected to communal taps in the street rather than directly to the houses.

In both ancient and contemporary desert cities, the modern technology of pumps and pipes, as well as canals that bring water from great distances, has changed patterns of water use as well as cultural attitudes towards water. The sense of water as a scarce and precious commodity, to be celebrated architecturally through noble fountains and the building of great cisterns and magnificent step-wells into which the monsoon rains are carefully channeled, can be seen in Yemen and Rajasthan. This sensibility has been displaced more recently by a purely utilitarian attitude that appears to have encouraged wastefulness. In beautiful old cities such as Jaisalmer in India, this newly excessive use of water overloads the inadequate drainage systems and erodes the foundations of older buildings that were not built to withstand the rising dampness.

In our modern desert cities there appears to be a growing consciousness of the need to be thoughtful about water. Many cities have adopted xeriscape as the standard for landscaping. Development also is constrained by the need to demonstrate the long-term availability of water, and an attempt is being made to avoid the exhaustion of the aquifers. In Phoenix, for example, the local press publishes articles about the loss of natural rivers because of the unconstrained increase in the number of wells within the watershed.
What techniques and attitudes can then be learned from the history and recent experiences of these desert cities.

**Water harvesting** is a term that needs to be understood and embraced. Desert cities throughout history have practiced it. The modern desert city may harvest water at the scale of the watershed and the region but, at the scale of the individual building and the small community, many still have lessons to be learned. For example, throughout Australia many older homes have under their eaves a great round steel cistern into which the rainwater drains. It is used to relieve dependence on the main water supply in old mining towns such as White Cliffs or Coober Pedy, where many live in underground houses converted from the opal mines and harvest water from the ground above.
An older example is in the courtyard in the middle of the great mosque in Kairouan, Tunisia. Below the center of the courtyard there is a cistern into which the rainwater that falls on that courtyard is drained, and is then available as a well for the ablutions required before prayer. At the center of the beautiful small town of Hababa, also in Yemen, is the town cistern, surrounded by a wall of houses and a small mosque, into which the winter rains are drained and stored. In India water harvesting is now a requirement for all new developments. All other desert cities could benefit from such a fine grain attitude towards water conservation. The continuing use of water already used for ablutions is evident in Sana’a, the capital city of Yemen, as it irrigates gardens where fresh vegetables are grown. The Waqf, the local religious foundation, manages these gardens as well as the adjacent mosque.

The celebration of water as a scarce and valuable commodity should be expressed in civic and private architecture, in urban form, and in management policies. As an example of what not to do; in a recent drought in Phoenix, the fountains were left dry to symbolize a commitment not to waste water, but this was actually misguided. The savings were negligible as the water used in the fountains is recirculated and the only slight loss would be through evaporation. Historically, fountains have been used to provide respite from the arid heat of the desert and to honor the cleansing and life-giving power of water. To keep the fountains flowing is to demonstrate the ability to continue life and civility in the desert. To turn them off is to admit defeat. The lesson here is in the appropriate use of civic architecture to celebrate the value of water as it is harvested and enjoyed.
Earth is the material most used in the construction of many of the older desert cities. Adobe and rammed earth, or pise, often are dug from the immediately adjacent land. From the North African
settlements of Morocco, Algeria, and Tunisia to most of the Middle East the communities are made of it. The towered city of Shibam in Yemen, for example, is built of mud brick from the great wash of the Hadramawt. Local stone also is used, as in Rajasthan, India, where the indigenous sandstone is extraordinarily versatile and can be used for columns, beams, floor slabs, as well as intricately carved screens and brackets. In Jerusalem, the city benefits from the continuing commitment to the use of its beautiful locally quarried Jerusalem stone on all of its buildings, giving a consistency and coherence lacking in many modern cities.

Building materials for the Desert. In contemporary desert cities, many architects of the Southwest have been exploring the use of rammed earth, adobe, and other more enduring materials and techniques that extend their palette to make a thoroughly modern architecture that fits their context as well as the contemporary needs of their clients. Eddie Jones in Phoenix and Rick Joy in Tucson are two of a rapidly growing school of regional architects whose work is being recognized far beyond the bounds of the region, and who have incorporated rammed earth as a valuable contribution to their architectural resources. Inorganic materials that will not deteriorate under the fierce attack of sunlight and dry air, such as earth and metals, have replaced wood as a primary raw material for the structure, or as cladding on the exteriors of buildings. Even the great wooden beams at Taliesin West have now been replaced by steel. In the arid air of the desert steel often can be left unpainted in the knowledge that the rusting process will be extraordinarily slow. Will Bruder has been a leader in exploring the use of metals, and his Phoenix Library is sheathed in locally mined copper that has been corrugated by the same machines that mould the steel sheets that form the walls of agricultural silos.

Figure 15 Shutters below clere-storey windows in Sana’a, Yemen

Air in the desert has been one its greatest assets. Many very talented people, such as New Mexico’s great architect John Gaw Meem, as well as Frank Lloyd Wright, who located his Taliesin West in
Scottsdale, Arizona, came to the desert to benefit from the clear dry air as a part of a treatment for their lung based illnesses. For many months of the year fresh desert air can be allowed to circulate freely through the buildings. The great mosques in the older desert cities of the Middle East are open to the air, without glazed windows. Indeed there is one mosque type that is little more than great arched porches, or iwans, on the four sides of an open fountained courtyard. In the older desert cities, there are many fresh-air environments where architecture is used to create exterior microclimates rather than closed interior environments. These courtyards, kiosks, porches, shaded souks or bazaars, gardens, or naturally ventilated major rooms, often domed and even fountained, lend much of the quality and richness to the fabric of older desert cities, particularly those of ancient Persia, Egypt, and the Arab world.

Some modern desert-based architects, such as Antoine Predock, have understood the continuing value of these architectural elements as they build in Arizona, New Mexico and other arid regions. Taliesin West, the winter home of Frank Lloyd Wright and his Fellowship, also had no glazed windows in its early years; just shutters that could be closed to keep out the wind or the cold night air. Similarly, older desert homes in the Yemen also had shutters only in their lower windows, with the higher windows “glazed” with thin sheets of alabaster to diffuse light into the rooms. High-level ventilation through lantern vents, or simply holes in the roof similar to that of the Pantheon in Rome, have ensured the evacuation of hot air from both major halls and linear vaulted souks or bazaars throughout the history of architecture in arid lands.

In the Islamic city, because of Koranic laws against overlooking into the private courtyards of neighboring houses, there is a consistent height for all the houses. This permits a continuous stream of breezes above the rooftops. The wind towers of Iran, such as in the great desert city of Yazd, reach into that stream to play an important part in stimulating air movement within the courtyard houses, both through scooping air down on the positive pressure side of the tower and through drawing air out on the negative pressure side.

**Fire** or the naked flame, the source of light and heat for millennia in the desert as elsewhere, has been replaced almost entirely by the captured flame of electricity and by the ignition of fossil fuels in the internal combustion engines. Before industrialization, it was the naked flame that cooked our food and heated us in winter, even provided the focus of social life. For example in Aboriginal communities in the Australian deserts fire, rather than buildings, marked human settlements. The acrid smell and smoke of cooking over charcoal or smoldering dried dung, has now been joined in the developing world by the choking exhaust fumes of mopeds, motor bicycles, taxis, trucks and trains. In these ancient sites, as in the developed world, the exhausts from the captured flame in engines and power stations have created a blanket of polluted air over our desert cities, particularly in winter when the colder night air causes temperature inversions that trap the dirty air. Efforts to control this have included a decision by the
Indian Supreme Court to mandate the use of Compressed Natural Gas (CNG) in Delhi, as the fuel for all public vehicles, including taxis and motorized rickshaws. Unfortunately, the decision was made before there were adequate refueling stations, so long lines formed overnight at the few stations that did exist. Emission standards in the West have been constantly improved, more recently in the United States by states such as California rather than by a Federal government sensitive to the objections of the automobile manufacturers.

Most encouraging as a response to this problem is a revival of interest in, and a commitment to, a new generation of mass transit. Many American cities are investing heavily, with the support of the Federal government, in light-rail systems. Desert cities such as Phoenix are late to participate, and other smaller desert cities such as Tucson and Scottsdale, are still debating the value of such a commitment. Tucson, however, does have some of remnants of an older trolley car system to form the basis for such a network.

Desert cities in the American Southwest owe most of their growth to the technological developments of the latter half of the twentieth century, notably domestic air-conditioning and the improved availability of automobiles. The density that results from automobile dependency is typically very low. Phoenix’s density in 2000 was about 2,750 people per square mile. This density is about half of the density of Los Angeles, a city that developed initially as a trolley car city.

Other desert cities, such as Tucson and Albuquerque, have an even lower density. It is those low densities that make such cities appear to be inappropriate for mass transit. In Phoenix, in 2007 as this is written, there is an anticipated shortage of parking spaces, particularly shaded parking spaces, on the lots planned around the park-and-ride stations on the light rail system that is being built with a first phase planned for completion in 2008. Park-and-ride may be an appropriate way for mass-transit to serve a low-density city. An alternative, though, is to deliberately set about increasing the density around the light-rail stations in order to bring significant numbers of people within walking distance.

The construction of the twenty-three miles of the first phase of a light-rail system is one of the most important developments in Phoenix in the twenty-first century. A further twenty-seven mile section of the light rail system, Phase II, is being planned. The fulfillment of the potential of this system depends on a radical change of urban density along those lines.

The system being planned for Phoenix, as of 2007, will total approximately fifty miles. If, for example, a density of 20,000 people per square mile could be achieved in a mile wide swathe centered on the light rail stations, then many benefits would accrue. First, the equivalent of a decade’s worth of population growth, i.e. about 1 million people, could be accommodated, with a minimum of new roads and without consuming more land. Second, at that density not only would the light-rail stops be within walking distance of a significant number of people, they would also be equivalently close to almost all the other institutions of urban life such as schools, shops, libraries, post-offices, restaurants, parks,
community-gardens, day-care and senior citizen centers, etc. A density comparable to substantial portions of New York City could be accommodated along that strip, without sprawling the city of Phoenix, at present densities, another 364 square miles. It would reduce the amount of new road construction and automobile travel time that a typical area of Phoenix requires, and also restrain the increase in the air pollution that plagues the city. Such a strategy would have major benefits both for Phoenix, and serve as a model for other desert cities.

**Compact Urban Form.** What form should higher density urban living take in a twenty-first century desert city? High and low-rise condominiums currently being built, particularly close to existing centers with an array of services available within walking distance, follow models established in San Diego and Dallas. For some people in the urban area, notably young professionals and older people without children, this may be an appropriate although relatively expensive housing type. Higher density traditional houses also are being built. The open space around many of these houses, though, has shrunk to a margin measured in feet rather than yards. This limits the use of the open-air space that is one of the rewards of desert living where, for much of the year it is possible and enjoyable to be in appropriately positioned and shaded outdoor spaces connected to the house.

The older desert cities, built before the days of the automobile and air conditioning have much to teach us about ways to live comfortably and well at higher urban densities. The late Norbert Schonauer wrote in *6,000 Years of Housing*:

“In a world where no nation is wealthy enough to afford waste, the land-use efficiency of the oriental urban residential pattern is worthy of emulation in terms of both land use and energy conservation. This is not to say that the oriental urban environment should be duplicated, but merely that some of its urban design principles should be adopted, such as, for example, the hierarchical order in street networks that bring about a safe residential environment.

“Moreover, planning small precincts for residential neighborhoods without through traffic would afford a more intimate identity with the residential community. In addition, a compact urban development pattern with no waste space would result in reasonable walking distance to many community facilities and would create the population density required for efficient mass transportation systems. Finally, the courtyard concept would be applied successfully in the design of both single-family dwellings as well as multiple housing in which each dwelling would have some semblance of privacy and indeed also a ‘well of heaven’.”

The following comparison illustrates the urban land-use efficiency Schonauer analyzed. The typical North American suburb has 23% of its area devoted to public rights of way, 6% to driveways and garages, 17% to built-up area, and 54% to private yard space, much of it just a buffer between the houses and between the houses and the road. He compared this to several other oriental urban patterns: Tunis,
Medina, 9% public rights of way, 74% built-up area, 17% private courtyard space; Ahmedabad, Kadwa Pol, 18% public rights of way, 69% built-up area, 13% private courtyard space; Baghdad, 16% public rights of way, 72% built-up area, 12% private courtyard space. In the oriental examples, instead of only one sixth of the land being used for dwelling, between two-thirds and three quarters of the land is in residential use, and that does not count the private open space, nearly all in the form of central courtyards that are an intrinsic part of the home. This makes it possible to achieve much higher densities without building high or losing contact with the ground. It also allows the use of building and paving areas to collect the runoff from rains and support the plants that can flourish in its courtyards and along its pedestrian ways.

This comparison does not mention the great value of the roof surface of the desert house. Typically flat, it is accessible and usable. Residents use it at night, under the clear desert sky, as a cool place for sleeping. In the early morning, with the appropriate shade from the early morning sun, it can be a delightful place for breakfast. In the winter, the gentler sun can be enjoyed directly. In the Islamic city, due to the strict rules about overlooking, the neighboring houses will not block the distant views. This becomes a welcome contrast to the introversion of the rest of the house. Even without the rule of the Koran, such height limitations could be easily assured within the planning controls of the western world.

**Past and Future.** Desert cities have been around since the beginnings of civilization thousands of years ago. Largely due to the extraordinary technological changes of the last century and a half, modern life has alienated us from much of the evolved wisdom of those millennia of urban desert living, even for those who grew up within such ancient patterns. For many contemporary desert dwellers, the term “sustainability” has attached to it a question mark. It would seem appropriate as we confront an uncertain future, where the optimism of modernity is being tempered by our growing concerns about the price it is exacting on our natural and social environments, for us to reconsider our heritage, not as something to be discarded, but as a source of valuable concepts. The past is not to be copied, but to be used as a reservoir of societal wisdom.
Implications on Planning and Design. For architects and urban designers it is always a necessity to explore in design the implications of any critical theory. As both an architect and a teacher this author has sought to have the above ideas inform much of the recent work of his students. As an illustration of some of their work, as shown in Figure 16, a quarter square mile of Central Phoenix, just north of the downtown core and adjacent to one of the new light-rail stations, has been examined as a site for compact, mixed use, urban development with a morphology based on an examination of older desert cities and their building types. Two very different geometries were explored. One arrangement stayed close to the rectilinear grid on which Phoenix grew from the middle of the nineteenth century, but explored the use of housing types from cities such as Lima, Jaipur, and Jerusalem. The other arrangement responded more to the desire lines of pedestrians as they headed to and from the light-rail station, much as in Islamic cities the Friday Mosques, like magnets that order “iron filings”, shape the elements of the urban fabric around them. In this case both the low courtyard houses of North Africa and the tower houses of Yemen were used as departure points in the development of compact city housing types.

The methodology, borrowed from other educators such as Michael Dennis of MIT, was to superimpose initially a piece of an older desert city onto the site, in order to establish a sense of the intricacy of their scale, and the richness and variety of their fabric, and then to morph it to meet the demands of modern American urban life. Clearly, the culture that informed the logic of the older city is quite different from that which would shape a modern American city, and so it was necessary to reinterpret the form. However, it made some sense to replace mosques with schools, palaces with major institutions such as university buildings, mosque gardens with community gardens, etc. Discussions with developers suggested that the retail system of bazaars or souks was actually quite transferable. A limited
accommodation of cars was allowed, but the commitment was to the primacy of pedestrian movement, much as is to be found on most university campuses. The students also developed reinterpretations of court and tower houses for modern American living. These contemporary applications, though, retained a commitment to use low energy building materials, such as rammed earth, to the optimization of the natural advantages of a desert climate for much of the year, and to the use of architecture rather than machinery as the primary means of ameliorating the impact of the hot summer sun.

Figure 17  The New Arizona Urban House project

This early set of studies, which has been followed by other similar investigations into custom courtyard houses with a floor area ratio (FAR) of 1, i.e. lot size equals house square footage, and mixed-use compact urbanism, suggest that there is some validity to the proposition that informs this chapter; that there are lessons to be learnt from studying older desert cities as we attempt to develop more sustainable ways to make the desert cities of the future.