The following is an extraction of the book:

“Sustainable Urban Design and Climate With Reference to Palestine”

Farid Al-Qeeq (Author)
It is evident that the geometry of the urban form as an urban design parameter is crucial. The layout of the structure can modify the urban climate through proper design, thus improving the thermal comfort both outside and inside buildings, even reducing energy demands for heating and cooling requirements. The main goal of the research is to examine the relationship between different urban forms and the shadow patterns they generate, and to develop evaluation tools for deriving climatic design criteria suitable for use by designers. The main structure of this thesis is arranged in two parts. The first part identifies the conceptual framework of the sustainable urban design in order to provide the reader with basic information about the subject. Secondly, parametric studies have been performed to bridge the gap in the previous studies. The study compares patterns (radial and rectangular) with different orientations and their relation to solar accessibility, bilateral type of buildings, and urban density. While the analysis was mainly related to the Palestinian climate, the techniques employed may be applicable to other countries.
Human Shelter and climate

Prepared by:
Asma El-Azaiza
May El-Nashar
Alyaa El-Saqqa
Nema Al-Buhaisi
Housing and all buildings are structures of components designed to mediate the existing environment which is less satisfactory in some way into more comfortable and satisfactory surroundings.
Historically shelter has been built to reduce the range of local climatic variations to avoid some of the sun's heat in hot climates and to conserve heat in cold climates.
Shelter has been designed to welcome the breezes when they can provide the desired cooling and to avoid winds when it exacerbates problems of an already cold climate.
The natural resources available in a given location, especially sun and wind, should be harnessed for the climate conditioning of buildings and should be reflected in the design of their layout and form.
The criteria for balance are minimum heat-flow out of building in wintertime minimum heat-gain in the structures during the over-heated period.
Early Urban Centers
The four main early urban civilizations:
1. Mesopotamia
2. Egypt
3. The Indus Valley
4. Northern China
are valuable examples in terms of the climatic impacts on the earliest urban evolution in the ancient world.
The rise of these four civilizations was an example of successful adaptation to the environment.
All early urban centers were located in river valleys.

- Mesopotamia
- Egypt
- the Indus valley
- CHINA
These areas share many common characteristics in their environment climate and evolutionary processes.

A common denominator among these four urban civilizations was their location in a hot-dry climate.

The existing vernacular settlements in the respective regions are often the physical evidences of a climate conscious design.
Mesopotamia
Mesopotamia is located in southwestern Asia in the valley of two major rivers the Tigris and the Euphrates.
The hot-dry climate where this civilization rose is characterized by high radiation especially in the summer and great amplitude between day and night temperatures.

One of the main aspects which created the city form was to place the maximum number of people within a minimal amount of land.

This was the result of the need for defense.
This also reflected the social need of residents themselves for social closeness. In addition, it reflected climatic considerations because compact cities provide more shadowed areas.
q Usually the cities were round in shape.
Streets in the ancient Mesopotamian cities were developed in three levels at least:

The widest was the main street leading to major monumental buildings and dividing neighborhoods.
The second was narrower and penetrating into the neighborhoods.

The third was the dead end usually surrounded by a conglomerate of houses that were attached side-to-side and back-to-back.
Dead ends provided protection against hot and dusty winds during the day and to some extent retained heat longer than the wide-open spaces during the evening when it was most desirable.
In most cases these streets ended in patio that provided great privacy, safety, and security.

These dead-end alleys as well as second-level streets were very narrow and were curved or zigzag in pattern. This characteristic provided more privacy and protection from the intense heat and dust storms from enemies.
The design principle of the Mesopotamian house was the patio style surrounded by rooms.

Because Mesopotamian cities were densely developed they did not have any significant green area or public open space within the city.

However the distance from the middle of the city to the open yet mostly agricultural space outside the city wall was an acceptable walking distance.
Egypt
Egypt is good example of the great impact the environment can have on urban and social development.

Egypt's climate is more stressful than that of Mesopotamia the Indus Valley or Northern China.

The climate is defined in general as a hot-dry one with extreme aridity. Rain is limited to the shores of the Mediterranean in northern Egypt and rarely occurs in the southern part of the country.
The Nile which runs from south to north was the source of survival.

All human activities were focused exclusively in the cities and villages along the Nile River.
Except for monumental buildings such as temples etc, buildings in Egyptian cities were built exclusively of mud.
The climatic aspects were very obvious in the design of Tell El-Amarna (City of Akhenaton).

The houses were oriented toward the north or west to take advantage of the cool wind.
The workmen’s neighborhoods were planned by the government.

The overall pattern consisted of small units attached mostly in linear form with very narrow streets.

The structures were geometrically standardized with all units being the same.
Monumental buildings were usually made of stone.

The impressive Monumental buildings, with heavy masses of masonry against vast open spaces, were typical of the ancient Egyptian cities.

The temple was the core of the city and became the center around which the residential and the commercial complex of buildings developed.
The first collapse of a state in Egypt was related to climatic change.

Lower agricultural productivity as a result of low Nile floods caused widespread famine and anarchy.
the area of fields under cultivation diminished, the harvest season decreased, and the number of livestock were reduced; of course, this was only one factor within a more complex process of social and political disintegration that included the collapse of centralized authority.
the Indus Valley
The urban centers of the Indus valley developed along the Indus river in the Himalayan mountains. These centers were developed around the middle of the third millennium B.C.
geographically, the Indus valley was the major crossroads of transportation north and south along the Indus river and east to west from India to Persia. In the Indus valley the climate is also hot and dry.
q Urban settlements in the Indus valley were characterized by a high standard of design, regularity, hierarchical street design and high-quality city services, including municipal facilities and sanitation arrangements. The design also was affected by the environment, climate, local building materials and site conditions.
Mohenjo-Daro can be considered among the first cities of its time to introduce systematic, preconceived design.
Two distinctive characteristics of Mohenjo-Daro’s urban design are the semi-grid systems of streets and the independent government citadel.
The streets themselves. The first level consisted of wide straight streets and the second level of narrower streets almost straight and running parallel to the major street.
The streets in the third level the narrowest, with some right angels running perpendicular to the first two levels of streets, dead ends were almost nonexistent.

The unique government citadel was close to the city but completely separated from it and combining many different functions.
Homes in Mohenjo-Daro shared some common characteristics with those in Mesopotamia. They were also patio style homes with two storey's of rooms surrounding the open courtyard. Access to homes mainly came from the second or the third level of the streets.
Mohenjo-Daro apparently was of mixed social and economic classes, since houses of varying sizes were clustered together.
The cradle of Chinese civilization which included the urban centers was situated in the northern part of China along the Wei He and the Huang He rivers. The climate of this region is arid and semi-arid and becomes more arid toward the north and northwest.
The region as a whole has plenty of water along the Huang He and the Wei He rivers which enabled the development of intensive agriculture.
The principles of ancient Chinese urban design were best expressed in the capital cities.

Most of these cities were located in central and some in northern China.
Most of the capitals were built as new towns and from a preconceived plant prepared by theoreticians, philosophers, and builders.

There are several design principles evident in the ancient Chinese urban design centers.

These include the use of open space, the use of belowground space, and the integration of residential and commercial needs.
Courtyards were used throughout the cities as common public space.
Gardening and natural landscaping were combined with sources of the environment.
Within the city two types of land-use patterns were dominant.

One pattern which was used only in the marketing areas combined markets on the ground floor with residences on the second floor.

In all other areas residential and commercial buildings were separated.

Housing concentrated around an internal open space enclosed by walls.
The family home usually turned its back on the street and focused around an internal courtyard.

The same design was true for entire neighborhoods which were collections of these houses enclosed within a larger wall and arranged around an internal open space that was common to all houses. Thus each grouping created a nesting pattern from the core of the city to its outer edge.
Comparison of early urban centers
In comparing the four case studies presented here we can outline some of the commonalities of these early urban centers of world.

Location and site selection of the hot-dry climate area are a common denominator among the four case studies.
All these civilizations developed in area zones with differing degrees of aridity.

Rivers were the source of life and the spine of each of the four civilizations with villages cities and transportation developing in a linear pattern along their banks.
The river was the source of fishing, drinking-water, transportation and most importantly for agricultural development.

Ultimately climatic conditions may have been the major factor in the selection of the location and the evolution of human settlements thought early civilizations.
People were pushed away from the tropical zone by the continuous threat of illness and diseases resulting from heavy rain swamps dense vegetation and the difficulty of coping with the discomfort of the rainy humid tropical climate.

It may be that the high density of wild animals, reptiles and insects threatened life and health even more.
Q Similar pressure may have occurred from the temperate zone falling north of the arid zone because of the stressful cold climate of snow and blizzards that characterizes those zones.

Q In either case the zones that were left relatively comfortable for humans were the zones arid and semi-arid regions.
In addition the hot-dry climate of the arid zone especially that of the middle east and the fertile crescent provided vast open space cloudless skies and views unobstructed by forests.
Sustainable Urban Design and Climate: With Reference to Palestine
Farid Al-Qeeq (Author)

The Book on the web: