

## A GEOGRAPHICAL PERSPECTIVE ON SUSTAINABLE LANDSCAPE DESIGN IN ARID ENVIRONMENTS

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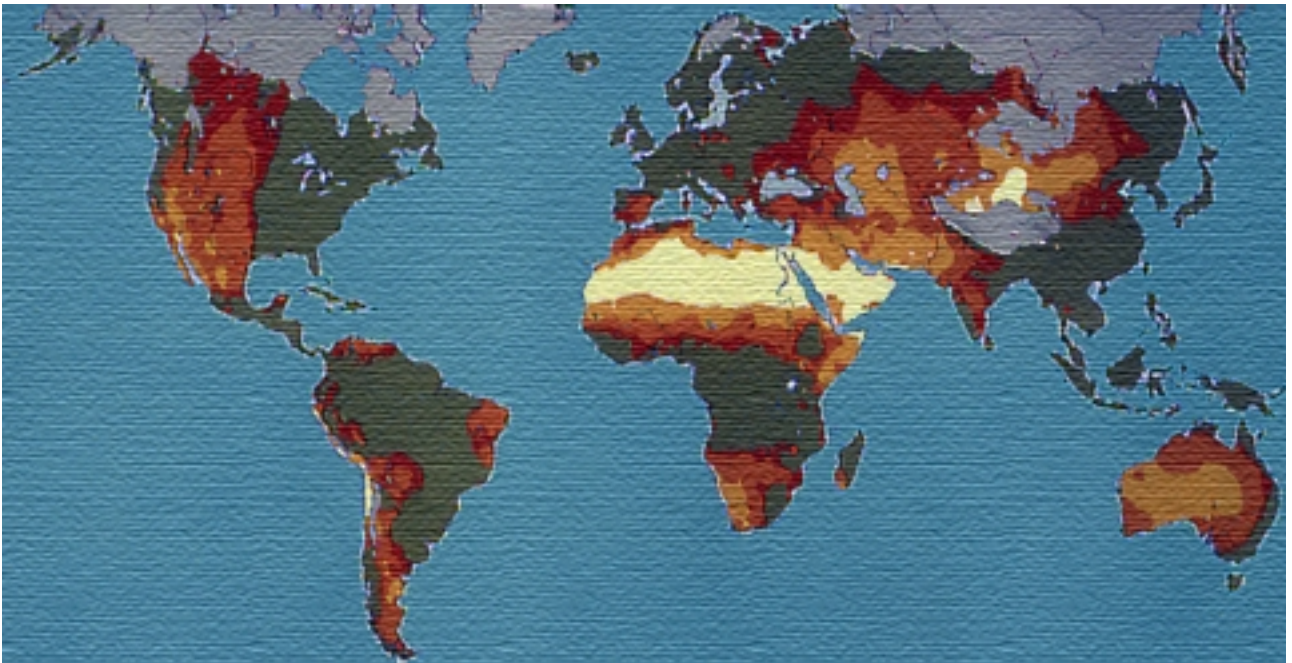
It is useful to situate the case studies of arid landscape design in this volume within a geographic context that can facilitate analysis, comparison, and evaluation. This chapter offers a brief introduction to arid environments and to processes of desertification that can undermine sustainable development.

The term “arid” has a range of connotations that vary by culture and historical period. For some, it implies barren wastelands while for others it evokes landscapes of biological, cultural, and aesthetic richness (Wescoat 1990). From a scientific standpoint, aridity refers to a scarcity of moisture, in which precipitation is exceeded by potential evapotranspiration (i.e., the amount of water that would be consumed by plants and evaporation when unlimited water is available). Aridity and drought indexes have been developed to analyse water scarcity. These varied climatic patterns of water deficit interact with physiographic conditions to produce a variety of arid and semiarid environments (figure 1). Five major causes and contexts of aridity may be distinguished:

**1. Subtropical Latitudes.** Subtropical zones, around latitudes 30 degrees north and south, are more likely to be arid than other belts because they are dominated by high pressure systems of descending air that inhibit convective precipitation. These climatic processes account for the broad arid and semi-arid belts of the southwestern U.S., northern Africa, northwestern India and Pakistan, Australia, southern Africa, and the Sahara desert.

**2. Rain Shadow Effects.** When moist air masses encounter mountains, they ascend and cool, which leads to condensation and precipi-

ARID CONDITIONS IN SHIMSHAL, A SMALL VILLAGE IN NORTHERN PAKISTAN, SURROUNDED BY DESERT AND BARREN MOUNTAINS. WHEAT PRODUCTION IS IRRIGATED BY SMALL CHANNELS, DIVERTING WATER FROM THE RIVER.



**FIGURE 1**  
 WORLD ARIDITY MAP  
 (FROM UNEP/FAO, WORLD ATLAS OF  
DESERTIFICATION, LONDON, EDWARD  
 ARNOLD, 1992)

tation on the windward side of the mountains. Downwind, dry descending air masses create a “rain shadow”. This effect produces the sharp climatic boundaries found along mountain ranges and escarpments of the northwestern U.S., southern India, and some Pacific Islands like Hawaii whose windward areas have humid subtropical climates while their leeward slopes are semiarid.

**3. Continent Interiors.** As air masses move across the large continents of the world, they lose moisture through precipitation, and then pick up little additional moisture by evaporation. Thus, they become increasingly dry, which helps explain the gradual transitions from sub-humid to sem-arid and arid conditions in the interior regions of the American Great Plains, Central Asia, and western China.

**4. Cool Current Coasts.** Cool ocean currents extend the arid conditions of subtropical regions into the middle or lower latitudes by reducing convection and precipitation. Such conditions occur on the western coasts of California, northern Mexico, South America, and southern Africa.

**5. High Altitudes and Polar Latitudes.** Although generally perceived as moist snow-covered landscapes, some polar and alpine regions have little precipitation and little water in a liquid state.