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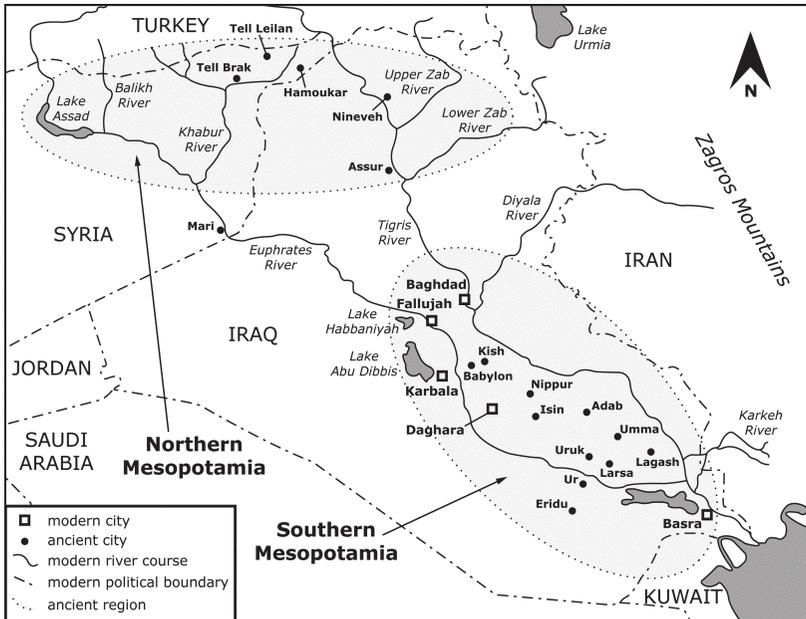
## Domination and Resilience in Bronze Age Mesopotamia

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Although Mesopotamia has long occupied a prominent position in the public imagination, recent events—in particular, the military occupation of Iraq and the large-scale looting of museums and archaeological sites—have drawn the Iraqi present and the Mesopotamian past vividly into the spotlight. Images of legendary ancient cities, now stranded in arid wastelands, and broken monuments to kings of vanished civilizations resonate powerfully with modern audiences, themselves increasingly uncertain about our collective future. For a world in which environmental disaster and economic collapse loom on the horizon, ancient Mesopotamia can provide both cautionary tales and success stories. Recurring hazards such as drought, flooding, and locust attacks were regularly planned for, counteracted, and endured in Mesopotamia; however, several much-debated episodes of political and economic collapse testify to the precarious nature of human-environment dynamics in the region.

This chapter provides an introduction to the range of hazards—whether strictly environmental or human-induced—that confronted the inhabitants of Bronze Age (ca. 3000–1200 BC) Mesopotamia. Particular emphasis is placed on institutional organization and institutional management as key factors in determining the impact of these hazards. The chapter begins with an introduction to Bronze Age Mesopotamia and to the most pertinent archaeological and written sources; it then focuses more narrowly on the evi-



7.1. *Map of Mesopotamia. Base map provided by the Oriental Institute Map Series, Oriental Institute, University of Chicago.*

dence for hazards and hazard management before closing with a look toward the future.

### BRONZE AGE MESOPOTAMIA

The ancient region known as Mesopotamia encompasses much of modern Iraq and northeastern Syria (figure 7.1).<sup>1</sup> Traversed by two major rivers, the Tigris and the Euphrates (figure 7.2), this arid land has long supported a subsistence economy centered on cereal cultivation and the herding of sheep and goats. Rainfall is typically meager and erratic, with a high frequency of drought years, but impressive agricultural yields can be achieved across much of the region. On the alluvial plains of Southern Mesopotamia, this is possible only with the aid of irrigation, but in Northern Mesopotamia rain-fed agriculture (also known as “dry farming”) is the norm. Today, as in the distant past, crops are sown in October–November and are then harvested and processed for storage in April–May (Adams 1965: 16; Postgate 1992: 167).

Throughout Mesopotamian history, settlement has been concentrated within the two agricultural zones—Southern and Northern Mesopotamia—but these zones are separated by a broad band of arid steppe better suited to



7.2. *The Euphrates River in modern Syria, irrigated fields in the foreground. Photo taken at the site of Dura Europos, near Mari in the Middle Euphrates region (see figure 7.1). Photo by Tate Paulette.*

exploitation by mobile pastoralists. Even within the cultivated zone, the herding of sheep and goats is (and was) a major component of the economy and is carefully factored into the daily and seasonal scheduling of agricultural activities. The need for pasture requires that sheep and goats are taken out to graze on a daily basis; when the herds become too large or when local pasture is scarce, they are often taken out to more distant grazing areas for longer periods of time.

Falling immediately on the heels of the famous Urban Revolution,<sup>2</sup> the Bronze Age was a time of demographic flux, economic transformation, and intense political competition in Mesopotamia. During several episodes of political centralization, expansionist dynasties created regional-scale polities encompassing portions of both Northern and Southern Mesopotamia, but these efforts toward unification and integration were typically fleeting. More commonly, Mesopotamia was divided into a patchwork of relatively autonomous city-states, whose territorial boundaries and relations with neighboring polities were in constant motion. Chronologically, archaeologists distinguish among the Early Bronze Age, Middle Bronze Age, and Late Bronze Age. For each geographical region (i.e., Northern and Southern Mesopotamia), this tripartite division is then broken down further into sub-periods (figure 7.3).

Over the course of the Bronze Age, the inhabitants of Mesopotamia

<b>Dates BC</b> (approximate)	<b>Mesopotamia</b> (primary archaeological periods)	<b>Southern Mesopotamia</b> (region-specific periods)	<b>Northern Mesopotamia</b> (region-specific periods)
1000	Early Iron Age	Second Dynasty of Isin	Neo-Assyrian Period
	Late Bronze Age	Kassite Period	Middle Assyrian Period
	Middle Bronze Age	Old Babylonian Period	Mitanni Period
2000	Early Bronze Age	Ur III Period	Kingdom of Shamshi-Adad
		Akkadian Period	Old Assyrian Period
		Early Dynastic Period	Early Jezireh Period
3000	Late Chalcolithic Period	Jemdet Nasr Period	
		Uruk Period	Late Chalcolithic Period

**7.3.** *Chronological chart showing the primary archaeological divisions (Early, Middle, and Late Bronze Age) and the corresponding, region-specific subdivisions of the Bronze Age in Mesopotamia (3000–1200 BC); also includes the preceding Late Chalcolithic period and the succeeding Early Iron Age.*

found themselves increasingly at the mercy of a series of powerful urban institutions. Although community organizations, corporate groups, and judicial bodies played an important role in city governance, the centralized political and religious organizations (“the palace” and “the temple”) emerged as major economic powers, managing huge tracts of land and able to mobilize labor on a massive scale. Many people were dependent on these institutions for their livelihoods, and institutional demands for taxes, tribute, and labor became an ever-present fact of life (e.g., Powell 1987).



7.4. *A typical tell, or mound, in the Upper Khabur region of northeastern Syria (near Tell Brak and Tell Leilan; see figure 7.1) Photo by Tate Paulette.*

It is often unclear, however, exactly how institutional interference impacted the domestic economy of individual households. Did the imposition of institutional control entail a shift in economic planning, in risk-buffering strategies, or in other forms of hazard management on the household level? Did different systems of institutional organization affect the localized impact of specific types of hazard? Did some forms of institutional control invite disaster or increase the chances of large-scale collapse, while others incorporated higher degrees of flexibility and resilience? These remain open questions.

#### TYPES OF EVIDENCE

The archaeological exploration of ancient Mesopotamia began in earnest during the later part of the nineteenth century, and fieldwork has continued in Iraq and Syria up to the present day, with some notable interruptions during times of war and political unrest.<sup>3</sup> The typical archaeological site in Mesopotamia is the *tell*, which means “mound” in Arabic (figure 7.4). *Tell* sites are the remains of ancient towns and cities, once constructed on level ground but now rising high above the surrounding landscape thanks to the gradual buildup of debris (from successive settlements built one on top of the other) over hundreds and often thousands of years. These mounds can be as small as half of a hectare (1.2 acres) or as large as 600 hectares (1,483 acres), and they may rise only 1 m or as

much as 40 m above the surrounding landscape.

Thousands of *tells* have been examined by archaeologists, through excavation and a range of noninvasive methods. Excavations regularly uncover the remains of houses, workshops, burials, temples, and palaces—all made of sun-dried mud bricks and, less commonly, stone or oven-baked bricks. Many different types of artifacts are recovered, including pottery, stone tools, metal objects, beads, figurines, seals, cuneiform tablets, human bones, animal bones, and plant remains. The most important noninvasive method is archaeological survey, which involves the systematic examination and recording of remains that are visible on the surface (e.g., artifacts, architecture, and landscape features; see, e.g., Wilkinson 2000a). Traditional survey is now supplemented by a host of remote-sensing techniques that use innovative technologies—such as magnetometry, ground-penetrating radar, and satellite imagery—to obtain new perspectives on surface remains and to probe beneath the surface in a non-destructive manner. The results in Mesopotamia have been spectacular, from the detailed mapping of buried streets and buildings to the identification of extensive ancient road systems (Meyer 2007; Ur 2003).

Natural scientists and physical scientists also play an active role in many archaeological projects. For example, recent debates over the evidence for climate change and societal collapse in Early Bronze Age Mesopotamia (discussed later in the chapter) have drawn together archaeologists, soil scientists, climatologists, botanists, and volcanologists, among others (e.g., Dalfes, Kukla, and Weiss 1997; Weiss et al. 1993). Joint projects involving specialists in digital imaging, database management, and computer modeling are also increasingly common (e.g., Wilkinson et al. 2007a, 2007b).

It is the written record, however, that really sets Mesopotamia apart as a source of information about human-environment dynamics in the ancient world. Cuneiform writing was invented in Mesopotamia near the end of the fourth millennium BC (Late Chalcolithic period). By the middle of the third millennium BC, it was being employed for a range of purposes, from administration and record keeping to royal inscriptions and literary works (e.g., Nissen, Damerow, and Englund 1993; Postgate 1992: ch. 3). It was during the Early Bronze Age, therefore, that writing truly emerged as a major data source, taking its place alongside archaeological evidence—the primary source of information about earlier, prehistoric periods.

Several caveats should be kept in mind with regard to the written evidence. First, the preservation of written material in Mesopotamia is extremely uneven, both chronologically and geographically. This situation is partially a reflection of actual trends in the production of written documents by Mesopotamian scribes, but it is also an effect of the accidents of discovery. Second, most cuneiform tablets were produced by and for the palace and temple institutions. They typically provide only a very partial perspective, biased toward the needs and

desires of the institutional powers. Many segments of society remain anonymous and without a voice in the written record.

### HAZARDS AND HAZARD MANAGEMENT IN MESOPOTAMIA

Hundreds of thousands of cuneiform documents have been uncovered from archaeological sites in Mesopotamia, but the Mesopotamian scribes did not leave behind any detailed compilations of climate statistics or any manuals outlining strategies for coping with environmental stress.<sup>4</sup> To understand ancient hazards and their impacts, modern scholars must piece together archaeological evidence, scattered textual references, and paleoenvironmental data while also making judicious use of modern climate records and more recent ethnographic or historic accounts.

Magnus Widell, for example, has recently drawn attention to the value of a Medieval document known as the *Chronicle of Michael the Syrian* (Widell 2007). Compiled during the late twelfth century AD, this twenty-one-volume historical account provides annual references to environmental hazards and their impacts in Northern Mesopotamia over a 600-year period.<sup>5</sup> The most common hazards were cold winters, locust infestations, and droughts; but the full list also includes snow, storm winds, freezes, hail, floods, plagues, mildew, rain, and attacks by rats and weevils. This Medieval chronicle cannot be taken as an accurate reflection of conditions during the Bronze Age, but it provides the kind of long-term, synoptic view on environmental hazards that is lacking in the ancient data. The pages that follow introduce a number of the most common and most devastating hazards in Mesopotamia, relying on ancient sources where possible but also supplementing them with data from more recent sources.

#### Drought

In arid zones, the threat of drought is a constant concern. This was especially the case in Northern Mesopotamia, where agriculture was dependent on rainfall rather than on artificial irrigation (figure 7.5). Tony Wilkinson calls this northern region the “Zone of Uncertainty,” drawing attention to “the considerable risk that is inherent in cropping an area with such a wide interannual fluctuation in rainfall” (2000b: 3). Near the boundary of the zone defined as adequate for rain-fed cultivation—where rainfall averages 250 mm per year—the percentage of years with no harvest is 36 percent. Wilkinson estimates that five to ten major droughts, each lasting six years or longer, would have occurred during the thousand-year span of the Early Bronze Age alone (1997: 75).

Throughout history, water deficits have led to conditions of hunger, malnutrition, and, in the worst cases, starvation. In Mesopotamia, surprisingly



7.5. *A dust storm in the modern village of Hamoukar (also a large Early Bronze Age site) in northeastern Syria. The photo was taken in 2010 during a region-wide drought that had already lasted more than three years. Photo by Amanda Schupak.*

little documentary evidence directly links drought with famine, aside from a few letters dating to the Old Babylonian period and a series of documents from the very end of the Late Bronze Age (Neumann and Parpola 1987: 178; Widell 2007: 59). The archaeological identification of drought and its impacts has, however, recently emerged as a major research focus, largely in response to a series of provocative hypotheses proposed by Harvey Weiss and colleagues. Their basic argument is that, during the later part of the third millennium BC, a sudden climatic shift toward more arid conditions led to widespread collapse in Northern Mesopotamia and across a much broader zone stretching from Egypt to India (Weiss 2000; Weiss and Courty 1993; Weiss et al. 1993). There is now general agreement that this drying trend did occur (e.g., Roberts et al. 2011), but debate continues over the suddenness of the climatic shift, the causes of the aridification, and, most important, the impact on Mesopotamian societies (e.g., Kuzucuoglu and Marro 2007).

Whatever the eventual verdict in this debate, it is certain that drought posed a significant and recurring threat to the people of Bronze Age Mesopotamia. In many cases—especially when droughts were short-lived and infrequent—the negative impacts of crop failure appear to have been successfully avoided through a variety of different buffering strategies (Halstead and O’Shea 1989; Wilkinson 2000b):



**7.6.** *In the fields surrounding the modern village of Hamoukar in northeastern Syria, sheep, goats, cows, horses, and donkeys are allowed to graze on piles of hay left in the fields following the cereal harvest. The manure deposited by the animals during grazing acts as a natural fertilizer for the fields. Like the related buffering strategy whereby animals are allowed to consume failing crops (e.g., during times of drought), this practice demonstrates the interdependence of agriculture and pastoralism in the region. Photo by Tate Paulette.*

1. Storage of agricultural surpluses (on the household and the institutional level)<sup>6</sup>
2. Increased mobility (e.g., moving flocks to better-watered areas)
3. The transport of food to affected areas (especially in Southern Mesopotamia, where riverine transport of high-bulk staple goods is more efficient than the overland transport necessary in Northern Mesopotamia)
4. Increased local and interregional exchange (e.g., exchanging high-value items such as metals and textiles for cereals and animals)
5. Salvaging failing crops (e.g., harvesting green crops early or allowing sheep and goats to graze on them; figure 7.6).

### Severe Winters

Although the region was prone to drought and was beset by brutally hot

summers, severe winter weather could also wreak havoc on crops and on human and animal populations in ancient Mesopotamia. The mountains to the north and east of the region are more prone to cold weather, but even southern Iraq occasionally experiences low nighttime temperatures and crop-killing frosts during the months of December, January, and February—right in the middle of the growing season (Adams 1981: 12; British Admiralty 1944; Willcocks 1911: 69).

There are numerous references in the cuneiform record to cold weather and its effects. Most commonly, low temperatures, snow, and ice are decried for making transportation routes difficult or impassable, thereby disrupting the flow of tribute, messengers, and troops. Harsh winter weather is also blamed for the deaths of animals and people, especially soldiers (Neumann and Parpola 1987: 181; van Driel 1992: 46; Widell 2007: 55). Although direct evidence is absent in the cuneiform sources, Widell also draws attention to olive trees. Like the ubiquitous date palms of Southern Mesopotamia, olive trees are valuable productive resources, representing a significant investment of time; their death at the hands of a harsh winter could have produced long-term economic consequences (Widell 2007: 55).

On a positive note, severe winters were regularly associated with higher levels of precipitation and, therefore, with normal or better-than-normal crop harvests in Mesopotamia. J. Neumann and Simo Parpola have argued that this correlation linking cold weather to rainfall and abundant harvests—and the opposing correlation linking warm weather to drought and famine—is visible in the Mesopotamian documentary record. Using this evidence, they argue that a major climatic shift toward warmer and drier conditions played a role in the decline of Assyria and Babylonia (i.e., Northern and Southern Mesopotamia) at the end of the Late Bronze Age (Neumann and Parpola 1987).

## Floods

Floods were a regular occurrence in Mesopotamia, and the danger of destructive flooding was very real. Unlike the Nile, whose annual flood arrived at an ideal point within the agricultural cycle, “the timing of the arrival of high water in both the Tigris and the Euphrates [was] poorly synchronized with the needs of cultivators” (Adams 1981: 3). The Tigris typically reached its highest levels in April and the Euphrates in early May. On this schedule, even minor floods, which may have occurred once every three to four years, could destroy mature crops in the fields (Verhoeven 1998: 202). More destructive high-magnitude floods may have occurred two or three times per century, with Tigris floods typically more severe than those of the Euphrates (*ibid.*: 203).

Floods could not be entirely prevented, but a number of flood-control measures were employed. In modern Iraq, overflow from the Tigris and the

Euphrates is directed into specially constructed storage reservoirs. During the Bronze Age, it is likely that a series of natural depressions—especially the modern-day Habbaniyah and Abu Dibbis depressions near Fallujah and Karbala—served a similar purpose. The Old Babylonian (i.e., Middle Bronze Age) king Samsuiluna may even have undertaken a massive project designed to connect these two natural reservoirs to one another (Cole and Gasche 1998: 11; Verhoeven 1998: 201). When such reservoirs were not available, a method known as *controlled breaching* appears to have been employed. For example, a letter written by the Old Babylonian king Hammurabi instructs an official to open a series of canals to direct floodwaters into a marshy area (Cole and Gasche 1998: 11). The physical remains of massive dikes, constructed to protect settlements from flooding, have also been excavated at a number of sites (ibid.: 7–9).

Despite these protective measures, floods did reach fields and settlements, sometimes causing great damage. Thick layers of water-laid sediment excavated at a number of sites testify to the incursion of floodwaters, and written evidence from both Northern and Southern Mesopotamia refers to the inundation of fields, the destruction of bridges and canal works, and the collapse of houses and palace walls (ibid.; Gibson 1972: 83–86).

### River Channel Shift

On the irrigated plains of Southern Mesopotamia, Bronze Age settlements were strung out along natural and artificial watercourses like beads on a necklace. Sudden river channel shifts could have catastrophic results for associated settlements, leading, for example, to the drying up of irrigation canals and the disruption of transportation and communication networks. Most channel shifts would have been triggered by a process known as *avulsion*, when a watercourse breaks through the bank of its levee and flows down the bank to create a new channel. Avulsions can be caused by natural flooding events, the weakening of levee banks through human interference (e.g., the cutting of irrigation canals), or a combination of these factors (Wilkinson 2003: 84).

There is clear evidence for a “sporadic but continuing and cumulative westward movement of the Euphrates” over time (Adams 1981: 18; cf. Gibson 1973: 454). This long-term process was the result of numerous distinct episodes of sudden channel shift. For example, the easternmost channel of the Euphrates, located to the north and east of the ancient city of Nippur (in Southern Mesopotamia), appears to have been abandoned by the river in favor of a more westerly branch during the later part of the Uruk period (Adams 1981: 61; Gibson 1973: 450).

Sudden channel shifts can lead to the abandonment of settlements, to population dispersal, and, in arid zones like Southern Mesopotamia, to desertifica-

tion (Gibson 1992: 12). For example, during the nineteenth and early twentieth centuries AD, the Hilla branch of the Euphrates in Iraq lost nearly all of its water to the more westerly Hindiyah branch, leading to hunger, disease, the abandonment of settlements and farmland, and migration toward better-watered areas (Gibson 1972: 26–29). During the Old Babylonian period (Middle Bronze Age), a similar river channel shift in Southern Mesopotamia may have been responsible for the abandonment of a series of major cities (Gasche 1989; Gibson 1980: 199). Channel shifts can also, however, create new opportunities for those positioned to exploit the situation. In fact, McGuire Gibson has argued that the Uruk period channel shift just described played a crucial role in the emergence of powerful states in Mesopotamia during the same period (Gibson 1973: 461; Wilkinson 2003: 84).

### Salinization

The alluvial soils of Southern Mesopotamia are rich in salts carried down from the mountains by the Tigris and the Euphrates. These salts tend to accumulate at the water table and can be brought toward the surface either through capillary action or through a rising of the water table. Once a certain threshold of salt near the surface is reached, crop growth becomes nearly impossible, and the land must be left uncultivated—sometimes for as long as fifty or a hundred years (Adams 1981: 4; Gibson 1974: 10; Jacobsen and Adams 1958: 1251). One of the most common causes of this *salinization* process is the excessive application of irrigation water. Complex drainage systems and fallowing regimes can help to both prevent the onset of salinization and alleviate its effects, but continued agricultural success then becomes dependent on these practices (Gibson 1974).

Direct evidence for salinization in Bronze Age Mesopotamia comes largely from cuneiform documents. For example, surveyors' reports dating to the late Early Dynastic period and the Ur III period (Early Bronze Age) record the existence of large parcels of land that could not be cultivated because of high salinity. Later, during the Kassite period (Late Bronze Age), curses inscribed on field boundary stones also testify to the threat of saline soils; one curse reads "May the god Adad, chief irrigation officer of Heaven and Earth, cause wet-salt to disturb his fields, make the barley thirst, and not allow green to come up" (Jacobsen 1982: 8). There is currently no foolproof method for measuring the frequency or ubiquity of salinization in Bronze Age Mesopotamia. Efforts to use declining agricultural productivity and changing crop preferences as proxy indicators for increasing salinization (Jacobsen 1982; Jacobsen and Adams 1958: 1252), for example, have met with significant criticism (Powell 1985).

The negative impacts of salinization can be devastating. In his ethnographic study of the town of Daghara in southern Iraq, Robert Fernea reports

that, in recent times, increasingly saline soils had forced the inhabitants to abandon rice and then wheat cultivation, leaving only the more salt-tolerant barley. According to villagers, between the years 1958 and 1966, the total area of cultivable land surrounding Daghara had been reduced by one-third (Fernea 1970: 22, 38). There can be little doubt that salinization was also a persistent threat in Southern Mesopotamia during the Bronze Age. Several authors have drawn attention to the close connection between salinization and the cyclical rise and fall of centralized powers in Mesopotamia. During periods of political centralization, it is argued, the drive toward agricultural intensification led to increased irrigation, the violation of fallowing regimes, and, eventually, widespread salinization. The ultimate impact was a collapse of state power and, consequently, a return to more decentralized political structures and more resilient agricultural practices (Adams 1978; Gibson 1974).

### Soil Degradation

The effects of other types of soil degradation—for example, nutrient depletion, loss of organic carbon, and soil erosion—in Bronze Age Mesopotamia are not well understood. The issue has, however, emerged as a research focus within the broader debate over late third millennium climate change and settlement collapse in Northern Mesopotamia. In particular, T. J. Wilkinson has argued that the interlinked processes of population growth, settlement nucleation (i.e., a focus on fewer, larger settlements), and agricultural intensification may have encouraged a process of soil degradation that left settlements vulnerable to even minor climatic variations (1997: 76–86, 2000b: 16).

The best evidence supporting this model derives not from direct indications of soil degradation but instead from a practice that was intended to combat soil degradation: the application of fertilizer. In a pioneering application of “off-site” survey techniques (i.e., focusing on the areas between settlements), Wilkinson has identified low-density artifact scatters extending out like a halo around many Early Bronze Ages sites in Northern Mesopotamia. Drawing on ethnographic and historic parallels, he interprets these field scatters as the remnants of manuring, a common practice in which household refuse is spread across agricultural fields as fertilizer. The evidence suggests that manuring was widely employed in Northern Mesopotamia but only during a relatively restricted period of time—the mid- to late third millennium BC. During this period of urbanization and population growth, it appears that fertilizer was regularly applied to fields in an attempt to combat the declining fertility associated with agricultural intensification (Wilkinson 1982, 1989, 1994: 491). The eventual abandonment of many of these third millennium settlements suggests, however, that these attempts may not have been entirely successful over the long term.

## Pests

For farmers everywhere, insects, rodents, birds, and other vermin are not only a perpetual nuisance; in many cases they represent a serious threat to agricultural success and economic viability. A whole range of such creatures confronted the farmers of Bronze Age Mesopotamia,<sup>7</sup> but the pest with the most potential for catastrophic damage was the locust. In modern Syria and Iraq, swarms of locusts can spread out over an area 400 km in diameter, devouring as much as 70 percent of a year's cereal crop, as well as vegetables, trees, and pastureland (British Admiralty 1944: 464; Widell 2007: 57). The periodicity and therefore the predictability of modern locust outbreaks has been a matter of some debate. In the data collected by Michael the Syrian (see earlier reference), however, Widell sees no particular pattern; a calculated average of 22.6 years between successive infestations actually conceals a much broader range of variation, with outbreaks separated by as few as 1 or as many as 74 years (2007: 58).

Cuneiform documents provide a wealth of detail about locust outbreaks in Bronze Age Mesopotamia and about methods for preventing and combating them. For example, a series of letters written to the king of Mari (Old Babylonian period, i.e., Middle Bronze Age) describes a regional governor's fight against two back-to-back years of locust infestation. The locusts were ravaging agricultural fields, and many residents were fleeing to neighboring regions. The methods employed against the locusts included hitting them, trampling them with oxen and sheep, and filling canals with water to serve as barriers (Heimpel 2003: 420). References elsewhere indicate that locusts were also collected in jars and eaten (George 1999: 291; Widell 2007: 61). Preventative measures included a set of special-purpose rituals performed in agricultural fields to protect them from Locust Tooth and from the so-called Dogs of Ninkilim, a general term for field pests. One ritual included offerings to a range of gods, a series of prayers or incantations, more offerings specifically for the god Ninkilim, and the burning of locust figurines made out of wax. It ended with this incantation: "O great dogs of Ninkilim, you have received your fodder, now go away" (George 1999: 295).

## RESILIENCE

The term *resilience* is now in such widespread use that it may be in danger of losing some of its analytical and explanatory power. The collaborators who have contributed to the current volume, however, are in general agreement that the notion of resilience still holds great potential as a tool of cross-cultural comparison and as a way of conceptualizing human-environment dynamics over the short and the long term. The following paragraphs present a brief examination of the concept of resilience—as it is typically employed by Mesopotamian

specialists—to introduce a crucial caveat. Resilience is a powerful concept, but an analytical focus on resilience *at the system level* should not blind us to the importance of actions and consequences *on the human scale*.

A number of contributors to the present volume have drawn upon the conceptual repertoire of resilience theory. Originally developed to explain the nature of stasis and change in ecosystems, resilience theory places particular emphasis on the inevitability of change and transformation. The basic unit of analysis is typically the *system* (e.g., the ecosystem or the social system), and systems are understood to develop along a trajectory known as the *adaptive cycle* (see, e.g., Redman 2005; Redman, Nelson, and Kinzig 2009). In discussions of ancient Mesopotamia, the term *resilience* appears with some frequency, though typically without an explicit connection to resilience theory. A brief look at how this term is used by Mesopotamian specialists will help to draw out two critical points regarding the dangers of an exclusive analytical focus on the resilience of social systems.

The first point is that a focus on systemic resilience may downplay the role of human agency. In a now classic discussion of resilience in ancient Mesopotamia, Robert McC. Adams (1978) borrows his basic definition of resilience from the ecological literature, but he makes the important analytical move toward what he calls *strategies* of resilience and stability. For Adams, resilience and stability in social systems are not only properties or behaviors that manifest themselves at the system level; they are also tied closely to the goals pursued by the specific actors and social groups that make up the system. Even though individuals and groups may have little control over the cumulative impact of their practices and decisions, certain types of strategy are more likely to encourage either resilience or stability at the system level.

In Mesopotamia, for example, the centralized institutions were built on complex systems of redistribution that required the maintenance of steady, predictable flows of agricultural goods into and out of centralized storage facilities. The institutional powers therefore tended to favor a maximizing approach to agricultural production, with the ultimate goal of maintaining stability in the supply of staple goods over the short term. Importantly, it appears that these institutional strategies of stability and maximization led repeatedly to system-level *instability*, resulting in the well-known boom-and-bust cycle that defines the broad contours of Mesopotamian political history (Adams 1978: 334). Although they are more difficult to identify in the available sources, some other segments of society—Adams calls them “the protagonists of flexibility”—appear to have been more fluid and resilient over the long term. Adams points in particular to “the tribally organized, semi-nomadic elements” whose mobility and diversified subsistence strategies allowed them to survive throughout the turbulent ups and downs of institutional history (*ibid.*).

The second point regarding resilience is that an analysis focused on sys-

temic resilience may inadvertently overlook the existence and the effects of institutionalized inequality and exploitation. Mesopotamian specialists are often ambivalent in their assessments (positive versus negative) of the role of institutional dependency in Mesopotamia, and this ambivalence is particularly noticeable in discussions of resilience. Although Adams's discussion of the concept is regularly cited, the term *resilience* is often used in a looser, less explicit sense that actually merges the notions of stability and resilience rather than contrasting them, as Adams does. Many scholars tend to assume that the Mesopotamian institutions, by virtue of their size and wealth, were intrinsically better equipped to weather environmental or economic crises than were individual households (e.g., Postgate 1992: 299; Stein 2004: 77; Stone 2007: 224; Westenholz 2002: 26). If true, this assumption (often presented without supporting evidence) would seem to contradict Adams's argument that the maximizing strategies favored by the central institutions were unsustainable and produced significant instability.

Even if it is eventually shown that the institutions actually contributed to system-level resiliency, this in itself says little about the effects of their practices on the people of Mesopotamia. In the highly stratified societies of Bronze Age Mesopotamia, the impacts of environmental hazards would not have been equally distributed across the social and economic spectrum. Resilience at the system or the institutional level might mask significant disruption and suffering for some segments of the population.

### INSTITUTIONAL POWER, RESILIENCE, AND COLLAPSE

Exactly how successful were efforts by the palaces and temples to prevent and mitigate environmental hazards in Bronze Age Mesopotamia? To what extent did institutional efforts to maximize and intensify production increase the likelihood of systemic failure or the vulnerability of specific segments of society? First, it is important to recall that the institutional landscape was neither static nor spatially homogeneous. The local balance of power between palace and temple was under continual negotiation, and regional power blocs grew and dissolved with relative frequency. At the same time, the forms and methods of institutional management were far from uniform; administrative reforms and large-scale restructurings were regularly instituted by newly ascendant regimes. Generalizations about the scope, effects, and effectiveness of institutional control in Mesopotamia are seldom possible.

The study of collapse has, however, generated a series of vigorous debates over the changing relationship between institutional power and resilience in Mesopotamia (e.g., Yoffee 1988). The paragraphs that follow provide a brief look at the three best-known episodes of collapse. The explanations offered for these episodes range across the spectrum, from environmental crisis to barbar-

ian invasion and economic or political meltdown (Richardson in prep; Yoffee 1988).

### Late Third Millennium BC

The second half of the third millennium BC witnessed the rise and fall of two legendary political dynasties. The Akkadian and Ur III states were the first successful attempts to unite the entirety of Southern Mesopotamia within one centralized political system, but neither lasted much more than a century.<sup>8</sup> Explanations for the collapse of Akkadian and, later, Ur III hegemony have pointed variously to external pressures (e.g., invading Gutians and Amorites), organizational weaknesses (e.g., the bypassing of local power bases, hyper-centralization, and micro-management), and overextension (e.g., preoccupation with military expansion and disregard for internal problems).

Others have credited environmental hazards with a primary causal role. For example, Thorkild Jacobsen links the decline of the Ur III state to a long-term process of progressive salinization in Southern Mesopotamia (1982: 55; Powell 1985). The possibility of a sustained period of aridification during the later third millennium (discussed earlier) has also generated significant debate in recent years. One contentious theory suggests that a climate-induced agricultural crisis in Northern Mesopotamia may have led indirectly to the collapse of the Akkadian state in Southern Mesopotamia (Weiss et al. 1993: 1002).

The late third millennium collapse episodes bring up two important points. First, the suggested “environmental” causes were closely intertwined with institutional management practices. Salinization is a naturally occurring process, but it would have been accelerated by institutional efforts to intensify irrigation agriculture in Southern Mesopotamia. The aridification scenario, on the other hand, assumes and hinges on a degree of interregional integration that was only achieved in Mesopotamia during a few periods of state expansion and extreme centralization. Second, a distinction should be made between political collapse and the collapse of a settlement system. The breakdown of the Akkadian and Ur III states as political entities may not have significantly impacted the routines of daily life for the much of the population. Widespread agricultural failure and settlement abandonment, however, could indicate a more devastating and potentially far-reaching historical transformation.

### End of the Old Babylonian Period

During the 1760s BC, Hammurabi of Babylon undertook a series of conquests that gave him control over much of Southern Mesopotamia and established Babylon as the dominant power in the region. By early in the reign of Hammurabi’s successor, Samsuiluna, however, the unified Babylonian state was

already beginning to fall apart. Samsuiluna gradually lost control over cities in the southern and then the central part of the alluvial plain. The dynasty itself remained in power for another four generations, but the territory controlled by the state had shrunk to a core area around Babylon itself.

Some theories ascribe the Old Babylonian collapse, at least in part, to “natural” processes. Economic decline, for example, has been linked to a drop in agricultural productivity, which might have resulted from either soil salinization or a series of major river channel shifts (Gasche 1989; Gibson 1980: 199; Stone 1977). More commonly, though, explanations for the collapse of the Old Babylonian state have pointed to economic, administrative, and political problems, such as inflation, spiraling debt, administrative inflexibility, and pressure from external groups (Richardson in prep). This brings up an important point. The present chapter has emphasized the impact of environmental hazards, perhaps downplaying the equally disruptive effect of other (often interrelated) forces, such as social conflict, economic crisis, and political tension (Robertson 2005).

### End of the Late Bronze Age

During the period from approximately 1500 to 1200 BC (the Late Bronze Age), Mesopotamia was linked into an interregional interaction sphere of unprecedented proportions. Southern Mesopotamia was ruled over by the Kassite dynasty, while Northern Mesopotamia first played host to the Mitanni empire and then to the emerging Assyrian empire. The rulers of these powerful states exchanged letters, gifts, and marriage partners with one another and with the rest of the Great Powers—a group that included New Kingdom Egypt, Hittite Anatolia, Mycenaean Greece, and Elamite Iran. Around 1200 BC the system collapsed, ushering in a “Dark Age” characterized by widespread socio-political upheaval. The eastern Mediterranean in particular witnessed significant disruptions, including fiery destructions at many sites and the disappearance of the powerful Hittite state. In Mesopotamia the long-lived Kassite dynasty came to an end, and Assyrian power waned. In both Northern and Southern Mesopotamia cities went into decline, and many people appear to have adopted a more mobile lifestyle (Van De Mieroop 2004: 179).

Explanations for the synchronized breakdown and collapse of states across such a broad region have been varied and numerous. External invaders, for example, have featured prominently. Most famously, a number of documents describe the movements of marauding “Sea People” around the coasts of the eastern Mediterranean. It has also been suggested that the elite-centered regional system was built on the increasingly harsh exploitation of much of the population. As debts and labor obligations mounted, many of these people managed to escape from the system (e.g., Liverani 1987) and may even have

risen up in revolt.

Although environmental factors have played a relatively small part in the broader debate about Late Bronze Age collapse, the breakdown of Kassite and Assyrian power in Mesopotamia has been linked to climate change. As mentioned earlier, Neumann and Parpola argue that a shift toward warmer and drier conditions around 1200 BC coincides with textual evidence for “crop failure, famine, outbreaks of plague, and repeated nomad incursions.” Ultimately, they suggest that this climate change contributed strongly to “the political, military, and economic decline of Assyria and Babylonia” (1987: 161).

### CONCLUSION: INSTITUTIONAL(IZED) RESILIENCE IN THE PAST, PRESENT, AND FUTURE

To draw the chapter to a close, it is worth reflecting briefly on the lessons that can be learned from a study of environmental hazards in Bronze Age Mesopotamia. Many of the hazards faced during the Bronze Age still confront the region’s inhabitants today. They are joined by a host of new hazards, including the reduction and pollution of water supplies (as a result of extensive dam construction), the disappearance of the marshes in southern Iraq, pollution related to oil extraction and production (figure 7.7), and unsustainable levels of population increase (McGuire Gibson personal communication). It is possible that an examination of ancient forms of hazard management and mitigation could resurrect some forgotten techniques that could be directly applied in the modern world.<sup>9</sup> There is also, however, another less obvious but equally valuable way in which knowledge of ancient Mesopotamia can inform the present world. The study of the past is as much about learning to ask the right questions as it is about uncovering exciting new discoveries. As we learn to ask the right questions about ancient Mesopotamia, we can achieve a better understanding of the potential impact of the decisions that are made and the policies that are adopted in our own increasingly global society.

The title of this chapter draws attention to the intertwined themes of domination and resilience, both crucial to an understanding of hazards and hazard management in Bronze Age Mesopotamia. Our knowledge of human-environment dynamics in Mesopotamia is still far from complete, but we are increasingly learning to ask the right questions. These questions center around the complex intersection between resilience and the institutionalized forms of domination that emerged in Mesopotamia—for the first time in world history—during the fourth and third millennia BC. I would like to draw particular attention to two issues that bear directly on our efforts to create a more resilient, sustainable future for the present world.

First, it is crucial that we pay careful attention to the effects and the effectiveness of different institutional forms. Over the course of the Bronze Age,



7.7. *Cereal fields near the village of Hamoukar in northeastern Syria. The Tur Abdin Mountains of Turkey are visible in the distance, and to the right a gas flare burns off waste material from an oil well. Photo by Amanda Schupak.*

Mesopotamia witnessed the rise and fall of a number of distinct systems of centralized political and economic organization. In some cases (e.g., the Ur III state), centralized control was tight and regional economic integration carefully orchestrated; in others (e.g., the Old Babylonian period), private entrepreneurs and agents played a stronger role, and the institutions managed the economy less closely. Throughout the Bronze Age the institutional powers regularly made efforts to prevent and combat environmental hazards, but in many cases their practices also contributed to the creation or exacerbation of hazards (e.g., soil salinization and channel shift).

In the modern world, when natural disasters strike, the inadequacy of institutional (i.e., state-organized) responses is often painfully obvious. One need only recall, for example, controversies over the US government's response to Hurricane Katrina in 2005 or to the oil spill in the Gulf of Mexico in 2010. There is a pressing need to fine-tune our own institutional structures, developing ways to increase their flexibility and the speed of their responses. In these efforts to improve the functioning of our institutions, the archaeological and historical records provide an invaluable, but largely untapped, resource. They offer the chance to examine countless examples of successful and unsuccessful responses to environmental crises and therefore to evaluate the effectiveness of a wide diversity of institutional forms over both the short and the long term.

The second issue is inequality—in particular, the unequal distribution of risks and benefits. We have seen that evidence for resilience at the level of the society or the system might mask the existence of deeply entrenched inequality and exploitation. Risk and the negative impacts of environmental hazards may be unequally distributed among the people and groups within a society, even when that society is, at a higher level of abstraction, resilient to repeated environmental crises.

The states of Bronze Age Mesopotamia were built on high levels of institutionalized inequality, but we still know relatively little about the distribution of risk within these societies. It is commonly asserted that the palace and temple institutions served as a social safety net; the evidence for this function, however, is relatively restricted, consisting largely of references to the support of orphans and widows (Postgate 1992: 135; Westenholz 1999: 61). We know a lot about the conditions of institutional dependency in Mesopotamia (including, for example, tenancy, share-cropping, and debt slavery), but, to my knowledge, we do not know how dependents were treated in times of scarcity or crisis.

In a now-classic study of tenancy and taxation in Southeast Asia, however, James C. Scott has shown that this is precisely where our analyses should be focused (Scott 1976). From the perspective of peasants living near the edge of subsistence—especially those owing taxes or rent to the state or to a landlord—what matters most is what happens in lean years, when food is in short supply. In such circumstances, how were dependents treated? Were they guaranteed a minimum level of subsistence, even in a year of abnormally low harvests or during a time of environmental crisis? The detailed archaeological and written evidence available from Bronze Age Mesopotamia is well suited to an exploration of these questions concerning the effects of inequality, and these are questions that need to be investigated as a crucial counterpart to analyses focusing on resiliency, stability, and collapse at the system level.

In our own world, the issue of inequality is no less urgent. Although many environmental hazards are now of global concern, the impacts of these hazards and of related policy decisions are seldom experienced worldwide in a uniform fashion. As we work toward a more sustainable future for our planet in the context of an increasingly interconnected, globalized economy, we need to ensure that some people (or countries) do not benefit at the expense of others. In the same vein, there is a danger in treating resilience and sustainability *at the system level* as goals in themselves. What if scientific study demonstrates that the most resilient type of society is one built on extreme inequality and exploitation, one in which the system is resilient only at the cost of great suffering for large portions of the population? Would this be a system worth sustaining? Of course not. The goal is not simply resilience or sustainability but rather resilience and sustainability coupled with equality, justice, and other basic human rights.

*Acknowledgments.* I would like to thank Payson Sheets, Jago Cooper, Ben Fitzhugh, Andrew Dugmore, McGuire Gibson, Tony Wilkinson, Magnus Widell, and Kathryn Grossman for reading drafts of this chapter and providing helpful comments and criticism. I also thank members of the MASS Project for many stimulating discussions on the topics discussed here. The MASS Project has been supported by funding from the National Science Foundation (Grant no. 0216548). My own work has also been funded by a Research Fellowship from the American Academic Research Institute in Iraq (TAARII).

## NOTES

1. For an introduction to Mesopotamian history and archaeology, see, e.g., Pollock 1999; Postgate 1992; Roaf 1990; Van De Mieroop 2004. For the archaeology of Syria, see Akkermans and Schwartz 2003.

2. The term *Urban Revolution* was coined by V. Gordon Childe (1950) to describe the multifaceted process of urbanization and state formation initiated in Mesopotamia during the later part of the fourth millennium BC.

3. Since the beginning of the Gulf War in 1990, there has been a hiatus in field-work by foreign archaeological teams in Iraq, but some teams are beginning to resume work.

4. There is, however, the *Farmer's Instructions* (Civil 1994), a Sumerian text from the third millennium BC that provides a wealth of detail about agricultural practices and the annual agricultural cycle.

5. The chronicle does not actually cover the entire 600-year span (AD 600–1196) with the same level of comprehensiveness and accuracy. In fact, Widell (2007: 50–52) argues that the reliability of the account can only be assumed for 276 years within this period.

6. See, e.g., Pfälzner 2002 and my forthcoming PhD dissertation (University of Chicago, 2012).

7. The list of pests known from ancient Mesopotamia includes locusts, “spotty bugs,” weevils, caterpillars, “eater”-pests, grubs, field mice, and granary mice, among others (George 1999: 291, 297–298).

8. The peak of the Akkadian state’s power lasted from approximately 2340 to 2200 BC and that of the Ur III state from 2112 to 2004 BC.

9. For example, in the Lake Titicaca region of Bolivia, there have been efforts to reintroduce the raised-field farming system employed in the region during the first millennium AD (Kolata 1991).

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TATE PAULETTE

Schloen, Nicholas Kouchoukos, Christopher Woods, John Sanders, Kathy-Lee Simunich, Mark Altaweel, Jason A. Ur, Carrie Hritz, Jacob Lauinger, Tate Paulette, and John Tenney

2007b Modeling Settlement Systems in a Dynamic Environment: Case Studies from Mesopotamia. In *The Model-Based Archaeology of Socionatural Systems*, ed. Timothy A. Kohler and Sander E. van der Leeuw. School for Advanced Research Press, Santa Fe, NM, pp. 175–208.

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**STATEMENT FOR POLICY MAKERS AND THE  
DISASTER MANAGEMENT COMMUNITY**

This chapter uses archaeological and written evidence to document the broad range of environmental hazards that confronted the inhabitants of Bronze Age Mesopotamia. Some of these hazards (e.g., droughts and locust attacks) could be expected to recur on a regular basis but could not be reliably predicted. Some (e.g., floods and river channel shifts) were more erratic, appearing suddenly and without warning. Others (e.g., salinization and soil degradation) took place gradually over much longer time scales. The impacts of these hazards varied widely, from short-term fluctuations in the food supply to declining soil fertility, settlement abandonment, and even large-scale political collapse.

Two key points—with direct relevance to the modern world—emerge from this study of Bronze Age Mesopotamia. First, it is vital that we pay careful attention to the effects and the effectiveness of different forms of institutional organization. In Mesopotamia, individual households and local communities used a variety of risk-buffering strategies to protect themselves from environmental hazards, but these households and communities were also tied into complex systems of institutional management. In some cases the centralized palace and temple institutions may have provided a degree of stability, insulating dependents from the worst effects of environmental hazards; in other cases, however, institutional practices appear to have triggered the onset of hazards or exacerbated their impacts. Second, the study of “resilience” must be combined with an analysis of the effects of inequality. In highly stratified societies, such as those of Bronze Age Mesopotamia, risks are seldom distributed evenly across the population. The impacts of environmental hazards will often be felt more deeply by some people than by others, and resilience may—but should not—come at the cost of inequality, exploitation, and suffering.