SYNOPSIS

"The Lessons of the Past: An Archaeologist Looks at Ancient Climate Change"

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The past is always around us, encouraging, threatening, and offering precedent. As the 19th-century German statesman Otto von Bismarck once remarked, we live in a Stream of Time. We are at its mercy, as it sweeps us along through the centuries. While the past cannot predict the future, it can at least give us some perspectives on our vulnerability to future climatic trends. Thanks to a revolution in climatology over the past quarter century, we are able to appreciate more fully the critical importance of climate change in shaping human life. There is no direct correlation between historical changes in human society and ancient climate change. Rather, it is the economic, political, and social consequences of climate change that have changed the course of the past.

Looking at the responses of human societies to climate change since the end of the Ice Age, we can discern major changes in our vulnerability to such events as drought cycles, major rainfall shifts, and El Nines. This increased vulnerability has a direct relationship to increasing population densities, the growth of urbanization, and the difficulties involved in governing ever more complex societies. Examples from ancient human societies in different parts of the world abound, although many details of their adaptations await further research. For tens of thousands of years, *Homo sapiens* lived by hunting and

gathering, in small bands constantly on the move. Drought and other climatic shifts required effortless adaptation, through movement close to permanent water sources. We see the same strategy still practiced by Australian Aborigines.

With the beginnings of agriculture and animal domestication some 12,000 years ago, the vulnerability equation changed dramatically. Subsistence farmers, wherever they dwelt, were, and still are, anchored to their fields, to the soil. Medieval Europe provides a telling example. A thousand years ago, during the so-called Medieval Warm Period, years of good harvests and population growth led to massive forest clearance and the cultivation of increasingly marginal lands. Then, in AD 1315, seven years of crop failures caused by excessive rainfall and soil erosion killed over 1.5 million people, at a time when virtually all of Europe lived from one harvest to the next. They perished because they could not move, nor could they fall back on game or wild plant foods.

By the nineteenth century, with millions more subsistence farmers on earth, especially in the tropics, a series of massive El Nines caused a series of monsoon failures in China, Southeast Asia, India, and Brazil—at a time when the British Raj in India was exporting Indian grain to the world market. These disasters are estimated to have killed more than 20 million tropical farmers, people who left no mark on history, as we know it. Two lessons come from these disasters—the importance of strong infrastructures, well administered mechanisms for distributing food and grain like those of the Q'in Dynasty in China, and, above all, decisive, caring leadership.

Today, many millions more subsistence farmers are on earth, many of them living in arid and semiarid environments. The Gwembe Tonga of Central Africa's Middle Zambezi Valley offer a classic example of the daunting problems of survival for village agriculturalists farming in areas where rainfall depends on climatic forces far beyond their homeland.

Five thousand years, the first urban civilizations developed in Egypt and Mesopotamia, societies dependent on irrigation agriculture and water supplies from afar. The experience of Egypt's pharaohs offers a classic example of the importance of decisive leadership in the face of climatic change, where a desert state depends on river floods. Old Kingdom Egypt collapsed in the face of massive Nile droughts in about 2180 BC. Pharaonic authority imploded when the ruler, considered divine, failed to feed his people. For more than a century, Egypt became a jigsaw of competing kingdoms ruled by decisive, powerful leaders. Their tombs tell of the ways in which they combated famine and persistent drought. After the reunification of Egypt in about 2000 BC, the pharaohs invested massively in irrigation and grain storage, and never called themselves infallible again—Ancient Egypt survived for a further 2,000 years.

On the other side of the world, ancient Maya civilization of the first millennium AD flourished in a tropical rainforest environment with only moderately fertile soils. The Maya were masters of water management and lowland agriculture, but, as populations rose and society became more elaborate and hierarchical, their civilization was set on a path of disaster. Unlike the Egyptians or Mesopotamians, the Maya never created a large territorial empire.

Their civilization was a patchwork of competing city-states, where rival lords vied for power and territorial advantage. Some of them were decisive rulers, but their concerns were never with subsistence, but with diplomacy, prestige, religious legitimacy, and warfare. Deep-sea and freshwater lake cores chronicle a series of intense droughts from the eighth century AD that led, inevitably, to the implosion of powerful city-states in the southern Maya lowlands. That the implosion took place was in large part due to the top-heavy social organization of Maya society and the stress placed on subsistence farmers by their lords. When the ecological crisis came, self-sustainability collapsed and the fabric of civilization self-destructed. The lessons: widening social and economic chasms between rulers and the ruled can lead to catastrophic vulnerability to climate change, especially if there is no infrastructure to distribute food.

The presentation ends with a brief look at a number of other successful and unsuccessful ancient societies. These include the Ancestral Pueblo of Chaco Canyon of the arid American Southwest, who made mobility in the face of rainfall shifts an integral part of their social fabric a thousand years ago, also the Moche and Chimu of Peru's North Coast, whose states flourished in one of the driest environments on earth. These two still little known societies of the past 2,000 years offer a dramatic contrast, and provide compelling reasons for long-term planning to accommodate future climatic change.

What, then, of the past and today's warming world? History tells us in no uncertain terms that higher temperatures are often the harbinger of global drought, well documented for the world of 1,000 years ago. Sophisticated

computer models now allow us to project the effects of warming temperatures on human societies, especially those living in semiarid and arid lands. There is a great deal of discussion about sea level rises and warming temperatures, but surprisingly little about the pending droughts, which may dwarf those of the Medieval Warm Period. One authoritative model estimates that about a third of the world's population will suffer from extreme drought within a half century and moderate drought affect half of us, up from 3 and 25% respectively today. This is the silent crisis that approaches humanity, despite the ominous lessons of the past. Futurists disagree on many things, but they are unanimous in forecasting that many wars of the future will center on that most precious of resources—water—in a world where there are many millions more people on earth than there were even a century ago. How will cities like Los Angeles and Phoenix survive—quite apart from millions of subsistence farmers in Africa, Brazil, Asia, and elsewhere? What strategies will enable us to survive in a future of ever spreading global poverty and food shortages? It will take all our qualities of ingenuity and opportunism to rise to the challenge of a drought-plagued future. The greatest lesson of all: our vaunted technological expertise will be insufficient to solve the problem. It is our qualities of planning ahead, of ingenuity, opportunism, and adapting to changed circumstances that will ensure our survival—the very qualities that have nurtured and sustained humankind since the emergence of *Homo sapiens* in tropical Africa 100,000 years ago. Above all, history makes it clear that long-term thinking, decisive leadership and massive investment against future climatic shifts are central to the challenge of global warming.