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Urban gardens, agriculture, and water management: Sources of resilience for long-term food security in cities

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ABSTRACT

Food security has always been a key resilience facet for people living in cities. This paper discusses lessons for food security from historic and prehistoric cities. The Chicago school of urban sociology established a modernist understanding of urbanism as an essentialist reality separate from its larger life-support system. However, different urban histories have given rise to a remarkable spatial diversity and temporal variation viewed at the global and long-term scales that are often overlooked in urban scholarship. Drawing on two case studies from widely different historical and cultural contexts – the Classic Maya civilization of the late first millennium AD and Byzantine Constantinople – this paper demonstrates urban farming as a pertinent feature of urban support systems over the long-term and global scales. We show how urban gardens, agriculture, and water management as well as the linked social–ecological memories of how to uphold such practices over time have contributed to long-term food security during eras of energy scarcity. We exemplify with the function of such local blue–green infrastructures during chocks to urban supply lines. We conclude that agricultural production is not "the antithesis of the city," but often an integrated urban activity that contribute to the resilience of cities.

1. Introduction

Over the last two hundred years, modernity, innovation, and progress have been associated with the city. Based in ecosystems theory (Clements, 1916) and using Chicago as a case study, the Chicago School of urban sociology emerged in the 1920s and 1930s to establish a modernist understanding of urban life as an essentialist reality separate from rural life. This idea still permeates urban scholarship and mainstream perceptions of the constitution of cities but is untenable when taking a longer-term perspective to global urban history. The idea of cities as separate entities essentially detached from their broader life-support systems (Wirth, 1938) was strongly linked to major innovations in transportation technology as Chicago became an important hub in the US railroad network in the 1850s, enabling food transportation over great distances. It allowed Chicago to grow rapidly from a few thousand inhabitants in the 1850s to over 2 million in the early 1920s. Harvey (1990) has shown how industrial-era technological innovation, cheap and efficient travel, and economic growth (opening new markets, speeding up production cycles, and reducing the turn-over time of capital) catered for the first wave of space–time compression, which refers to those socio-economical processes that accelerate the pace of time and reduce the significance of distance. Hence, the modernist ideology underpinning the emergence of urban planning during the early decades of the 1900s distinctly separated local agricultures as obsolete in futuristic and normative understanding of the city as an autonomous social system (Eisenstadt, 1966).

Today, urbanization is in a second wave of space–time compression driven by internet, jet-travel, and globalized economies (Harvey, 1990). The accelerating pace at which urban life proceeds and the decreasing importance of geographic barriers and distances are qualitatively different in terms of their intensity and scope compared to even fifty years ago (Harvey, 1990; Sassen, 1991). However, space–time compression is an outcome of surplus energy of diminishing returns subsidized by fossil fuels (Strumsky et al., 2010; Tainter, 2011). Large cities mainly feed themselves by global food systems relying on fossil fuels (Curtis and Ehrenfield, 2012; Fraser and Rimas, 2010; McMichael, 2011) to sequester foodstuffs from the farthest reaches of the planet (Deutsch, 2004; Folke et al., 1997), often with detrimental environmental impacts (Fraser and Rimas, 2010; Steffen et al., 2011). While such high global connectivity between cities and remote food supplies can decrease cities' vulnerability to food shortages and build resilience during medium-severe crises (Ernstson et al., 2010), sudden severances of supply lines – that for instance peak oil scenarios threatens to levy – pose major threats to urban food security (Barthel et al., in press; Newman et al., 2009). We define food security broadly as the situation when people have physical and economic access to sufficient, safe, and nutritious food to meet their dietary

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needs (FAO, 1996) and the food system as "the chain of activities connecting food production, processing, distribution, consumption, and waste management, as well as all the associated regulatory institutions and activities" (Pothukuchi and Kaufman, 2000, p. 113). We argue that the historical and archaeological record offers important insights on urban food systems that are not sponsored by fossil-fuel regimes. In this paper, we analyze food systems in pre-Industrial cities, addressing two main questions: How did people in cities of the past build food security? How did people in cities of the past cope with cuts in supply lines?

Different urban histories have given rise to a remarkable spatial diversity and temporal variation viewed at the global and long-term scales that are often overlooked in urban scholarship (Fletcher, 2009; Marcus and Sabloff, 2008; Sinclair et al., 2010; Smith, 2003; Storey, 2006). Comparing long-term urban histories in a global frame of reference suggests that a marked conceptual and physical separation between urban and rural sectors emerged largely as a consequence of modernist space–time compression (Barthel et al., in press). This paper explores food security resilience for urban people by comparing two distinct and unrelated historical metropolitan landscapes: the pre-Columbian Lowland Maya cities in Mesoamerica and medieval Constantinople in the eastern Mediterranean (Fig. 1). As temporal frames of analysis, we adopt a multi-scalar approach and look at both processes over the *longue durée*, the long-term, as well as *événement*, or historical events (Balée, 2006; Braudel, 1980). We present these two cases since they are the ones we are the most familiar with from previous research (Barthel et al., 2010b; Isendahl, 2002, 2010, in press; Ljungkvist et al., 2010). We argue that the similarities observed in these urban settings offer important insights that are not simply idiosyncratic but can be valid for understanding food security in cities more broadly, even though the sample size is inadequate for any nomothetic conclusions.

1.1. Social–Ecological Resilience of Urban Food Supply Systems: The Analytical Lens

Ecological resilience was originally conceived in forest ecology (Holling, 1973), linked to the interrelated behavior of sets of species over time in spatially defined areas (Folke, 2006). Social–ecological resilience is defined as the capacity to absorb shocks, utilize them, reorganize, and continue to develop without losing fundamental functions (Carpenter and Folke, 2006). Diversity has been put forward as an overriding principle of social–ecological resilience (Gunderson and Holling, 2002; Low et al., 2003). The evolutionary logic is that "diversity of species within the same functional group, superficially described as a redundancy, add resilience to that specific ecosystem function (e.g. pollination), because each species responds differently to a given disturbance" (Folke et al., 1996), as memories of past experiences are captured in the genetic pool of each species.

Since it informs future responses and renewal in relation to disturbances by drawing on different forms of memories, the capture and use of experiences – sometimes called learning – is another key principle of resilience. Analyzing features that brings "captured experiences" into periods of crises is one way to unpack temporal sources of resilience (Colding et al., 2003; Folke et al., 2003; McIntosh et al., 2000). One concept that deals with such temporal resilience dynamics is called social–ecological memory (Barthel et al., 2010a). Such memory also includes features of wider spatial importance for renewal after collapse (Bengtsson et al., 2003; Nyström and Folke, 2001). For instance, in the context of dramatic disturbance – such as natural forest fires or human forest clearance – resilience depends on three main factors: the diversity and quantity of surviving memory carriers within the disturbed area (large trees that survive fire or seeds that remain in the soil); the diversity of vectors (insects, birds, humans) that brings in new memory carriers (seeds, eggs, pollen), and the often human shaped physical morphology of the surrounding landscape, including migration routes and diversity of refugia from which memory carriers can be vectored back into the disturbed area, thus collectively forming a complex mnemonic infrastructure for resilience.

In an analysis of urban food supply systems we need to apply these principles of resilience in an inclusive manner, beyond the strict behavior of sets of species in an ecosystem. We use the above definition of resilience as a benchmark, but construe diversity and memory also of broader categories in social–ecological systems. Since urbanism has a multi-millennial history on most continents, it is evident that cities in a general sense are remarkably resilient systems as ways to organize large and complex human populations. It is illuminating that many ancient cities persisted to reach life-ages it is hard to imagine that any contemporary city in the United States will. Surely, there must be important insights for urban planning to gain from analyzing the resilience of past urban food systems over the long-term and in times of stress in the diverse urban archeological and early historical record. In a global framework, the diversity of types of cities and urban food systems forms an essential part of the explanation as to why the city in many senses has been a long-term "success story." But urban resilience must be assessed at several scales, from global and regional levels to individual cities and intra-city sectors. In the present analysis we scale down the level of analysis to individual case cities, applying social–ecological resilience as a lens for assessing the management of urban food resource security, but with reference to regional contexts and complex social networks.

One approach to investigate and compare urban resilience is to assess the degree of diversity in the options available to urban communities in relation to food resource production and distribution

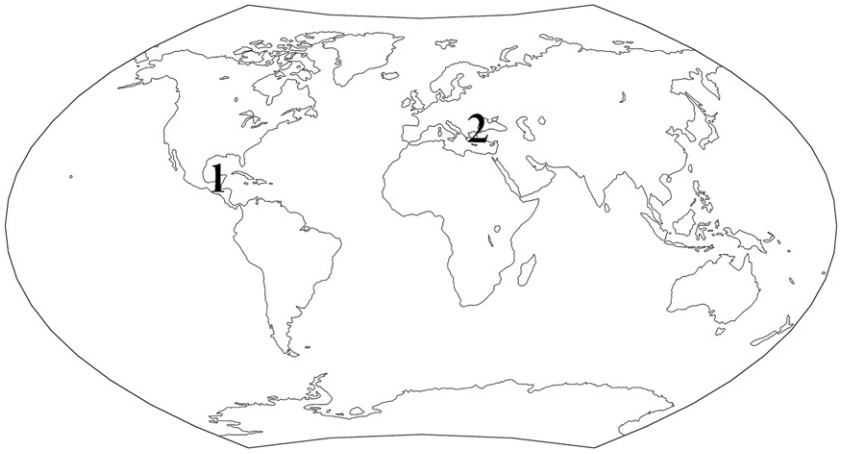

Fig. 1. Map showing the location of case studies: (1) the Maya Lowlands and (2) Constantinople.