

20

CITIES, FOOD, WATER, AND ENVIRONMENTAL HISTORY IN CHINA, THE USA, AND INDIA

Making Bubbles

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Many years ago, one of the founders of the field environmental history, Donald Worster, wrote “Human history starts with human bellies”. So also does the history of cities. In the ancient past, cities grew from the surplus food produced by agriculture relying on irrigation. As humans began to settle, expand, stratify, and build, they constructed villages, towns and, finally, cities. Since then, food and water have been the two most essential resources needed by cities to sustain themselves and grow. Conversely, the increasing demand of cities for food and water has profoundly transformed those places producing and providing those resources. Scholars have called these places “hinterlands” – “behind lands”, at first geographically, later on economically and culturally, when hinterland came to mean “backward lands”, contrasting with the cities.

With globalisation, a city’s hinterland could be on the other side of the world. Today’s Beijing, for example, has created a hinterland in faraway South America. Middle-class citizens in Beijing have begun devouring avocados, a new fashion of diet rising in China in the last decade, grown in Latin America, leading to deforestation and water shortage in those places on the other side of the Pacific Ocean. In 2017, China imported 32,000 tons of avocados, 22% more than 2016, around half of which (16,707 tons) came from Chile, 8,754 tons from Mexico, and 6,667 tons from Peru. “According to Mexico’s National Institute for Forestry, Farming and Fisheries Research, 2,000 litres of water are needed to produce a kilo of avocados”, while countries like Chile are suffering from severe lack of water (Cuéllar 2018). In a way, urbanisation has turned the whole planet into the hinterlands of cities, as urban theorist Neil Brenner (2014) suggests.

Urban history can be understood as the product of their hinterlands – but there is never only *one* hinterland. Nor does any hinterland support only one urban centre. On the contrary, the process of environmental development creates *hundreds of hinterlands* which are like *bubbles*, big and small. Rather than calling this process of creating resources providing and consuming relationship between cities and the rest of the earth “making hinterlands”, we suggest calling it “making bubbles”.

“Hinterland” in its essence is a geographic term, referring to a specific place. “Bubbles”, however, emphasises the economic relations, implying how volatile and vulnerable the

relationship is. Each city or even small town has its bubbles which can overlap. They are not perfectly round in all directions, but usually irregular and sometimes very elongated into the interior or, increasingly, extending globally. Those bubbles have proved to be far more capricious and unstable than their creators ever anticipated. They present different human cultures, soils and vegetation patterns, different species of wild animals, different evolutionary histories, different river patterns and water flows, different energy resources (e.g., oil, gas, coal), and, not least, different climates and climate cycles. Each bubble is unpredictable in shape. Each offers both opportunities and resistance to the plans of the city builders.

Water and food are the crucial subjects of the bubble-making process. In recent decades, urban people have acquired these two central resources too cheaply and conveniently, therefore, there is always an illusion that cities function free of them as well as the places generating them, or at least, function on a solid material foundation – the so-called hinterland. Yet, when we examine history, too often cities rely on fragile bubbles for their prosperity or even subsistence. This chapter intends to examine the bubble-making process in a planetary sense with a few examples coming from different parts of the world. It argues that bubbles are not created once and then simply remain in an endless state of stability, control, and permanence. They can be disturbed and even fall apart. Sometimes, unlike a hinterland, a bubble pops. Much of urban environmental history has been about the failure of schemes of economic development (what we call “bubble popping”) in the face of misunderstood, underappreciated, and unstable natural conditions. There is also the adaptation of the bubble to its ecological reality, quite distinct from the city’s design.

Humans are not the only force in the process of making bubbles, nor do they play a unified role. Some of them are bubble boosters, some are food producers, and all of them are consumers. Meanwhile, nature, as a noncultural force, has never been absent, supporting cities’ existence, furnishing them with possibilities, defining their patterns, limiting their expansion, and sometimes, undermining their ambitions. Nature is not a stagnant backdrop for cities, appearing only at the beginning of a city’s history, but has been a shaping force always present during urban evolution. Seeing cities integrated with nature does not mean that nature loses its autonomy as an independent and spontaneous force, nor does it suggest any complete human triumph over nature. Nor does it try to repeat the old dichotomy regarding city as a pure human invention in which nature plays no role. Instead, it argues that humans and nature together create and define cities as two interactive and relational, yet in many ways autonomous forces. We need to “understand the city’s place in nature”, as William Cronon (1991: 8) writes in *Nature’s Metropolis*, a foundational work of urban environmental history. In order to do that, we must go into the deep past of that tangled story that links cities’ relationship with their hinterlands.

Before the birth of modern environmental history, Lewis Mumford was arguably the most important analyst of the ruptured city-nature relationship from a historical perspective. Born in Flushing, Queens, New York, in 1895, Mumford called himself “a city kid”, shaped by growing up in one of the world’s biggest cities. He walked New York’s streets and alleyways, witnessed its expansion and densification, and reflected on its changes and trends. He became a philosopher of the urban environment, but also a critic of the transformation of the city into the megalopolis and into mega-machines, a psychological healer of the modern urban trauma. Although not trained as a professional historian, he was inclined to go back into the history of urban evolution to understand present issues and dilemmas (Miller 1989).

In his masterpiece *The Culture of Cities*, first published in 1938, Mumford suggested that the concept of the “region” would be useful in both the study and design of cities. For him,

the region referred primarily to a place defined by nature rather than humans. His strategy reflected his own political philosophy of decentralisation, but also rested on an appreciation of nature's diversity and recognition of his philosophy's connections with nature. The region's natural elements, such as topography, climate, rivers, soils, vegetations, food and drink, and minerals, he argued, influenced the city in an immediate and yet profound way. "The city", wrote Mumford (1970: 319), "may cover a visible terrain more cramped than that of the village or its fields. But its invisible regional base, embraced through the raw materials that reach it, ... is much broader". Mumford concluded:

the region, then, is a warp upon which the fabric of communal life is woven. Even when the coarse geographic threads are unnoticed, their quality and number and closeness will affect the weaving of the ultimate cloth. The variety of these natural influences, the complexity and their individuality of their assembled character in the city, are in fact a perpetual guarantee against man's inveterate tendency toward over-simplification.

(Mumford 1970: 319, 322)

Unfortunately, much of Mumford's reflection on cities and their regions was ignored by following urban historians. They wrote from *within* the cities, neglecting the surrounding region. Like most people living in cities, they regarded cities as the achievement of human labor and mind, focusing their research on people only. They belonged to the generation influenced by social history, emphasising the stratification and mobility of an urban population, the racial, class, and gender tensions and interactions among urban people, the flow of capital, the distribution of power, and the sparks from ideas. Cities, according to those historians, despite all their evils and injustices, were the places that set people free of conventional restraints, rural mentalities, and ecological limits. Few of them looked on cities as an ecological habitat, shared by many life forms including human beings, connected with a long rural past, and still relying on the places from which energies come.

Across the globe, cities are expanding, but for a long time in human history, they were home to only a small number compared to a predominately agricultural population. Until the beginning of the 20th century, most people in the world were still living in the food-producing countryside, working on the land directly and raising food for themselves, seldom for export (see Figure 20.1). Once there had been a metabolic connection between countryside and city, but when urban wastes were not returned to restore the fertility of the land, when the so-called "metabolic rift" occurred, cities lost their organic tie with the countryside (Foster 1999). In a modern urban industrial era, every grain of every crop traveled a longer and longer way from field to urban dining table; consequently, urban residents began to believe that their food came from supermarkets and their water flowed magically from faucets. It became easy for historians to think the same way, to ignore the process by which cities acquired, transported, processed, distributed, and consumed food and water, which should have been the most fundamental and permanent theme of urban history, as shown by Cronon's *Nature's Metropolis*.

Environmental history has its human-centred problems, too, but it can be and should be more subversive than that. It should be grounded in the view that humans have been and always will be part of the natural world on this planet. Environmental history puts much greater emphasis on the material dimensions of our lives and generally takes a more materialist

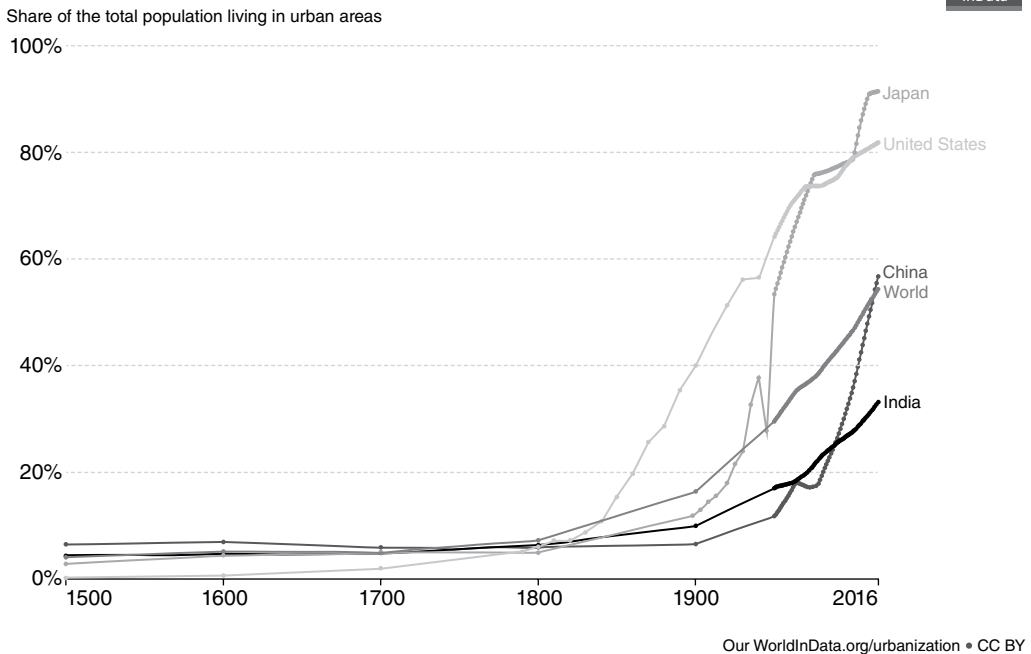


Figure 20.1 Urbanisation over the past 500 years, 1500–2016. One World in Data, <https://ourworldindata.org/grapher/urbanization-last-500-years>, accessed 15 February 2023.

approach to the past. It emphasises food, water, and soil, all forms of nature that fall outside urban understanding among historians.

What, then, is an environmental history of cities? Martin Melosi and Joel Tarr were among the first historians to locate cities in their surrounding landscape as early as the 1980s, and they wrote several historiographic essays to define this new subfield in the 1990s (see Melosi 1981).¹ Energy, water, sewage, and pollution within and beyond cities have concerned them the most. Like many later practitioners of urban environmental history, they pay attention to social justice and environmental inequalities among various social groups living in cities. By investigating how cities evolved from “organic city” to “sanitary city”, they ask why pollution was generated, who suffered from it, and how ideas about urban environmental problems were altered (Melosi 2008; Tarr 1996).² Urban environmental historians also have increasingly explored the history of disasters; urban parks; animals such as horses, pets, and pests; trees, weeds, and microbes; and their changing relationship with different races, classes, and genders.³ More urban environmental historians choose to study a specific city, to capture a sense of that place, to show the individuality and specificity of the natural environment.

Another landmark in the field is Cronon’s *Nature’s Metropolis: Chicago and the Great West* published in 1991. He called it an urban biography, but unlike biography, it goes beyond the limits of Chicago and reaches out to the great west, the “hinterland” (in Cronon’s word) with which the city has a deep ecological bond. Cities have always relied on the countryside to feed them. Yet in most urban history, except for a few capital cities, like Beijing

during the Ming and Qing periods of China, which depended on the Grand Canal to bring crops from the Yangtze River valley, most cities were geographically connected to their hinterlands. Moreover, in a subsistence economy, although hinterlands produced the food for cities, their production logic was local and did not follow the market or capital logic in cities. But this state changed as Chicago and other midwestern American cities began to rise. Those new hinterlands stretch and swell, becoming much more distant, formless, and fluid, not just behind or surrounding their cities any longer.

Cronon's Chicago is thus quite unlike a traditional city. He locates it in a broader historical and ecological space. Through analysing the influence of various commodity flows between the metropolis and its hinterland, he shows how Chicago became the largest city in the American Midwest. He focuses on the connections between the ecological systems of nature and the economic system of the city. Symbolised by modern technologies like railroads, grain elevators, and refrigerator cars, Chicago broke through the geographic, seasonal, and other natural restraints and transformed the Great West into a subordinate periphery. In that process, wheat fields took the place of native prairie, cattle replaced bison, the forests of the Great Lakes became urban construction materials, and the nature of the West was gradually commodified. As the hub of all those commodity networks, Chicago grew to be "nature's metropolis", an imperial centre. Capitalism inserted its logic into the ecology of the Great West's system. Cronon writes:

What had once been a diverse prairie landscape produced fewer and fewer species. Although the local ecological conditions of first nature continued to influence which species grew where, the economic imperatives of second nature – distance from the city, cost of transportation, supply and demand, price – played an ever more important role in determining the shape of the landscape. As the human inhabitants of Chicago's hinterland responded to the siren song of its markets, they simplified local ecosystems in the direction of monocultures.

(Cronon 1991: 267)

This is undoubtedly a provocative argument. But Chicago's environmental story, as Cronon well knows, did not end with the imperial triumph of the 1890s White City, the Chicago World's Fair ground, where Cronon wraps up his narrative. Nature was not yet conquered completely. Nor did capitalists entirely dominate the size and durability of the bubbles. Nature did not really become simply "second nature". Although capitalism's logic did go on to spread globally in the last two centuries, nature has always been an independent power. As a spontaneous, self-generating force, nature persisted within cities, even in the nearby countryside where the power of capital and cities seemed to be most potent.

We can see this more complex story if we look at Chicago's fellow midwestern city Kansas City, which straddles the Missouri–Kansas state line. Compared to Chicago, Kansas City is a smaller, much more obscure city internationally, but it shares the same bubble with Chicago and shows many similar environmental experiences. Furthermore, as a more "ordinary" city, it tells a more common story of the relationship between cities and their bubbles. Sitting at the junction between the Missouri River and the Kansas River, Kansas City was destined to become a "gateway city". It served as a natural transition place where thousands of people heading down the Santa Fe Trail or later across on the Oregon Trail would switch from boats to wagons to cross the Great Plains, searching for a new life and new wealth. This crucial geographic location made the land where the Kansa and Osage indigenous peoples

lived and fought, where bison roamed, and where wolves lurked become an active stepping-off place by 1855. But its real opportunity to expand did not come until the end of the Civil War, when the United States began moving westward to grab land and grow crops, and to construct more solid homes instead of merely accumulating some quick but temporary money in the form of mineral resources. Like its big brother Chicago, Kansas City became a centre of wheat and cattle production, making its own particular bubble (Hou 2021).

The early boosters of the city were clearly aware of the indissoluble connection between the city and nature, more particularly the nature of soils. Their confidence and ambition to create a great “agriculture capital” in the heartland of America was derived from the extraordinary fertility of the Great Plains, which came from millions of years of soils eroding from the Rocky Mountain uplift and vegetation living and dying on those soils. As early as 1857, three years after the American Congress passed the Kansas-Nebraska Act, people were already celebrating the wealth of nature at their doorstep, a wealth that glittered before the “ambitious little city”. In a history of Kansas and Nebraska, one author came up with a long subtitle that began with “soil” (Sloan 1857: 17). Throughout the rest of the 19th century, Kansas City’s leaders continued to celebrate the fertile bubble stretching to the west and to see in it a prosperous future for the city. They argued that Kansas City would become great because of “the laws of nature”. Nature would make it “the gateway into the most fertile and productive territory in the world”, a “territory of incomparable fertility and productiveness”.⁴ As the Board of Trade of Kansas City expressed their dependency, “the relations between Kansas City and the New West are so intimate and sympathetic that whatever affects the one immediately affects the other” (Miller 1879: 9).

To a great extent, the rise of Kansas City follows a typical American story of urban success. By 1891, it was already one of the most famous “cow towns” of the nation, ranking second only to Chicago. Hundreds and thousands of livestock were arriving from the fertile grasslands into the city’s stockyards – “the animal hotel” from which they would be transferred to eastern markets or consumed right in the city. As the Annual Report of the Board of Trade and Commerce vividly put it,

If the total number of cars of livestock which have been brought to Kansas City were put in a continuous train, this aggregation would reach from Louisville, Kentucky, to San Francisco and back again, and if this train were going at the rate of fifteen miles an hour it would take it fourteen days to pass a given point. The livestock placed in single file would make a living line 39,376 miles long.⁵

When the city planning commission looked backward in 1945, their city (which had been merely a fur trade town less than 100 years earlier, home to a few dozen people) had grown fat on the land. It now

ranked the first in normal years in the production of mill feeds, and for a number of years has been consistently the second in the United States in the production of wheat flour. This is related to the fact that Kansas City has for some years ranked first in the United States, if not in the world, as a winter wheat market.

(City Plan Commission 1945: 14)

Along with Chicago and many other “gateway cities”, Kansas City turned the Great Plains into a vast bubble supposedly under the control of a market economy. Also like Chicago,

this city faced, on the one hand, the great west, gathering in its abundant resources; while, on the other hand, it faced east, providing food to the cities there and even abroad. Just as the City Plan Commission wrote:

Into her rail and truck terminals pour livestock and grains, milk and dairy products, poultry, eggs, vegetables, and fruit from a rich farming area. There they are moved to packing houses, storage plants, wholesale markets, processing plants, retail outlets, and exchanges. Some are consumed in their raw state, others are first processed and then used in Kansas City. Some move on through the city without even leaving the cars or trucks and are used in distant centers.

(City Plan Commission 1945: 3)

Everything seemed to be working smoothly and efficiently. The bubble produced, the city bought and sold, and people everywhere consumed. The buying and selling sector, however, was an unstable link between producers and consumers, while the link between the city and its hinterland was not to be depended on. Consumers were only concerned about whether the food in the grocery stores or supermarkets was adequate and affordable. As for those producing and consuming the food, perhaps most did not have much knowledge or even interest in the origins of their food, or realise how vulnerable they were.

A hidden bond, however, did not mean a broken bond. In fact, the buying and selling side – those who thought they controlled everything – had been conscious of its connection with the bubble and seemed to consider it always in its plans. But they took it for granted all the same. In the same report was a reminder to people in Kansas City to understand that they were “as an economic unit ... [dependent on] this area upon the agricultural hinterland”. “The metropolitan area of Kansas City”, the report went on, “exists because of a very productive agricultural hinterland which is tied to it by a spider-web of rail and truck lines” (City Plan Commission 1945: 1–3). Yet little did they know how that dependency could upset their lives.

Interestingly, a word which had frequently appeared in 19th-century boosters’ vocabulary was missing in this 1945 report – “nature”. Although the commissioners acknowledged that Kansas City could not exist independently of the Great Plains, they did not see the full force of nature, the nature that continued functioning outside of capitalist logic. This blindness and vulnerability Cronon overlooks. At the end of his story, nature has become a man-made hinterland – “second nature” – a landscape under the full control of capitalism. The hinterland, he presumes, was an invention of human design, and a thoroughly successful invention, tamed, orderly, and predictable. Once in a while, there might be some “spasms”, but always the region would get back to the original track to progress. Nature, however, had remained in many ways an unfettered force. When human culture tries hard to adapt to the land, the two forces might achieve a relatively stable cooperation. But more often they are in a state of confrontation and competition, especially when the human culture is determined to conquer and dominate nature. Sometimes, technology and capital have the upper hand, but once their exploitation of nature reaches a certain limit, the force of nature could explode. Although it does not necessarily lead to revolutionary changes, that moment of backlash could still spoil the city’s plans, bringing disasters, and force the conquering powers to yield. Kansas City was not exempt.

After almost 80 years of marching along the road to victory, Kansas City, like thousands of other cities, encountered the shock of the Great Depression, the biggest ever failure of the

urban capitalist economy. But what dimmed the skies of the city was not only the collapse of the eastern stock market, but also a series of massive dust storms coming from the Great Plains. The bubble that had promised fertility and abundance ceased to produce in the way expected by urban capitalists and consumers. Severe drought and prairie destruction brought high winds and blowing dust. Drought had long been normal in the Great Plains (Worster 2004, afterwords). Even in the city's annual trade and commerce reports, droughts are often mentioned, implying crop failure. Drought and dust proved they could destroy the profit that Kansas City expected from the agricultural business. Drought alone did not produce the dust storm. Those occurred when people destroyed the perennial native grasses and planted annual crops with short roots which failed to hold the soil during severe drought.

One of the most infamous environmental disasters in human history, the Dust Bowl debacle in which agricultural expansion on the Great Plains of North America overran the natural, cyclical limits of the land, causing severe wind erosion and economic collapse, is the subject of another classic work in environmental history published in 1979, Donald Worster's *Dust Bowl: The Southern Plains in the 1930s* (Worster 1979). Worster is concerned with grasses, waters, soils, and people creating and suffering the "dirty thirties" on the Great Plains. Yet he does not pay attention to the impact on Kansas City, nor does he try to connect the ecological changes on the Plains to the cities that supported them. Cronon, on the other hand, does not anticipate the Dust Bowl and its impact on his city. Although he also tackles the question of capitalism's plunder of nature and is critical of the rise of nature's metropolis, he does not suggest that Chicago was heading to a major ecological disaster. Furthermore, he focuses only on the commodification of nature within the city, while none of the natural disasters, droughts, locusts, floods, or dust storms happening to the west, the hinterland of his metropolis, shows up in his history. This is not to criticise either author. Rather, their works inspire us to connect the two stories, to reflect on the impact of nature on cities, rather than cities on nature. Urban environmental history would then be more balanced in analysis and perspective – more alert to the continuing power of both human and non-human agencies in the past and present. We would achieve a more interactive, dynamic understanding of the city's role in nature. While power in that interaction may have shifted over time towards humans, cities are still shaped by the power of climate, rivers, soils, microbes, and other natural phenomena. Historians should not leave us with the illusion that the earth is a blank slate on which humans write whatever they want.

The meaning of the Dust Bowl for Kansas City should have been obvious. From the annual reports of trade and commerce made from the 1900s, we can easily see how the rise and fall of the city's economy was influenced by natural forces out in the bubble. In 1921, the largest harvest of wheat after World War I brought more profits to Kansas City. In that year, the city received 139,629,550 bushels of grain, including 110,204,550 bushels of wheat and 15,495,000 bushels of corn. Over the next decade, the market was more or less stable. Even during 1929–1931, when eastern cities were shattered by the Great Depression, the crop and livestock market in Kansas City maintained its prosperity. In 1932, however, drought started affecting the Great Plains and the yield of crops. The grain arriving in the city was only half what it had been in 1921, while the wheat reception decreased even more, falling to only one-third of what it had been in 1921. By 1936, there was a minor increase, yet, the general decline did not end until the next year, when the rains returned.

Kansas City did recover from that Dust Bowl disaster, and its economy boomed again. Nature and city alike showed some resilience. But if those pioneers of the Great West, including the founders of Kansas City, had aspired to possess a permanent Garden of Eden,

they were doomed to be disappointed again and again. Bubbles are blown up by people, but none of their bubbles can withstand the forces of nature, which can always reject or challenge the people's plans, grand or small. Cities cannot expect their hinterlands to remain stable, sustainable, and domesticated once they are built. The truth is that they will be disturbed, broken, and sometimes popped. The Dust Bowl in the 1930s for Kansas City popped a big bubble; but it was, after all, an unusually big disaster. Sometimes, bubbles vanish when natural resources are exhausted. More often, the changes in a bubble are more gradual and subtle, reminding its creators that they constantly adjust the design, or even abandon it.

No one would deny that cities change, but those changes are not merely about growth or decline. For most cities in history and present, the changes are new adaptations, conforming to whatever nature allows their bubbles to be. Once they exceed that limit, they might face new failures. Perhaps they will revive, like Kansas City did from the Dust Bowl, but those failures require a generation or several generations to pay a high cost; and often those people are the common folk living in an inner city or farms. But as both Worster and Cronon point out, historians should recognise another victim – that is, a dynamic, vibrant, and diverse ecosystem, consisting of the rest of nature, all the other lives living there for millennia or even millions of years.

Once an ecosystem is lost, it is lost forever. A city could perhaps recover from its failure, but will its revival then become a new victory story? Will a city learn how to live within its limits and face ecological reality? A city always belongs to its region, just as Kansas City and Chicago belong to the Great Plains. As Worster suggests in *Dust Bowl*:

A mere century or two of American domination of the Plains is not an adequate base for making any predictions about the long-term survival rate of any society or its institutions. On the basis of such a short period no historian, environmental or other, is in a position to pick the future's winners. But scrutinizing the past, distant or recent, can suggest where one might best put trust or confidence, can reveal what has failed in the past and what may fail again, and can sort out what looks like good news from the bad.

(Worster 2004: 253)

If human history starts with food and urban histories are about material and spatial relationships extending far beyond the city's limits, then the role of water in cities is critical to understanding both the geography of cities and what geographer Erik Swyngedouw, in his study of Guayaquil, Ecuador, terms the "urban metabolism". Water literally animates life in cities in its metabolic-like circulations: as arterial routes for transport, as the essential requirement for human and other life, as a necessary substance for manufacturing, and as the primary medium for the elimination of waste. *Unmanaged* water also highlights the double-edged nature of water in cities. Broken pipes, flooded districts, dried-out reservoirs, and mosquito-borne diseases all attest to the potentially deadly effects of *unmanaged* water. Writes Swyngedouw (2004: 175), "this urban transformation of water is a manifestation and expression of wider relations that clearly transcend the simple question as to who does and who does not have access to water". A closer analysis of water's multiple roles in urban life shows a deeply political geography in almost every city with respect to *who* lives in flood-prone, pestilential areas, *who* controls government-sanctioned, public or private monopolies over water utilities, and quite literally *who* gains and *who* loses in battles over a limited resource.

Perhaps no city in the modern world illustrates the extreme politics of water distribution than Los Angeles in the United States. Located on the Los Angeles River, the original Mexican Pueblo de Los Angeles numbered just 1,610 people in 1850, when California fell under American control. By 1890, the population of the city grew to 50,000; and by 1900 it doubled again to over 100,000 (Hundley 2001: 138). As in other newly established cities in this time, citizens of Los Angeles clamoured for a public, municipal water authority, and one of the most powerful water agencies, the L.A. Department of Water and Power, was formed. Its first superintendent, William Mulholland, quickly gained national fame when he moved to acquire a more plentiful source of water in the snowmelt-fed Owens Valley of the Eastern Sierra Mountains. While cities have long relied on peripheries for food, labor, fuels, and water, in this case the water source was located 235 miles away across harsh deserts and earthquake-prone mountains. Mulholland led LADWP through a decade of legal wrangling, backroom deals, contentious court cases, and even eco-terrorism (blowing up the pipeline) before Owens Valley water flowed into Los Angeles in 1915. Such distant places with water-starved, downstream communities became “water colonies” of the city (Hundley 2001: 142–67). This urban takeover of a distant watershed effectively launched a wave of water reclamation projects across the United States accompanied by the construction of monumental dams such as Hoover Dam built on the Colorado River. Los Angeles’ metabolic reach, along with other south-western cities including Las Vegas, Phoenix, and San Diego, extends several hundred miles into the reservoirs and aqueducts of the Colorado.

Cities are centres of economic and legal power; but as densely inhabited, built environments situated along rivers and coasts, they are also centres of intense vulnerability. In 2005, when Hurricane Katrina made landfall at New Orleans and caused levees to rupture, floodwaters poured through a 1,000-foot hole and inundated 70% of the city. Over the next several weeks of nightly news coverage, the story of the storm and the failure of the levees developed in several distinctive ways with respect to Swyngedouw’s idea of “urban metabolism”, how politics figures in to the geography of such disasters. First, news stories moved from the *natural* disaster of the hurricane to the failures of engineering, city and federal policies, and problems of corruption that prevented long-needed maintenance to flood control systems. Second, the news focused on one neighbourhood hit the hardest by the floods, the Lower Ninth Ward, whose residents were majority Black and lower income. By looking at spaces of *unmanaged* water in cities, especially after flooding events, we can often see how inequalities in water distribution and flood protection lay bare other disparities marked by differences in race and class (Kelman 2003).

Largely because cities have grown so rapidly in the past century, floods now have a greater potential to render large numbers of people homeless and even cause urban abandonment. A warming climate is causing seas to rise and increasing rainfall in some areas, which in turn increases the pressure on people and their governments to respond. Perhaps nowhere did this buildup of urban space along powerful rivers have more devastating consequences than in China in 1931. An especially cold winter with heavy snows combined with unusually heavy spring rains to flood the Yangtze, Yellow, and other rivers and inundate China’s densely populated, coastal plains. Floodwaters covered over 180,000 km², and cities like Wuhan on the Yangtze were especially hard-hit. After the end of the Second Opium War in 1858, foreign powers gained access to this river town 600 miles upstream from Shanghai. Like Chicago, Wuhan emerged as a powerful exporter of industrial commodities that literally “fed” China’s more well-known, coastal cities with meat, tea, tobacco, steel, iron, and silk. Unlike American cities, however, Wuhan had been a densely populated

megacity with a population of over 1 million for many decades. Before the weakening of the Qing dynasty in the Opium Wars, a combination of traditional practices and centuries of engineering and policies aimed at “living with the river” precluded the sort of flood that ravaged Wuhan and killed more than 2 million people across China. Chris Courtney’s account of the Wuhan flood shows that the 1931 flood was a product not simply of extreme natural events but also a result of the collapse of traditional, popular and city-level practices that ultimately strengthened dikes and coordinating popular labor contributions necessary to maintain water defenses. One symbolic example of this cultural and ideological divide between modern technocrats and working-class occupants of Wuhan occurred in 1930, one year before the floods. Town planners ordered the destruction of the Dragon King Temple in order to construct a new road. After the floods came, thousands of residents blamed them on the destruction of this powerful river deity’s temple. Courtney shows how this popular religion, with an annual Dragon Boat Festival, offered an important way for many people – especially migrants and the working poor – to pay their respects to this highly volatile, river force where most of them worked and lived (Courtney 2018: 101–7).

Another challenge that modern cities pose with respect to waterborne vulnerabilities is the global trend from the late 19th century to fill in swamps and marshes and to *fix* what were naturally moving river banks. In Seattle, Washington, in the decades after the 1898 Klondike Goldrush, urban boosters used hydraulic cannons from the goldfields to reduce steep hills and cover the city’s bays with a layer of fill. Native peoples who traditionally fished all around the Salish Sea, aka Puget Sound, increasingly found that either their fishing grounds had been destroyed by wharfs and reclamation or that new laws and posted signs criminalised their access to the waterfront. Similar conflicts between city-builders and Indigenous peoples can be found around the world, from Boston to Cape Town to Kolkata, but Seattle was one of the first modern cities where Indigenous people successfully regained their rights to the city’s marshes. During the civil protests engulfing American cities in the 1960s, Native peoples with support of the American Indian Movement staged “fish-ins” along Seattle’s waterfront. Native groups successfully fought in American courts to regain their traditional rights to Seattle’s fisheries, and in the process they helped push Seattle’s residents to embrace some of the most pro-Native and pro-environmental policies in the world (Thrush 2007: 187–90).

The urban reclamation of swampy land exposed stark class differences, and in many cities, it remains a highly contentious issue as seas rise and descendants of “untouchables”, indigenous peoples and others seek to re-establish ties to ancestral lands. In Kolkata, India, as in Seattle, the riverbank was not just an important site for commerce but a sacred space of passages and rituals intimately linking water to urban life. The *ghat* or river steps along the Ganges River formed an important cultural sphere where riverine commerce intersected with festivals and rituals. Historian Debjani Bhattacharyya shows how collections of boatmen songs, tidal songs, and minstrel songs portrayed a life on the urban-water edge that blended spiritual practices with commercial trade. She writes, “As a precolonial archival source, the poems of the *Mangalkavya* genre attest to the complexity of the space of the ghat where the river and its banks are depicted as sites of both worship and trade” (Bhattacharyya 2018: 120). British surveyors and colonial governors worked to *fix* the waterfront of Kolkata in order to turn this riverfront property into some of the city’s most valuable parcels, and they used all manner of material-engineering and political wrangling to dispossess Bengalis of access to the *ghat*. In the present era, as worsening typhoons batter these areas and rising seas threaten to inundate urban shorelines, different constituencies, including Indigenous

rights advocates and even conservative urban planners, are coming together and turning to the pre-modern history of cities in efforts to open paved-over creeks and even restore urban wetlands.

Restoring a city's wet spaces, however, is also politically complicated. One well-studied case is the Cheonggyecheon Stream running through the middle of Seoul. Once covered by a street and later used for an elevated freeway, the stream and its neighbourhoods were some of the most polluted, blighted areas of the city by 1980. In 2003, the mayor of Seoul pushed for a \$350 million clearing of the aging freeway and re-opening of the stream. The project is now regarded as a successful example of "eco-branding", for it gained global attention, and the newly opened spaces fostered rapid economic developments with pedestrian shopping and more valued residential spaces. However, critics question whether the effort was really "restoration" or rather a form of urban landscaping primarily designed to *fix* this "blighted" waterway in ways that in turn produce more urban revenue (Lee and Anderson 2013). In the context of urban renewal, environmental cleanups and historic preservation, these publicly drawn contrasts between modern/colonial and pre-modern/traditional landscapes often continue to obscure underlying economic and political pressures to "green-wash" urban shorelines – even when done in the name of restoring Indigenous landscapes.

If cities are super-metabolic bubbles consuming food, energy, and water from surrounding sinks, then the problems of sewage and waste removal might be a fitting conclusion. Until the late 19th century, sewage flowed from factories and neighbourhoods via surface and underground conduits into rivers and the sea. Rivers and shorelines in cities have always served three purposes: as upstream sources of clean water, as transport conduits, and as downstream sinks for sewage. Before the 19th century, nightsoil collectors removed the nitrogen-rich wastes of humans and work animals for use as fertiliser in farming; but the advent first of guano and then of industrially synthesised, ammonia fertilisers eliminated the market for nightsoil. As cities worldwide began to skyrocket in growth, they were also drowning in poop. Daniel Schneider's *Hybrid Nature: Sewage Treatment and the Contradictions of the Industrial Ecosystem* details a complex and truly metabolic engagement as businessmen, engineers, and city leaders explored the development of activated sludge as a way to purify and recycle wastewater. Activated sludge is wastewater with an activated bacteria culture or microbiome that eliminates or controls potentially harmful bacteria such as *Escherichia coli* (*E. coli*) and separates nitrogen-rich solids from purified water. Cities such as Milwaukee supported the launch of new businesses selling the sewage-based fertiliser; and to continually reach more customers, the makers of Milorganite even developed new products like Milarsenite – a combination of arsenic and sludge-based fertiliser designed to feed grass but kill (via the arsenic) broadleaf weeds (Schneider 2011: 155).

As urban industries have added thousands of new chemicals and contaminants to city waste streams, these blends of organic, living, and inorganic, possibly toxic ingredients have become too difficult to manage. The Milwaukee Sewerage Commission stopped selling Milorganite in 1972 when the passage of the US Clean Water Act required cities to monitor waste streams for dozens of chemicals deemed hazardous to human health. The boundaries dividing "natural" and "artificial" in these flows of water through pipes, into homes and factories, and out to sewage treatment plants have become permanently blurred. Today cities in water-scarce environments must develop more technological fixes to insure a continuous supply of fresh water and the safe elimination of sewage as well as salty brine, toxic metals, and bio-pathogens. In Orange County, California, the city of Huntington Beach

desalinates sea water, pumping it more than 50 kilometres uphill so that it flows downhill to augment waters flowing down the water-parched Santa Ana River. This short river, like the neighbouring San Gabriel and Los Angeles Rivers, flows for much of the year at a trickle. Cities upstream consume the seasonal waters fed by snowmelt and occasional rains. In fact it is their treated sewage water, released back into the river, that flows downstream where large water users like Disneyland take up the water again, filtering it before sending it into the water supply system. Increasingly, cities are relying on desalinated and twice- or thrice-recycled water to maintain urban life.

Piercing the “bubbles” of the city and its outward surfaces shaped around tall buildings, streets, and monuments, we find what Italian novelist Italo Calvino and countless *noir* stories like Roman Polanski’s *Chinatown* (1974) identify as an “invisible city”, the flows of water, food, energy, and waste through this urban shell (Calvino 1999). In *Chinatown*, a Los Angeles politician contends an aqueduct is needed to bring water to the city from the hinterland 200 miles north: “Beneath every street there is a desert, and without water the dust will rise up and cover us as if this place never existed”. Who controls these flows and who lives in the differentiated spaces of cities, those living closer to farmers’ markets and fountains versus those living near sewers and dumps, is often the focus of *noir* fiction, crime procedurals, and fantasy movies that unpeel a city’s outer layers to reveal these hidden worlds.

Notes

- 1 For some historiographic essays, see Melosi (1993), Platt (1999), Rosen and Tarr (1994), and Tarr (2004: 25–40).
- 2 Besides Melosi and Tarr, for environmental justice issues, see Hurley (1995). For a more recent work about the social approach to study urban environmental history, see Kiechle (2019).
- 3 Urban disasters are one of the major themes of urban environmental history. Besides industrial disasters, especially air and water pollution, floods, earthquakes, hurricanes, and forest fires have intrigued many urban environmental historians. Some recent works include: Courtney (2018), Dyl (2019), and Horowitz (2020). There are several dozen works on the environmental history of urban parks all over the world, including Hou (2013). As for the environmental history of different life forms, besides Clay McShane and Joel Tarr’s book on horses (McShane and Tarr 2007), three more recent works deserve some special attention: Biehler (2015), Falck (2016), and Brown (2019).
- 4 Charles Deatherage, *Early History of Greater Kansas City, Missouri and Kansas, the Prophetic City at the Mouth of Kaw*, Vol. I, Kansas City, MO: Interstate Pub. Co., 1927, p. 574; *Notes on Kansas City, including Tables and Statistics Showing the Extent of Her Financial, Mercantile and Industrial Interests*, compiled and published by the Winner Investment Company (Willard E. Winner), Kansas City Bank Note Co., Printers, 1887, p. 18; *The Leading Industries of Kansas City: A Review of the Manufacturing, Mercantile and General Business Interests of the “Gate City of the West,” to Which Is Added a Historical Sketch of Its Rise and Progress*, Kansas City: Reed & Co., 1882, p. 3.
- 5 *Twelfth Annual Report of the Trade and Commerce of Kansas City*, being the first under the auspices of the Commercial Club of Kansas City, for the commercial year ending 30 June 1891, Kansas City: Press of Hudson-Kimberly Publishing Co., 1892, p. 47.

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