CREATING THE SANITARY CITY
WATER, WASTEWATER, AND HEALTH IN AMERICAN CITIES

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Outline

- Introduction
- The Age of Miasmas
- The Bacteriological Revolution
- The New Ecology
- Conclusion
Water supply and wastewater systems are technologies of sanitation. Choosing between available technologies was informed by the prevailing environmental theory of the day. From colonial times to 1880 initial technologies of sanitation were implemented in a period dominated by the miasmic theory of disease. From 1880 to World War II bacteriological theory informed choice. After World War II choices made concerning technologies of sanitation were influenced by new theories of ecology.
The Age of Miasmas

- The English “sanitary idea” influences American systems and others throughout the world.

- The Miasmatic (or filth theory) was anti-contagionist in nature, focusing on bad smells, putrefaction, and sewer gas.

- Environmental sanitation was viewed as the solution to many disease problems.

- First American “sanitary awakening” in the U.S. between 1830-1880 led to a blueprint for environmental services, especially city-wide water supplies and sewerage systems.
New water supply protosystems meant to improve health and combat fires.

A model water supply system was developed in Philadelphia in 1801.

First water systems (mostly after 1830) were nothing more than transportation systems for water.

Sewerage development was meager from 1830 to 1880. Since sewers didn’t generate revenue like water systems, they came later.

However, increased piped-in water led to demand for underground sewers by the end of the period.

Also, the late-19th century introduced water filtration technology.
EARLY METHODS OF GATHERING WATER
FAIRMOUNT WATER WORKS
PHILADELPHIA, 1801
### AMERICAN CITIES WITH WATERWORKS, 1800-1830

<table>
<thead>
<tr>
<th>Year</th>
<th># Works</th>
<th># Cities</th>
<th>Cities with Works</th>
<th>Public</th>
<th>Private</th>
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<tr>
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<td>17</td>
<td>33</td>
<td>51%</td>
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<td>1810</td>
<td>27</td>
<td>46</td>
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<td>22</td>
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<tr>
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<td>51%</td>
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<td>26</td>
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<td>45</td>
<td>90</td>
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Cities = 2,500 or more population

LATE-19TH CENTURY WATER WORKS

Chicago

Atlanta

Kansas City
DELIVERING WATER FROM A DISTANCE

"Like a Monster Snake"

Croton Dam, New York

Redwood Pipe, Denver

Owens Valley-Los Angeles Aqueduct
The Bacteriological Revolution

- Bacteriology ultimately modified the priorities of the public health community.

- Environmental sanitation increasingly would be viewed as the responsibility of the technical community—municipal engineers.

- More focus in the period on centralized, capital-intensive, public water and wastewater systems.

- Preoccupation with water-borne disease produced by “germs” led to an emphasis on water/wastewater treatment.

- Debates over filtration versus treatment became more common.
Memphis System revolutionizes sewer systems with the advent of separate rather than combined technology.

A “broadening viewpoint” about water pollution was beginning to raise questions about older views concerning what constituted pollution.
PROTECTING PUBLIC HEALTH

Is Your City in the Vanguard Fighting Water-Borne Typhoid?

1890 Typhoid Death Rate
80 to 100 per 100,000.

1906 Typhoid Death Rate Reduced to 32.1 per 100,000.

1918 Typhoid Death Rate Reduced to 7 per 100,000.

Time!
PUMPS AND PIPES
Filtration and Treatment

Mechanical Filters

Missouri Water Co.

Jacksonville, IL Waterworks

Mechanical Filters
# Public v. Private Ownership of Waterworks, 1830-1924

<table>
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<th>Public</th>
<th>Private</th>
<th>% Public</th>
<th>% Private</th>
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<td>9</td>
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The New Ecology

- The New Ecology suggested that external forces influenced sanitary services more than ever.

- Trend in medicine away from emphasis on preventive medicine and greater attention to social and behavioral concerns influenced public health and focused more heavily on personal health. Therefore, public health as a field suffered.

- Urban growth also placed stiff demands on sanitary services—metropolitanization and suburbanization.

- Postwar water problems marked by uneven distribution, shortages, increased pollution, and the challenge of privatization.
Increased importance of federal involvement and legislation related to local urban affairs.

Transformation of the definition of “pollution” evolved from a primary emphasis on biological causes to biological and chemical causes, with increasingly attention to industrial/commercial sources of toxic and hazardous wastes.

Types of pollution—especially nonpoint and groundwater pollution—undermined the value of existing technologies of sanitation.
Conclusion

By the 20th century most major US cities and many smaller ones established permanent, centralized sanitary services.

However, since water and wastewater systems were products of the late-19th century, their development had been directly informed by the goals of environmental sanitation.

The change in paradigm to bacteriology shifted focus to “front-of-the-pipe” issues of pollution.

The New Ecology offered a new awareness of environmental inputs and outputs and focused greater attention on a “broadening viewpoint” regarding pollution.
However, despite greater attention to problems such as nonpoint and groundwater pollution, combined sewer overflows, and so on, change in the systems were powerfully constrained by the limits of “path dependence.”

In addition, development and control of sanitary services increasingly faced problems related to competing local and regional jurisdictions, federal involvement, and privatization.

Ultimately, technologies of sanitation in the US have had a mixed record of achievement.

Note: All photos and figures in the presentation were drawn from Martin Melosi, The Sanitary City (Johns Hopkins, 2000).